KLIPPENSTEINS
BARRISTERS & SOLICITORS
160 JOHN STREET, SUITE 300,
TORONTO, ONTARIO M5V 2E5
TEL: (416) 598-0288
FAX: (416) 598-9520

May 9, 2008

BY COURIER (7 COPIES) AND EMAIL

Ms. Kirsten Walli
Board Secretary
Ontario Energy Board
P.O. Box 2319
2300 Yonge Street, Suite 2700
Toronto, Ontario M4P 1E4
Fax: (416) 440-7656
Email: boardsec@oeb.gov.on.ca

Dear Ms. Walli:

Re: Pollution Probe – Interrogatory Responses to OPG and GEC-etc.
EB-2007-0905 – Ontario Power Generation – 2008-09 Payments

Pursuant to Procedural Order No. 4, please find enclosed Pollution Probe's interrogatory responses to the interrogatories from OPG (Exhibit M, Tab 12.0) and GEC-Pembina-OSEA (Exhibit M, Tab 12.7, which are only the last two pages of this package).

Yours truly,

Per

Basil Alexander

BA/ba

Encl.

cc: Applicant and Intervenors per Procedural Order No. 1

OPG INTERROGATORY #1 TO POLLUTION PROBE

Ref: Page 22

Preamble:

Drs. Kryzanowski and Roberts forecast the 30-year Government of Canada bond yield at 3.85 percent for 2008 and 4.25 percent for 2009.

Interrogatory:

a) Please explain, in detail, the basis for the expectation that the yield curve will flatten and reduce the average spread for April 1 - December 31, 2008 to 25 basis points.

b) Please confirm that the average 30-year Government of Canada bond yield during April 2008 was 4.1 percent, and was 4.2 percent at the end of April 2008.

c) Please confirm that in order for the 30-year Government of Canada bond yield to average 3.85 percent during the nine months of 2008 for which OPG's regulated payments would apply, the May - December average yield would have to be lower than during April 2008.

d) Please discuss the reasons Drs. Kryzanowski and Roberts believe the yield on 30-year Canada bond yields will decline during 2008.

e) Please explain why Drs. Kryzanowski and Roberts believe the forecast of 10-year Canada bond yields for March 2009 is a good proxy for all of 2009.

f) How does the 15 basis points forecast spread compare to the typical spread that has prevailed during similar points in the business or interest rate cycle.

Response:

a) Drs. Kryzanowski and Roberts observed the average spread of 30-year over 10-year Canada's as 39 basis points for 2008 based on monthly data available at the time their evidence was filed on April 4, 2008. The calculation is in Schedule 2.1 of their evidence. They also calculated the same spread for 2007 using quarterly data provided by TD Economics in the Quarterly Economic Forecast, March 19, 2008. The average spread was 6 basis points for the year. Excluding Q2 which had a negative spread, the average was 10 basis points. Based on these observations, Drs. Kryzanowski and Roberts concluded that for purposes of forecasting, the 2007 historical spread was abnormally low. They also concluded that it was likely that the spread would moderate somewhat from the 39 basis points observed for the first 3 months of 2008. Based on these considerations they chose 25 basis points as their forecast for the spread for the remainder of 2008 and 15 basis points for 2009.

b) Drs. Kryzanowski and Roberts confirm that the average 30-year Government of Canada bond yield during April 2008 was 4.1 percent. On May 1, the yield was 4.07 percent according to the Report on Business, Globe and Mail, B14, May 2, 2008.

c – f) Drs. Kryzanowski and Roberts did not conduct forecasts of Canada rates. Rather they relied in their evidence on the latest forecasts then available from Consensus Economics. At the time of the hearing, Drs. Kryzanowski and Roberts will provide an update to their forecast for the 30-year Canada rate. The update will be calculated as the average realized rate weighted by the number of months included in that average plus the Consensus Forecast for the 10-year Canada rate adjusted for the last month's average spread for the remaining months for 2008.

Drs. Kryzanowski and Roberts did not conduct detailed business cycle analysis in forecasting the spread. Rather, they recommend that the Board conduct the spread calculation based on the most recent month at the time of rate setting. A detailed description of how this is done by the National Energy Board appears on page 100 of the Evidence of Drs. Kryzanowski and Roberts.

OPG INTERROGATORY #2 TO POLLUTION PROBE

Ref: Page 25

Preamble:

Drs. Kryzanowski and Roberts say theory teaches us to be suspicious of attempts to determine an appropriate equity ratio using a formula.

Interrogatory:

a) Is it Drs. Kryzanowski and Roberts's view that an optimal capital structure does not exist for a utility? Please explain.

b) What, in Drs. Kryzanowski and Roberts's opinion, is the quantitative relationship between the equity ratio and the return on equity for a utility? For example, if the Board were to determine that OPG's regulated capital structure should contain a deemed equity ratio of 65 percent, what would Drs. Kryzanowski and Roberts recommend as an allowed ROE and how would they estimate it?

Response:

a) No, it is not Drs. Kryzanowski and Roberts' view that an optimal capital structure does not exist for a utility. In their Evidence, they recommend capital structures for OPG's hydro and nuclear businesses and for the overall regulated entity.

b) Drs. Kryzanowski and Roberts do not vary the allowed ROE as a function of the allowed capital structure or of any other features of an individual company. Please refer to pages 98-99 of their Evidence for a detailed explanation of this approach.

OPG INTERROGATORY #3 TO POLLUTION PROBE

Ref: Page 26 - 27

Preamble:

Drs. Kryzanowski and Roberts set out three factors affecting the target debt ratio, including taxes.

Interrogatory:

a) Would Drs. Kryzanowski and Roberts agree that, the lower the tax rate, the less the tax benefit from using debt, all other things equal?

b) When the "generic cost of capital" approach was first adopted by the NEB in 1995, what was the statutory combined federal/provincial income tax rate in Ontario?

c) What is the statutory combined income tax rate expected to be based on current legislation by 2010?

Response:

a) Drs. Kryzanowski and Roberts agree that, the lower the tax rate, the less the tax benefit from using debt, all other things equal. They also note that a further benefit of using debt is that, after tax, the cost of debt is generally lower than the cost of equity.

b) In 1995 the statutory combined federal provincial corporate tax rate in Ontario was 43.5%.

c) The combined corporate income tax rate is expected to be 32 percent in 2010 according to federal budget materials at:
http://www.fin.gc.ca/budget06/bp/bpc3be.htm#dividends.
Drs. Kryzanowski and Roberts also note that the reduction in the corporate income tax rate will also result in a reduction in the Canadian dividend tax credit.

OPG INTERROGATORY #4 TO POLLUTION PROBE

Ref: Pages 29 - 42 and Schedule 3.1

Preamble:

OPG would like to understand Drs. Kryzanowski and Roberts' framework for risk analysis better and to test its sensitivity to assumptions.

Interrogatory:

a) Have Drs. Kryzanowski and Roberts' given equal weight to each of the nine dimensions of business risk? If yes, please explain why they believe each of the nine warrants similar weight and what evidence they rely on to support the implication that investors would give each dimension equal weight.

b) With respect to the (1) to (5) risk classifications, are these intended to apply solely to regulated companies? Please explain.

c) Based on Drs. Kryzanowski and Roberts' framework, would Hydro One's Transmission operations be assigned a risk rating of 1? Please explain why, or why not.

d) Did Drs. Kryzanowski and Roberts take into account the OEB's decisions to adopt deemed common equity ratios of 40 percent for Hydro One's Transmission operations and 40 percent for the Ontario electricity distributors in arriving at their recommended common equity ratios for OPG? If yes, please explain how, or if no, why not.

e) For each of the nine risk dimensions, please discuss what characteristics would lead a utility to be at the upper end of the (1) to (5) scale.

f) Is it Drs. Kryzanowski and Roberts' view that the business risks of OPG's regulated operations are the highest of all major regulated entities in Canada? If no, which regulated companies face higher business risks, on which of the nine dimensions are the risks higher? Please explain why the risks are higher.

g) Please discuss whether the risk rankings for each of the nine dimensions for OPG take into account both the probability of a negative event occurring and the cost of the negative event. If yes, please explain how. If no, please explain why not.

Response:

a) Each of the nine dimensions of business risk takes on equal weight for presentation purposes in the risk analysis framework employed by Drs. Kryzanowski and Roberts. Their framework is designed as a directional guide incorporating the risk factors commonly discussed in assessments of utility business risk produced by bond rating agencies and witnesses in utility rate hearings. The numerical values are intended to be indicative of bands of risk (low, moderate and high). In their Evidence, Drs. Kryzanowski and Roberts benchmark their framework against determinations of business risk by regulators for transmission, distribution and integrated utilities in Canada.

b) The risk classifications are applied only to regulated companies in the Evidence of Drs. Kryzanowski and Roberts because examination of such companies provides the most relevant benchmarks. There is no reason why the framework properly modified could not be applied to non-regulated companies.

c) Drs. Kryzanowski and Roberts did not conduct a detailed analysis of Hydro One's transmission operations. Their Evidence does contain an assessment of the business risk of the transmission sector of the utilities industry in general on pages 29 and 30 which states: "We assess the business risk of transmission utilities as low (score of 1 out of 5)"…

d) Drs. Kryzanowski and Roberts benchmark their recommendations against the percentage of equity deemed by regulators including the Board in Schedule 3.7 of their Evidence. They also provide the percentages they recommended in various hearings. For electricity transmission utilities, they recommended 30 percent equity in the Generic Hearing in Alberta in 2004 and the Alberta Board set the equity component at 33 percent. Schedule 3.7 notes that the Ontario Energy Board set the equity component for electricity transmission at 40 percent in 2006 and 2007. They regard the level of 40 percent as generous for a low-risk electricity transmission utility. Please refer to pages 47 and 48 of the Evidence of Drs. Kryzanowski and Roberts for a detailed discussion of the concept of generosity.

e) A discussion of "what characteristics would lead a utility to be at the upper end of the (1) to (5) scale" would be purely hypothetical. In contrast to the request, the Evidence of Drs. Kryzanowski and Roberts applies their risk rating framework in six actual cases (transmission, distribution and integrated electricity utility sectors, OPG hydro, nuclear and regulated business). As summarized in Schedule 3.1, they assign risk rankings by dimensions ranging from low to medium to high. For example, as stated on page 36 of their Evidence, both operating leverage and technology are rated moderate to high because "Nuclear technology is more advanced and characterized by a greater degree of fixed costs (operating leverage) and higher technology risk."

f) Drs. Kryzanowski and Roberts did not conduct a detailed analysis of the business risks of all major regulated utilities in Canada in comparison to OPG's regulated operations. They did, however, conduct an analysis of the risks faced by three sectors of that industry: transmission, distribution and integrated electric utilities and form comparisons with OPG's regulated operations by businesses on page 49 of their evidence:

> Our analysis of the business risk faced by OPG Hydro assesses this risk as low to moderate – higher than that of a distribution utility and somewhat above the business risk of an integrated electric utility.

> Schedule 3.7 shows that this business risk rating for OPG Nuclear exceeds the rating for OPG Hydro (1.8). It also signals that OPG Nuclear bears higher business risk than generic integrated companies (rated 1.5) or generic distribution utilities rated (1.4).

g) In arriving at their assessments of each of the nine dimensions of risk, Drs. Kryzanowski and Roberts formed assessments of both the subjective probability of negative events and their severity. An example, addressing regulatory risks arising from sources beyond OPG's principal regulator appears on page 40 of their evidence:

> Additional regulatory risk arises from possible shifts in environmental and safety regulations regarding nuclear operations but this is mitigated by the minor role currently played by this risk and the company's right to request a deferral account should the risk become material in the future. Overall, we assign a rating of moderate to this second aspect of regulatory risk arising from OPG's nuclear operations.

OPG INTERROGATORY #5 TO POLLUTION PROBE

Ref: Page 37

Preamble:

Drs. Kryzanowski and Roberts' state, "These data strongly suggest that production shortfalls attributable to management issues (and not constituting a risk to be recognized in regulation) were a major concern for OPG Nuclear in the period 2005 - 2007."

Interrogatory:

a) Please provide any and all evidence to support this assertion.

Response:

In the sentence before the one quoted in the Preamble to this Interrogatory, Drs. Kryzanowski and Roberts provide evidence of substandard capability performance by OPG as follows: "For 21 of 30 plant years (70% of the cases) the unit capability factor failed to achieve the benchmark level." The 30 plant years are based on data supplied by OPG in response to Pollution Probe Interrogatory #5. Footnote 20 on page 37 of the Evidence of Drs. Kryzanowski and Roberts confirms the conclusion of substandard capability performance using an independent data source:

> Data for capability factors for these plants going back to inception are available on the website of the International Atomic Energy Agency. They show a similar pattern of low capacity factors.

OPG INTERROGATORY #6 TO POLLUTION PROBE

Ref: Page 41

Preamble:

Drs. Kryzanowski and Roberts state that distribution companies are subject to operating level risk as they levy variable charges to cover fixed costs.

Interrogatory:

a) Please explain Drs. Kryzanowski and Roberts' understanding of how electricity distribution rates are set in Alberta and Ontario and the extent to which the rates designed to recover fixed costs are variable or fixed in nature.

Response:

The risk ranking framework employed by Drs. Kryzanowski and Roberts assesses operational risk based on the structure of each industry sector. Because distribution companies sell to retail and wholesale customers, their revenues are variable due to weather or market competition from other energy sources. This risk can be mitigated through rate design by allowing fixed charges to recover certain specified fixed costs as well as by deferral accounts. To illustrate, as documented in Board Decision EB-2005-0378, distribution companies in Ontario set rates based on a load forecast adjusted for Conservation and Demand Management programs and approved by the Board under cost of service regulation. A number of other specified costs are estimated by the company and approved by the Board including corporate costs and depreciation. Deferral accounts and variance accounts reduce the risks faced by distribution companies.

OPG INTERROGATORY #7 TO POLLUTION PROBE

Ref: Page 44

Preamble:

Drs. Kryzanowski and Roberts state that "from the vantage point of DBRS, Canadian Utilities, Enbridge, Newfoundland Power and TransCanada Corporation are the only companies which enjoy an A credit rating." and "As stated earlier, the typical company is rated on the borderline between A(low) and BBB (high) by DBRS."

Interrogatory:

a) Please provide the DBRS debt ratings of the following:

AltaLink
CU Inc.
Enbridge Pipelines
Gaz Metro
Nova Gas Transmission
Terasen Gas
Union Gas

Response:

Drs. Kryzanowski and Roberts acknowledge that all the companies listed above are rated A or A(high) by DBRS. They note, however, that the full quote from page 44 of their evidence reads [emphasis added]:

> **The schedules show that**, from the vantage point of DBRS, Canadian Utilities, Enbridge, Newfoundland Power and TransCanada Corporation are the only companies which enjoy an A credit rating.

The statements quoted in the Preamble refer to the sample of companies in Schedule 3.2 of the Evidence of Drs. Kryzanowski and Roberts. For the reasons explained in Pollution Probe's Response to OPG Interrogatory #9(b), the schedules in question do not include any of the companies listed in the present Interrogatory.

OPG INTERROGATORY #8 TO POLLUTION PROBE

Ref: Page 44

Preamble:

"We conclude that the experiences of the companies in Schedules 3.2 - 3.4 suggest that a bond rating of BBB or higher is sufficient to maintain good access to capital markets."

Interrogatory:

a) Please define "good access".

b) Please quantify how much higher the cost of debt to a BBB credit (versus the cost of debt for an A credit) would have to be for Drs. Kryzanowski and Roberts' to conclude that an A rating results in a lower cost of capital to ratepayers.

Response:

a) and b) Credit rationing occurs when a company seeks debt financing and cannot obtain the full amount sought even by increasing the yield offered on its debt. By "good access to capital markets", Drs. Kryzanowski and Roberts mean an absence of prolonged periods of credit rationing and/or periods in which financing is available only under unusual terms and rates. They recognize that BBB-rated utilities typically pay more for debt than do A-rated companies but note that, as documented in Pollution Probe's Response to OPG Interrogatory #13(d), with the exception of Pacific Northern Gas, utilities with BBB ratings did not face credit rationing.

OPG INTERROGATORY #9 TO POLLUTION PROBE

Ref: Page 45 and Schedule 3.5

Preamble:

"The average 2007 allowed return for this sample was 8.75 percent while the average actual ROE for the consolidated company was 12.03 percent. The difference, 328 basis points represents the out performance of allowed returns."

Interrogatory:

a) How, in Drs. Kryzanowski and Roberts' view, do the higher (than allowed) consolidated ROEs impact the companies' debt ratings?

b) Please provide any and all analysis undertaken by Drs. Kryzanowski and Roberts to determine the extent to which the consolidated ROEs represent "overearning" by the regulated operations covered by those allowed ROEs.

Response:

a) Drs. Kryzanowski and Roberts do not argue that higher than allowed consolidated ROEs impact the companies' bond ratings. Their point is that the high ROEs of the consolidated companies (relative to allowed levels) constitute evidence that the consolidated companies are not burdened by bond ratings at the BBB level.

b) Drs. Kryzanowski and Roberts did not conduct any analysis of the actual earning performance of regulated operations as distinct from consolidated companies. For this reason, they qualify the analysis in this section of their evidence as follows on pages 42 and 43:

> These companies represent a current sample of utilities with publicly traded shares. In forming this sample we seek to measure ratings and financial ratios for the traded entity associated with the regulated utility. In focusing on traded companies, our goal is to maintain sample consistency throughout our evidence. We recognize, however, that many of the traded companies include nonregulated businesses in addition to the regulated utility. We control for any bias by commenting on the differences as well as comparing our conclusions to those drawn strictly for regulated entities.

OPG INTERROGATORY #10 TO POLLUTION PROBE

Ref: Page 48

Preamble:

Drs. Kryzanowski and Roberts discuss the relative risk of ATCO Pipelines and AltaGas Distribution.

Interrogatory:

a) Please provide a risk ranking for both ATCO Pipelines and AltaGas Distribution based on Drs. Kryzanowski and Roberts' understanding of the business risks using the nine dimension framework set out in Schedule 3.1 and explain the rationale for the ranking on each of the nine dimensions.

b) Please confirm that Drs. Kryzanowski and Roberts recommended equity ratios of 40 percent for both ATCO Pipelines and AltaGas in the EUB's generic cost of capital proceeding.

Response:

a) Drs. Kryzanowski and Roberts developed their risk ranking framework for the current hearing and so did not apply it to ATCO Pipelines and AltaGas Distribution in their 2003 evidence. As a result, they are unable to provide the requested analysis.

b) The statement is confirmed.

OPG INTERROGATORY #11 TO POLLUTION PROBE

Ref: Page 50

Preamble:

Drs. Kryzanowski and Roberts state that the higher business risk of OPG Nuclear should translate into a significant increase in its common equity ratio on the order of 5 - 10 percent over that for OPG Hydro.

Interrogatory:

Please explain in more detail how the differences in the risk rankings translate into the specific incremental common equity ratio of 5 - 10 percent.

Response:

Drs. Kryzanowski and Roberts explain in detail why there is no mathematical formula for establishing a target debt-equity ratio. The discussion appears in their Evidence in Section 3.2 (pages 25 – 28) and in Appendix 3.A (pages 158-169).

In this context, the range of 5 – 10 percent arises from their review of the three electric utility industry sectors summarized in Schedule 3.7. Drs. Kryzanowski and Roberts note that the equity components allowed by regulators for the sectors in that schedule vary from a low 33 percent for transmission by the EUB to 37-40 percent for distribution to a high of 44.5 percent for an integrated electric utility (Newfoundland Power). This gives a range of approximately 5 percent between sectors and a range of approximately 10 percent from lowest to highest. Drs. Kryzanowski and Roberts arrive at a similar range when they reexamine their own recommendations in prior evidence on electricity utilities summarized at the bottom of Schedule 3.7. Their lowest recommended equity component was 30 percent for transmission in the Alberta Generic Hearing, followed by 35 percent for distribution in the same hearing and their highest was 42 percent for a small integrated company (Northwest Territories Power Corporation). Once again, they arrive at a range of 5 to 10 percent over which capital structure varies to reflect the risk differences among sectors.

OPG INTERROGATORY #12 TO POLLUTION PROBE

Ref: Pages 41 and 51

Preamble:

On page 41, Drs. Kryzanowski and Roberts state that distribution companies are subject to operating leverage risk as they levy variable charges to cover fixed costs. On page 51, Drs. Kryzanowski and Roberts state that denying OPG's request for a 25 percent fixed charge would reduce risk mitigation, which, in their framework falls under the deferral account category.

Interrogatory:

Please explain why denying the fixed charge request does not fit into the operating leverage category.

Response:

As noted in the Response to OPG Interrogatory #6, Drs. Kryzanowski and Roberts employed a framework which assesses risks and the degree to which the risks are mitigated. Because OPG's nuclear business involves a high degree of fixed costs, operating leverage receives a rating of moderate-high (4 out of 5). The presence of a fixed charge (assuming that it is approved by the Board) mitigates this risk and is reflected in a rating of low (1) under deferral accounts as explained on page 51 of the Evidence of Drs. Kryzanowski and Roberts. The category labeled "deferral accounts" reflects regulatory rate design features that mitigate risk. For purposes of their analysis, Drs. Kryzanowski and Roberts classified the fixed charge in this category. Taken together with the other ratings in the OPG Nuclear column in Schedule 3.1, the result is the overall rating of moderate risk (2.3) for OPG's nuclear business. If the Board should deny OPG's request, the rating for deferral accounts would increase to 3 in the OPG Nuclear column in Schedule 3.1. As a result, as explained on page 51, the overall business risk ranking for this business segment would increase to 2.6.

OPG INTERROGATORY #13 TO POLLUTION PROBE

Ref: Pages 52 - 53 and Schedules 3.2 and 3.4

Preamble:

Drs. Kryzanowski and Roberts conclude that there is no reason to believe that as a stand-alone company, and interest coverage of 2.1 times, OPG could not achieve a BBB rating with 47 percent common equity.

Interrogatory:

a) Could Drs. Kryzanowski and Roberts please confirm that the debt rating agencies focus on cash flow metrics like FFO coverage and FFO to debt ratios rather than EBIT coverage?

b) Could Drs. Kryzanowski and Roberts please confirm that one of their four BBB companies, Pacific Northern Gas, is rate BBB (low) with a negative trend.

c) Please provide the quantitative detail for the calculation of Pacific Northern Gas's 2007 coverage ratio.

d) Please provide all evidence that Pacific Northern Gas could access 30-year debt in the current capital market environment.

e) Please provide Drs. Kryzanowski and Roberts's estimate of the spreads at which TransAlta Corporation could issue 10-and 30-year new debt in the current capital market environment.

Response:

a) Drs. Kryzanowski and Roberts cannot so confirm. Their understanding is that rating agencies attach importance both to cash flow metrics and to coverage ratios. To illustrate, they note that EBIT interest coverage (times) is the first ratio appearing on page 1 of DBRS Rating Report on OPG of November 30, 2007. On page 2 of that report, DBRS writes: "Cash flow-to-debt and interest-coverage ratios will likely come down modestly from their current levels, but are expected to remain more than adequate to support the current ratings." Further, Drs. Kryzanowski and Roberts note that EBIT interest coverage (x) appears on the list of ratios in the peer comparisons for both OPG and the electricity sector on page 13 of Standard & Poor's report on OPG dated December 9, 2005. Finally, Drs. Kryzanowski and Roberts point out that Ms. McShane discusses DBRS' use of interest coverage on page 82 of her evidence.

b) Drs. Kryzanowski and Roberts confirm that Pacific Northern Gas, is rated BBB (low) with a negative trend by DBRS.

c) The definition of interest coverage is earnings before interest and taxes divided by total interest. From The Pacific Northern Gas 2007 Annual Report, Drs. Kryzanowski and Roberts obtain the following data ($ thousands): Operating income, 14,759; Interest on long term debt, 6,452; Interest on short term debt, 703. The calculation of the interest coverage ratio is:

$14,759 / (6,452 + 703) = 2.1

Drs. Kryzanowski and Roberts point out that interest coverage ratios must be interpreted in the context of a company's performance and other dimensions of risk. Given the low profitability of Pacific Northern Gas and financial distress, the calculated coverage level may be viewed as low. This would not be the case for a more stable, profitable utility.

d) Drs. Kryzanowski and Roberts have not conducted a detailed study of Pacific Northern Gas. However, they acknowledge that the company experienced financing difficulties in 2005 as documented by Ms. McShane in her reply to Pollution Probe Interrogatory #54. Drs. Kryzanowski and Roberts further note that Pacific Northern Gas is one of six companies in their sample with a rating of BBB from at least one rating agency. Pollution Probe Interrogatory #54 to OPG referenced this set of companies as follows:

> Please provide all evidence/materials of which Ms. McShane is aware of regarding difficulties accessing financing experienced by any of these six additional companies with a rating of BBB."

The response was:

> Ms. McShane is not aware of any specific financing issues that the referenced companies, other than Pacific Northern Gas, have faced …

Drs. Kryzanowski and Roberts conclude that, according to Ms. McShane, 5 out of 6 companies rated BBB have experienced no financing difficulties. Further, they note that the criterion for judging access to financing is not whether the firm can access 30 year debt. Please refer to Pollution Probe's Response to OPG Interrogatory #8 for further discussion of access to financing.

e) Drs. Kryzanowski and Roberts have not conducted a detailed analysis of the spreads for BBB-rated utilities like TransAlta. Based on their review of the spreads provided by Ms. McShane in her Response to Pollution Probe Interrogatory #54, they note that the spreads on 30-year Canadian utility bonds rated either BBB+ or BBB by Standard and Poor's range from 190 to 242 basis points.

OPG INTERROGATORY #14 TO POLLUTION PROBE

Ref: Page 59

Preamble:

Drs. Kryzanowski and Roberts refer to the Daubert criteria for evaluating the admissibility of expert testimony adopted by federal and state courts.

Interrogatory:

a) Please provide any evidence that the Daubert criteria have ever been applied for the purpose of evaluating the fair return for a utility.

b) Please provide evidence that the Daubert test and criteria are applied in Canada either by any court or any regulatory tribunal.

c) Please provide any references in regulatory decisions or court decisions that have determined that the Daubert criteria are useful for the purpose of selection of methodologies or other indicators of a fair return for a regulated utility.

Response:

a) – c) Drs. Kryzanowski and Roberts are not aware of any explicit evidence that the Daubert criteria have been applied for the purpose of evaluating the fair return for a utility or their application in Canada. Drs. Kryzanowski and Roberts similarly are not aware of any ruling by a court or regulatory tribunal that explicitly states that the Daubert criteria are not useful for the purpose of selection of methodologies or other indicators of a fair return for a regulated utility.

Criteria similar to the Daubert criteria are commonly used implicitly by Canadian regulatory regimes when they explain why they gave little or no weight to, for example, the Comparable Earnings Estimation Method. An example is provided starting on page 136 of the Evidence of Drs. Kryzanowski and Roberts. Specifically:

> Drs. Brigham, Shome and Vinson state that the comparable earnings method "has now been thoroughly discredited (see Robichek [15]), and has been replaced by three market-oriented (as opposed to accounting-oriented) approaches …".[1] Furthermore, there is widespread agreement among utility and intervenor witnesses and Boards that the Comparable Earnings Test is not appropriate for determining a

[1] E. F. Brigham, D. K. Shome and Steve R. Vinson, 1985, The risk premium approach to measuring a utility's cost of equity, *Financial Management* (Spring), pages 33-45.

fair rate of return.[2] For example, in 1999, the Alberta Energy and Utilities Board stated:[3]

> "In the Board's view, the comparable earnings test is sensitive to accounting practices of the sample firms, the sample selection, the selected business cycle and discontinuities caused by mergers, divestiture or restructuring. Given the historical corporate restructuring and economic uncertainty, which may adversely affect the test results, the Board gives little weight to the comparable earnings test in this proceeding for the purposes of determining an appropriate rate of return."

The Alberta Energy Utilities Board has re-iterated its position on the merits of the Comparable Earnings Method in a subsequent decision on the application by AltaLink and TransAlta as follows:[4]

> "Accordingly, for all of the above reasons, the Board continues to consider that the comparable earnings method is not appropriate and, hence, gives no weight to the comparable earnings method in this proceeding for the purposes of determining the appropriate equity rate of return."

In addition to the above excerpt from the Evidence of Drs. Kryzanowski and Roberts, the Alberta Energy Utilities Board again re-iterated its position on the merits of the Comparable Earnings Method in its Generic Cost of Capital Decision (EUB Decision 2004-052, July 2, 2004, page 24) as follows:

> The Board concludes that it should place no weight on the CE test because of the implementation problems of the CE test and the above-noted conceptual and methodological concerns with the CE test.

---

[2] The direct testimony of Dr. M.J. Vilbert for TransAlta Utilities Corporation, May 2000, is an example of a utility witness, and the direct testimony of Drs. L.D. Booth and M.K. Berkowitz for TRANSCO, August 2000, is an example of intervenor witnesses.
[3] Alberta Energy Utilities Board Decision U099099, November 25, 1999, page 326.
[4] Alberta Energy and Utilities Board, August 2003, Decision 2003-061: AltaLink Management Ltd. and TransAlta Utilities Corporation Transmission Tariff for May 1, 2002 – April 30, 2004, TransAlta Utilities Corporation Transmission Tariff for January 1, 2002 – April 30, 2002, page 115.

OPG INTERROGATORY #15 TO POLLUTION PROBE

Ref: Page 71

Preamble:

Drs. Kryzanowski and Roberts begin their assessment of the market risk premium with an examination of the 57-year time period 1951 - 2007 which they claim is "not contaminated by the first few years of rapid economic and equity market exuberance resulting from the satisfaction of pent-up consumer demand and very low administered interest rates after World War II."

Interrogatory:

Please provide the scientific criteria applied to determine that the years following World War II should be excluded but that none of the sub-periods within the period 1951 - 2007 contaminate the measurement of the returns.

Response:

The scientific criterion is that a researcher or expert should not knowingly introduce a selection (or "cherry-picking") bias into the choice of the starting date for the series being studied. As Drs. Kryzanowski and Roberts state on page 114 on their Evidence:

> The MERP that Ms. McShane estimates for Canada for the 1947-2006 period is materially impacted by the first four years of this period. To illustrate, the annual average over the first four years (1947-1950) are 7.69% for the Consumer Price Index, 1.38% for long Canada bonds, 0.46% for 91-day Canadian Treasury Bills and 20.88% for the equity market index. The result is an annual average MERP over this four-year period of 19.50%!

Stating these values differently, the Consumer Price Index grew by a compounded total-period rate of 33.91% over the 1947-1950 period, and the corresponding compounded total-period growths in the rates of return were 104.77% for stocks, 5.47% for bonds and 94.66% for the MERP. Obviously, the inclusion of these four initial years has a material and distorting impact on the MERP estimate.

OPG INTERROGATORY #16 TO POLLUTION PROBE

Ref: Page 72 and Schedule 4.3

Preamble:

Drs. Kryzanowski and Roberts conclude "The major observation that we draw from this analysis is that the MERP has been declining in Canada over time, and that using the historical MERP over the longest available time period as a going-forward MERP estimate is not appropriate."

Interrogatory:

a) Please confirm that Schedule 4.3 shows no evidence that stock returns are declining. If this cannot be confirmed, please explain why.

b) Please confirm that Schedule 4.3 demonstrates that the reason the measured equity risk premium has declined is because the calculated bond returns increased.

c) Please explain, given that Drs. Kryzanowski and Roberts are forecasting long-term Canada bond yields of 3.85 percent and 4.25 percent, why historic risk premiums that reflect average bond returns as high as 10.47 percent are relevant to investors' future expected risk premiums.

Response:

a) – b) Schedule 4.3 indicates that the realized returns for both stocks and bonds have increased most recently. As noted on page 118 of the Evidence of Drs. Kryzanowski and Roberts, this type of evidence also shows that stock returns exhibit mean reversion and bond returns exhibit mean aversion. In turn, this is evidence that the returns of stocks and bonds are not independent and identically distributed. In turn, this violates a necessary assumption for using the arithmetic mean, and suggests that some weight should also be placed on the geometric mean when using realized MERP (market equity risk premium) to estimate forward-looking MERP.

c) This allows for future mean aversion in bond returns as using high and low equity returns allows for future mean reversion in equity returns. It would not be very scientific to *arbitrarily* truncate some of the bond returns above the mean and not do the same for stock returns above the mean. This would introduce a selection bias into the analysis that would inflate the MERP estimate.

OPG INTERROGATORY #17 TO POLLUTION PROBE

Ref: Footnote 7

Preamble:

Drs. Kryzanowski and Roberts reference several forecasts.

Interrogatory:

Please provide copies of the referenced forecasts.

Response:

Copies of the requested forecasts are attached as Attachments 1-3 to this Schedule:

Attachment 1 – *TD Quarterly Economic Forecast*, March 19, 2008, www.td.com/economics.

Attachment 2 – BMO Capital Markets Economics, *Canadian Economic Outlook*, April 1, 2008, www.bmonesbittburns.com/economic.

Attachment 3 – Scotiabank Group, *Global Economic Research, Forecast Update*, March 28, 2008, www.scotiabank.com.

Please note the correction to the date of BMO forecast which was a typo in the Evidence of Drs. Kryzanowski and Roberts.

www.td.com/economics

TD Bank Financial Group

TD Economics

TD Quarterly Economic Forecast

March 19, 2008

CANADIAN REGIONAL DIVIDE TO WIDEN WITH MADE IN U.S.A. RECESSION

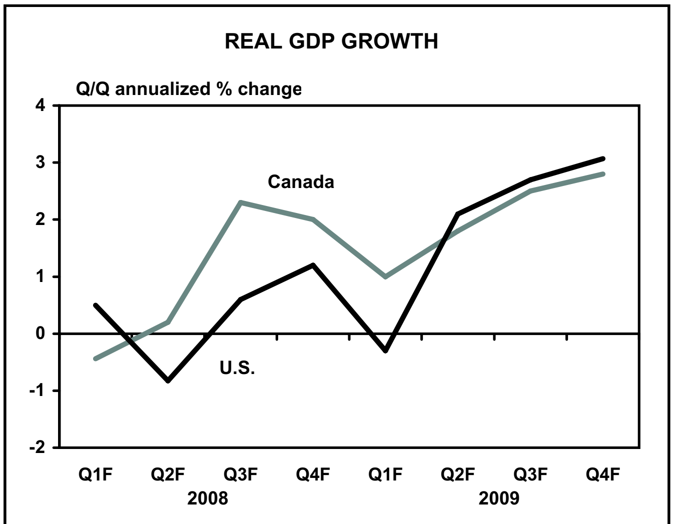
On February 5th, we produced an economic update on the U.S. outlook in conjunction with the announcement of a fiscal stimulus package by Congress. At that time, a number of leading indicators left the impression that the U.S. was capable of skirting a recession, however, real GDP growth was still expected to slow to a crawl in the first half of the year, averaging just 0.5% annualized. With growth projections just a hair off of the zero-threshold, we knew it wouldn't take much to knock the U.S. economy into contraction territory. This risk has now become a reality in our economic outlook. We believe the history books will log 2008 as a recessionary year for the U.S. economy. However, this outturn may not be obvious by looking at the headline GDP figures alone, which will be temporarily skewed up when consumer spending is boosted from the fiscal stimulus package in the second and third quarters of this year. Even as this goes on, we expect to see broad-based job losses that extend into the first half of 2009, which, in turn, will depress real personal income once transfer payments are stripped away. And, business investment is also expected to contract throughout 2008 and most of 2009. Together, these factors are qualifiers for a recession according to the National Bureau of Economic Research (NBER). In fact, jobs and incomes were cited as the two most influential factors that led to the 2001 recession markers by the NBER.

The boost to consumer spending from the fiscal stimulus in this cycle will have a limited impact on the overall American economy because much of the consumer boost will be met through imports and a drawdown of inventories. And, since the stimulus is temporary in nature, the

HIGHLIGHTS

- **U.S. economy slated for a recession in 2008.**
- **Fed funds rate to be slashed to an ultra-low 1% by August-08**
- **Sustained U.S. economic recovery not likely to take hold until the second half of 2009.**
- **U.S. real GDP growth expected to be a dismal 1.1% in 2008 and 2009.**
- **Canada will only narrowly miss entering into a recession itself.**
- **Bank of Canada to cut rates by a further 150 basis points, placing overnight rate at 2% by mid-year.**
- **Canada will produce equally soft real GDP growth of 1.1% in 2008, but stage a modest rebound to 1.8% in 2009.**
- **Provinces with a heavier manufacturing base and, in particular, low net exports of high-demand resource products, are going to be the ugly ducklings of the flock. The primary candidates are Ontario and Quebec.**
- **Saskatchewan will be at the top of the leader board, outperforming national growth by nearly threefold.**

CONTENTS



Forecasts by TD Economics, March 2008

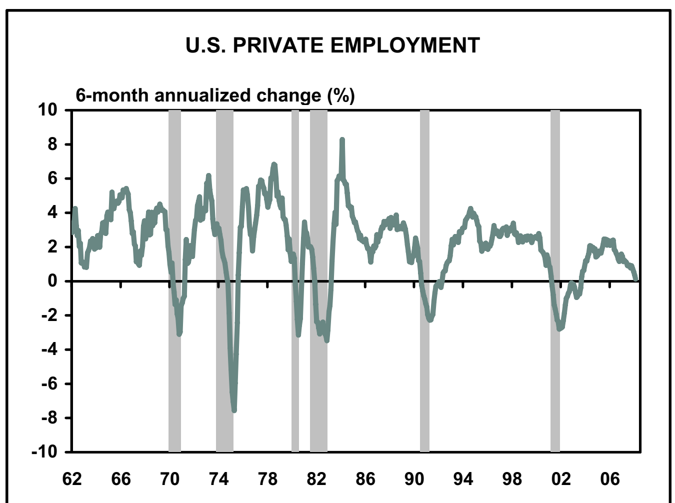
economy will settle right back into the funk in the second half of 2008 and early 2009. As a result, we expect real GDP growth to turn in a dismal 1.1% performance in both years. However, the seeds will be sown for a sustained recovery in the second half of 2009. By then, housing will be able to modestly contribute to growth after having found a bottom in early-2009, the Fed's hard work on liquidity and massive interest rate cuts will be getting some traction, and the export market will continue to benefit from the momentum in global demand.

The Canadian economy will bear the markings of the U.S. downturn in two important respects: slumping exports and disparity in regional economic growth. The net trade balance was a considerable drag on real GDP growth last year, but some of that impact was masked in the headline figure because domestic demand was on fire. Although we believe the dichotomy between trade and domestic demand will persist through our forecast horizon, it's unreasonable to expect Canadian domestic demand can be fully insulated from a U.S. recession, so the split personality of the economy will not be as pronounced this year. Furthermore, the drag from the U.S. will not be felt evenly across Canada. Those provinces with a heavier manufacturing base and, in particular, low net exports of high-demand resource products, are going to be the ugly ducklings among the flock. The primary candidates are Ontario and Quebec.

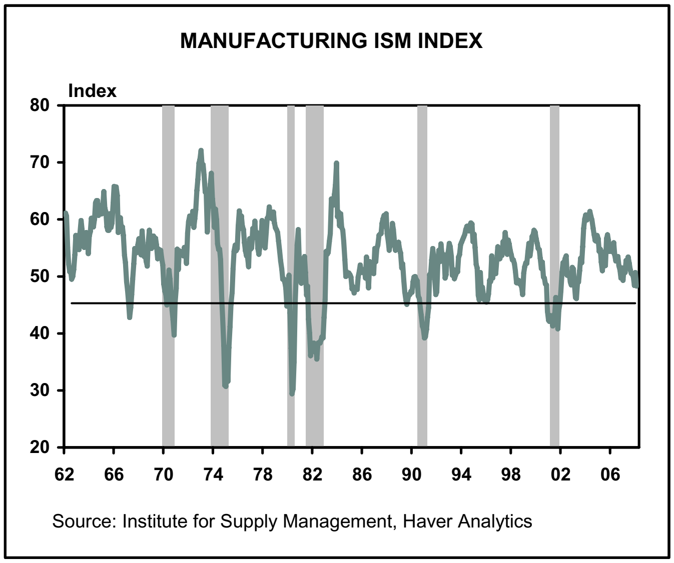
With a number of the largest economies in Canada to bear the biggest economic impact from the U.S. recession, Canada will only narrowly miss entering into a recession itself, and will ultimately produce equally soft real GDP growth of 1.1% in 2008. However, an important distinction between the two countries is that the composition of growth in Canada will be fundamentally sounder than that of the U.S. and the rebound in 2009 will be slightly stronger at 1.8% when the U.S. recovery begins to heal Canada's trade sector. Cooling domestic demand growth in Canada won't change the fact that the underpinnings are day and night relative to its U.S. counterpart. Among the differences, Canadian housing markets are flourishing, while consumers are already benefiting from past fiscal stimulus and strong income growth. These factors won't come apart at the seams in 2008, especially when an additional 150 basis points in monetary stimulus of central bank cuts is added into the equation.

Recession – made in the U.S.A

Since our U.S. economic update in February, a number of unfavourable developments have unfolded. Among the five leading indicators we have been following to gauge economic momentum, three are now flashing red for a recession.[1] The first indicator – building permit issuances – had been flagging recession for over a year, suggesting it has lost its predictive power in this cycle. However, job losses and the broad-based nature of those losses in each of the first two months of this year was influential in prompting a shift in our view to a U.S. recession. If the job losses had remained contained to the usual suspects – manufacturing and construction – the U.S. consumer would have found some refuge from negative housing wealth effects in wage growth, because jobs and incomes matter more than wealth when it comes to meeting day-to-day living



Source: BLS, Haver Analytics



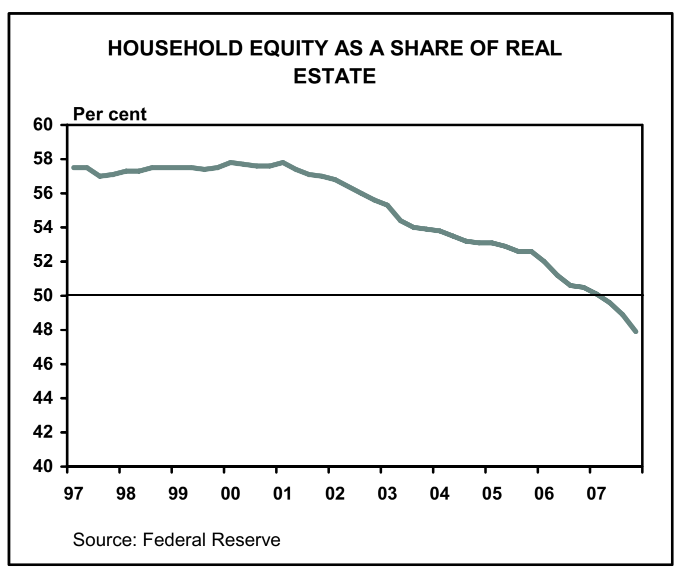
expenses. This support is now in question. In January and February, 10 of 15 industries posted year-to-date losses in jobs. And, the 6-month annualized change in private sector employment dropped to 0.1%. There are no instances since the 1960s when this indicator decelerated to as low as 0.6% without a recession ensuing within 1 to 3 months. The data are now well within that threshold.

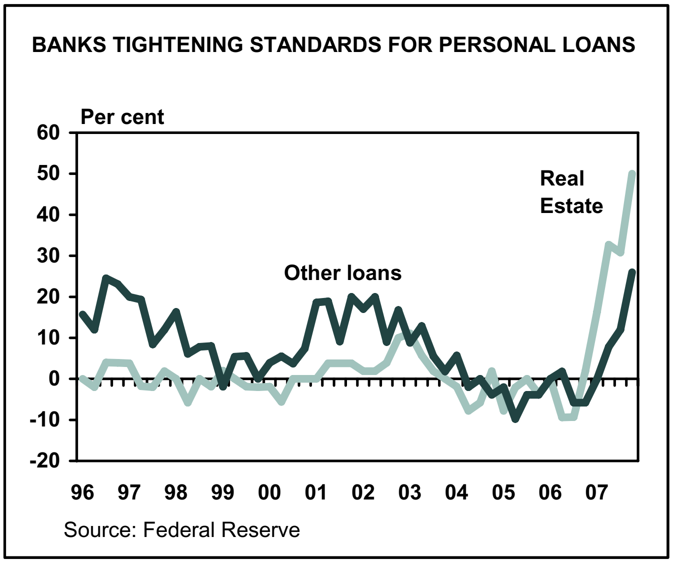
The third recession-marker indicator is the ISM index, which has fallen into contraction territory twice in the past three months and is dangerously close to our point-of-no-return recession threshold of 46.0. In addition, the deterioration in this index was mirrored by the non-manufacturing ISM index in January and February, suggesting that downtrodden sentiment among producers is increasingly widespread.

Alongside this mix of bad-news data, the last two months have also brought forward an intensification of both the housing downturn and risk aversion in the credit markets. In regards to the latter, central bankers are implementing one measure after another to inject liquidity in order to stave off a devastating crisis of confidence in the investment community, but to little avail. The near-collapse of Bear Stearns in mid-March caused an eruption in market jitters. The cost of funding among financial institutions subsequently worsened, with the spread between 3-month Libor and Treasury Bills widening to 190 basis points on March 17, mirroring spreads seen at the end of last year. The heightened risk-premium on borrowing between financial institutions is showing little sign of letting up, suggesting the Fed will have to do more to pass along the intended benefit of monetary stimulus to households and businesses. For instance, in spite of the aggressive 300 basis points in rate cuts by the Fed over the past six months, the fixed and variable mortgage rates have barely budged relative to the magnitude of the cuts.[2]

Meanwhile, existing home prices have fallen for an unprecedented 18 months and high inventories suggest a reprieve is not in sight, especially with record levels of foreclosures dumping more supply onto the market. To make matters worse, for the first time since the Federal Reserve started tracking the data in 1945, the amount of debt tied up in American homes is exceeding the equity homeowners have built, which was just below 48% in the fourth quarter of 2007. This presents two threats to the economy and consumer spending. First, the risk of so-called "mortgage walkers," or homeowners who can afford their payments but decide not to pay, rises as home values depreciate and equity diminishes. This action would increase loan losses among financial institutions, which, in turn, would lead to more cautious lending behaviour. The Federal Reserve's Senior Loan Officer survey released in early February indicated that the consumer borrowing environment was already becoming prohibitively restrictive. Banks have pulled back the reins for residential mortgages to the point where credit conditions are the tightest on record (1990), and other consumer loan products are sharing in a similar experience. Second, falling home equity limits a household's ability to refinance their mortgages or draw on existing equity to shore up consumer spending.

The list of bad news on the housing front goes on and on, but the message is clear: the housing slump will extend through 2008. This, in combination with broadening job losses and a volatile financial environment, leaves consumer





spending in a precarious situation. Although tax rebate cheques will boost expenditures in the second and third quarters of the year, the impact will be temporary and there is little the government or monetary policy authorities can do in the near-term to influence domestic spending.

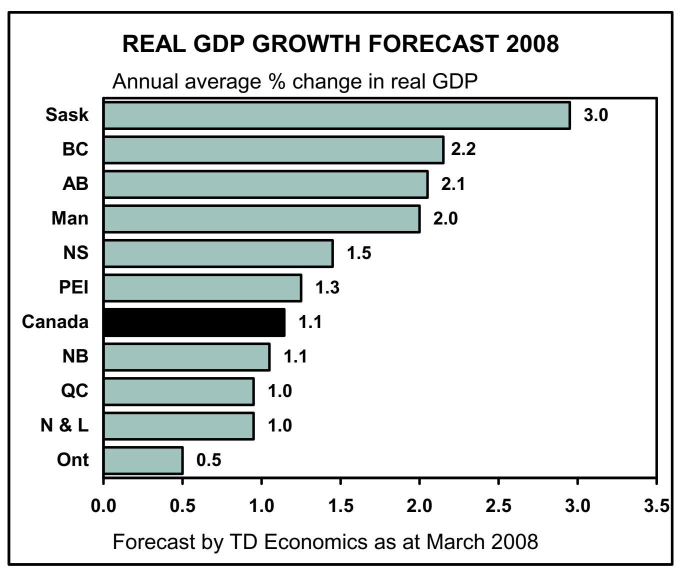
While consumer spending will slump in 2008, the outlook for 2009 is promising. It is all too easy to get bogged down in the negative news from near-term economic indicators, but the adjustment that is underway in the U.S. is a necessary evil that will allow lenders and homeowners to work through oversupply, stagnating home prices, and the excesses of past lax lending standards. Likewise, the current deep wariness investors have to U.S. and international short-term lending markets will eventually ease. By the end of this year, we hope there won't be any major new news to flush out with regards to counterparty risk between financial institutions. The gradual normalization of risk aversion will allow more favourable interest rates to be passed on to consumers, especially since we believe the Federal Reserve will be taking rates to an ultra-low 1.00% by August 2008. This, in combination with massive past liquidity injections, should start to gain traction, as central banks around the world continue to work towards new solutions. By 2009, the housing market, consumer spending and lending behaviour in general should face fewer constraints, allowing consumer spending to sustain a convincing recovery by the fall of that year. Likewise, by the tail-end of 2009, U.S. real GDP growth is expected to return to a healthy 3.1% quarterly pace.

Canada won't escape U.S. downturn

The U.S. troubles will continue to wash onto Canadian shores in very visible ways, contributing to modest 1.1% economic growth in 2008. The nation as a whole is already feeling the effects from the credit crunch that originated in America, evident by the Bank of Canada having to repeatedly inject liquidity into the financial system. Even though the central bank has cut rates by 100 basis points since December, we calculate that the credit crunch is exerting the equivalent of about 50-75bp of implicit monetary policy tightening. Since the broad economy has only seen the benefit of perhaps one-quarter to one-half of the monetary stimulus, the central bank will have to work harder to get the desired monetary stimulus to shelter Canadians from the U.S. downturn, especially in light of two direct linkages between the two countries.

First, the current tightness in the credit cycle will act as a speed bump to investment by raising the cost of funding and restricting investment for a number of Canadian companies. An IMF study estimated that close to one-quarter of financing by Canadian corporations is raised south of the border. So the direct impact of tighter credit conditions there, in addition to the spillover into Canada, raises the cost of capital for domestic corporations.

Second, the lethal combination of a high Canadian dollar and weak U.S. demand will continue to drag export growth. A deteriorating net trade balance will be the primary source of downdraft on GDP growth in 2008, shaving almost 3 percentage points from annual growth. In fact, exports are expected to contract outright in the first



half of the year extending the massive loss in shipments that ended 2007 in dramatic fashion. Between November and January, real Canadian auto exports declined 23%, the biggest drop off since the end of the 1982 U.S. recession. Meanwhile, exports of other consumer goods fell by 14% over that period, the worst showing in almost three decades.

With corporations facing impediments to financing alongside a battered and bruised export sector, the Bank of Canada is expected to respond by slashing rates 150 basis points over the next three meetings. This would bring the overnight rate to rest at 2.00%, providing the monetary kick to help heal Canada's economic wounds in 2009.

The east to grow the least

The weakness in the trade sector over the forecast horizon will not be evenly distributed among the provinces and the pattern will reinforce the east-west divide that Canadians have become all too familiar with in recent years. The province of Ontario is slated to absorb the biggest negative trade impact. The economy is expected to eek out 0.5% growth in 2008, the worst showing since 1992, and there's a significant risk that Ontario will experience a mild recession. At the opposite end of the spectrum, Saskatchewan will outperform national growth by nearly three-fold.

A mismatch in regional economic performances is not a new development – different parts of the country have always tended to move to the beat of different economic structures and resource endowments. And with that, regional trading blocks have formed. The emergence of free trade with the United States in the late 1980s and the persistence of trade barriers at home has been a catalyst for developing north-south trade routes rather than east-west. As the adjacent graph indicates, the U.S. export share of GDP by province ranges from a high of 40% in Ontario to a low of 18% in British Columbia. As a rule of thumb, central Canada is the most closely tied to the U.S., followed by eastern Canada.

The degree of export reliance only tells part of the story. The sector mix is equally important. Since we expect a consumer-led recession in the U.S., related shipments will be hardest hit within the provinces, particularly auto and forestry products. Not surprising, Ontario is expected to post the worst economic performance in large part because one-third of its total international exports are attributed to shipments of automotive products. In contrast, even though British Columbia has a high share of its exports in forestry-related products, the impact on that provincial economy is mitigated by its relatively low overall reliance to U.S. trade. Declining U.S. forestry demand will impact New Brunswick and Quebec, but again, their exposure is relatively low at 6-7% of total exports.

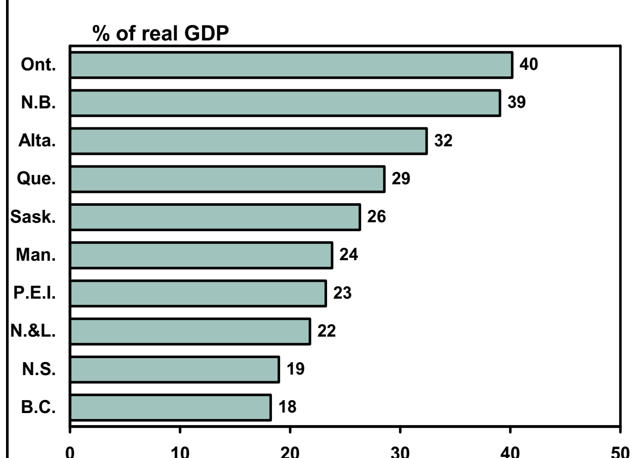
In contrast, some export areas are likely to hold up relatively well in 2008, including energy, other non-forestry commodities and agriculture. This is partly why Saskatchewan will be at the top of the leader board in 2008. It shares the distinction, along with four other provinces, of having a heavy export tilt towards energy and/or refined

TOP 3 PROVINCIAL EXPORTS TO THE U.S.
(% of total exports)

	1	2	3
Nfld	Crude & Refined *(70%)*	Food mnfg *(2%)*	Forestry *(1%)*
PEI	Food mnfg *(38%)*	Fruit/Veg *(5%)*	Aerospace *(3%)*
NS	Oil/Gas *(17%)*	Tires *(12%)*	Forestry *(10%)*
NB	Refining *(59%)*	Forestry *(7%)*	Food mnfg *(2.7)*
QC	Alum *(9%)*	Aerospace *(8%)*	Forestry *(6%)*
Ont	Autos *(31%)*	Pharma *(4%)*	Gold *(4%)*
Man	Nickel *(8%)*	Copper *(6%)*	Hydro *(5%)*
Sask	Oil/gas *(34%)*	Potash *(14%)*	Wheat *(12%)*
AB	Oil/gas *(68%)*	Rubber *(3%)*	Fertilizer *(1%)*
BC	Forestry *(21%)*	Oil/gas *(8%)*	Coal *(8%)*

Source: Statistics Canada

PROVINCIAL RELIANCE ON EXPORTS TO U.S.



Source: Statistics Canada; Estimates calculated by TD Economics products: N&L (70%), Alberta (68%), New Brunswick (59%), Saskatchewan (34%), Nova Scotia (17%) and B.C. (8%). Saskatchewan, along with Manitoba, also has 10-20% of their total exports in non-energy minerals. And, as a final clincher, just under one-third of Saskatchewan's total exports are related to wheat and oilseeds crops, which are areas that will reap the rewards of strong price conditions this year.

Putting it all together, the western region remains in the best shape to weather the headwinds of the U.S. recession, while Central Canada – and notably Ontario – is in the worst position. Although domestic spending in all provinces will continue to receive support from falling interest rates, rising home wealth, and sturdy income growth, it is unreasonable to expect domestic spending to be completely immune to the growing pressures on provincial export sectors. By the second quarter of this year, employment in central and eastern Canada is expected to flatten out, leading to some increase in unemployment rates and some easing in consumer spending and housing activity. As a result, Ontario will barely keep its head above water in 2008, while expansions in the rest of the eastern provinces fare slightly better at 1-2%.

Although the western regions won't be immune to slower growth, Saskatchewan is likely to stand out as the only province to both experience faster overall growth and a real GDP gain of 3% on the back of strength in its resource sector.

What could go wrong?

Our economic outlook for a return to more stable growth in the latter half of 2009 on both sides of the border is conditional on some greater stability – but not necessarily perfection or even full restoration – in financial-credit markets. Should this not occur, a double-dip recession could be in store for the U.S. after the impact from the fiscal stimulus dissipates at the end of 2008. At this stage of the current cycle, it is difficult to quantify what the full impact of this uglier scenario would be on the Canadian economy. The obvious statement is that the provinces most vulnerable to the U.S. would be in the worse shape, with Ontario unlikely to withstand the recessionary pressures from the U.S. without falling into the same predicament in 2008 and 2009. Suffice to say that the negative impact on Canada as a whole would be deeper and more extended.

Beata Caranci, Director of Economic Forecasting
416-982-8067

Endnotes

1 For further details see TD Economics special report, "The Five Finger Guide: Economic data that provide a heads-up to a U.S. recession, January 17, 2008"

2 For details see TD Economics special report, "U.S. Homeowners Not Getting Much of a Break on Mortgage Rates" March 2008

GLOBAL ECONOMIC OUTLOOK

As we begin 2008, the U.S. economy is the poster child for a full-blown recession. The rest of the global economy is continuing to show signs of a broad-based deceleration; however, recessions in these markets have not yet materialized – nor are they inevitable, or even likely. Since our last global forecast in December, some economies – like Brazil, Russia, and the U.K. – are faring better than we thought they would up to this point. Others – like Japan and China – appear to be in just as precarious a position, while still others – such as Italy and Singapore – have deteriorated markedly. On balance, we have downgraded our forecast for global growth in 2008 from 4.2% to 3.6% and for 2009 from 4.3% to 3.3%.[1] A contraction in U.S. consumer spending for three out of four quarters in 2008, oil at $110 per barrel, high and rising inflation in many economies, and ongoing strains in credit markets is not a recipe for robust global economic growth.

U.S. consumer impact

The expected surge from a fiscally-supercharged U.S. consumer in mid-2008 – which we are increasingly pessimistic about – will prove crucial in determining how the Asian export-oriented economies fare. It is true that exports to the U.S. from the region have been trending lower as consumer demand and the falling U.S. dollar shifted these flows elsewhere. But, about 2% of the Chinese economy was reliant on the U.S. at the time of the last U.S. recession in 2001. Now, that number is closer to 10%. And with half of Chinese exports made with imported content, this chain filters into the rest of the region.

Many of the smaller Asian economies ended 2007 with a mixed bag of momentum. The Singapore economy contracted by a 4.8% annualized rate in Q4 as exports fell. Taiwan grew by just a 0.9% annualized rate in the final quarter of 2007 and showed a broad based contraction in consumer spending, capital formation, exports and imports. Meanwhile, Malaysia, saw a very weak quarter with both consumer spending and capital investment shrinking. Steady growth seen in Hong Kong, Korea, and Indonesia – so, there is no reason to panic. But, with some sizeable inventory accumulations and capital investments behind some of these figures, the next few months should show whether the slowdown is spreading.

Price Wars

In spite of the fact that global measures of industrial production have been decelerating, oil prices and those of many other commodities continue to defy gravity. Oil at $110 a barrel is a problem – not a panacea – for the global economy. It has helped the energy-rich. Russia has seen little easing in economic activity; we now forecast the Middle East region to see GDP growth in 2008 unchanged from 2007, and the fiscally irresponsible expansion in Venezuela is sustainable for a bit longer. However, if domestic demand and consumers outside of the United States are expected to ride to the rescue of the global economy, those consumers may have little left in their wallets by the time they get done paying for the gas for their trip to the store.

On top of this, inflation is on the rise in many economies outside of Canada and those higher prices will sap spending power as well. In spite of the benefits of high oil prices for the Russian economy, CPI inflation has risen from 7% in early 2007 to 13% as of February, while PPI inflation

GLOBAL ECONOMIC OUTLOOK
Annual per cent change unless otherwise indicated

Real GDP	2007 Share* (%)	2006	2007e	Forecast 2008	Forecast 2009
World	99.1	4.9	4.8	3.6	3.3
North America	25.5	3.0	2.3	1.2	1.2
United States	21.4	2.9	2.2	1.1	1.1
Canada	2.0	2.8	2.7	1.1	1.8
Mexico	2.1	4.8	3.3	2.5	2.1
European Union (EU-27)	23.7	3.0	2.9	1.6	1.4
Euro-zone (EU-13)	16.1	2.9	2.6	1.4	1.2
Germany	4.4	3.1	2.6	1.6	1.2
France	3.2	2.2	1.9	1.6	1.3
Italy	2.8	1.9	1.7	0.4	0.5
United Kingdom	3.3	2.8	3.1	1.4	1.9
EU accession members	3.4	3.3	3.8	2.6	2.1
Asia	35.5	7.4	7.4	6.0	5.6
Japan	6.6	2.4	2.0	1.0	1.7
Asian NIC's	3.7	5.5	5.6	3.9	3.8
Hong Kong	0.5	7.0	6.3	3.2	3.4
Korea	1.9	5.0	4.9	3.9	3.7
Singapore	0.3	8.2	7.7	4.4	5.2
Taiwan	1.1	4.9	5.7	4.1	3.8
Russia	3.2	7.4	8.1	6.5	5.7
Australia & New Zealand	1.4	2.7	3.9	3.2	2.9
Developing Asia	20.6	9.6	9.6	8.2	7.4
ASEAN-4	3.1	5.5	6.0	4.8	4.4
China	10.9	11.1	11.4	9.9	8.8
India	4.6	9.8	9.0	7.7	7.2
Central/South America	6.1	5.5	6.2	5.0	4.0
Argentina	0.8	8.5	8.7	7.2	4.8
Brazil	2.8	3.7	5.4	4.6	3.6
Other Developing	8.4	5.9	6.0	5.8	4.9

*Regional wts. do not sum to 100% because some countries omitted
Forecast as at March 2008
Source: International Monetary Fund, national statistical agencies

doubled to 25% from September to January. In February, Chinese consumer inflation increased to its highest rate in 12 years (8.7%), as severe snowstorms exacerbated food shortages. This will likely force policymakers there to continue to allow the currency to appreciate at an elevated pace, as well as increase reserve requirements and interest rates in order to prevent overheating.

In Europe, the ECB has continued to talk tough about inflation, now running at 3.3% in the Eurozone – the highest in 14 years – and well above the pace of below but near 2% that the ECB targets. To date, this inflation has remained contained in food and energy prices. If this shows any signs of broadening, the ECB will raise interest rates; however, we still believe this is unlikely and expect the bank to cut interest rates by summer or early fall once their fears of a broader inflation trend are allayed. The Bank of England, too, may be increasingly queasy in their campaign to stimulate economic activity with lower interest rates as inflation has once again picked up.

Shaky Credit Markets

Adding to these burdens, global credit and financial markets are still under a tremendous amount of strain. In the last month, we saw a likely about-face from the Reserve Bank of Australia, as a message of inflation pressures and the need for higher rates turned to one of expected rate cuts in part due to increased implicit credit tightening. Contagion from the U.S. subprime crisis has leaked into Icelandic banks, with fears of default heightening the risk of a banking and currency crisis there. In European markets, credit default swap spreads of many banks have widened more than for their U.S. counterparts as markets feel U.S. institutions have been more forthcoming than their European counterparts regarding losses and write-downs. Given the lesser importance of consumer credit and generally smaller housing booms, there is a good case to be made that the impact of tighter credit conditions should be felt less on the continent.

Nevertheless, as this protracted credit crunch has led concerns to move from one of liquidity to solvency, deteriorations and contagion on this front can be dramatic and swift, and it will take some time for this cloud to be lifted. For emerging markets, as well, which saw almost $800 billion in capital inflows last year, there is a risk that conservative investors and tighter standards could see profitable and much-needed investment in infrastructure and other capital needs postponed for more benign times, to the detriment of current economic growth.

Early in 2007, we likened global workers to woodchucks and said the economic prospects to weather a U.S. slowdown would hinge on how well these vast armies of woodchucks – many with unemployment rates at all-time lows – would respond. Pop goes the weasel may be the U.S. slogan for this year, but while the rest of the world's woodchucks look likely to hibernate a bit longer, there are no signs they'll sleep right through 2008.

Richard Kelly 416-982-2559

ECONOMIC INDICATORS FOR THE G-7 AND EUROPE

			Forecast		
	2005	2006	2007	2008	2009
Real GDP (Annual per cent change)					
G-7 (41.17%)*	2.3	2.7	2.2	1.1	1.3
U.S.	3.1	2.9	2.2	1.1	1.1
Japan	1.9	2.4	2.0	1.0	1.7
EU-12	1.6	2.9	2.6	1.4	1.2
Germany	1.0	3.1	2.6	1.6	1.2
France	1.7	2.2	1.9	1.6	1.3
Italy	0.2	1.9	1.7	0.4	0.5
United Kingdom	1.8	2.8	3.1	1.4	1.9
Canada	3.1	2.8	2.7	1.1	1.8
Consumer Price Index (Annual per cent change)					
G-7	2.3	2.3	2.1	2.8	1.9
U.S.	3.4	3.2	2.9	3.8	2.3
Japan	-0.3	0.2	0.1	0.6	0.6
EU-12	2.2	2.2	2.1	3.0	1.9
Germany	1.9	1.8	2.3	2.5	1.7
France	1.9	1.9	1.6	3.0	2.0
Italy	2.2	2.2	2.0	2.9	1.4
United Kingdom	2.0	2.3	2.3	2.8	2.0
Canada	2.2	2.0	2.1	1.5	1.9
Unemployment Rate (Per cent annual averages)					
U.S.	5.1	4.6	4.6	5.3	6.7
Japan	4.4	4.1	3.9	4.4	4.7
EU-12	8.6	8.2	7.4	7.4	7.7
Germany	9.4	9.8	8.4	8.3	8.8
France	9.7	9.2	8.3	8.3	8.6
Italy	7.7	6.8	6.0	6.3	7.0
United Kingdom	4.8	5.3	5.3	5.5	5.8
Canada	6.8	6.3	6.0	6.0	6.3

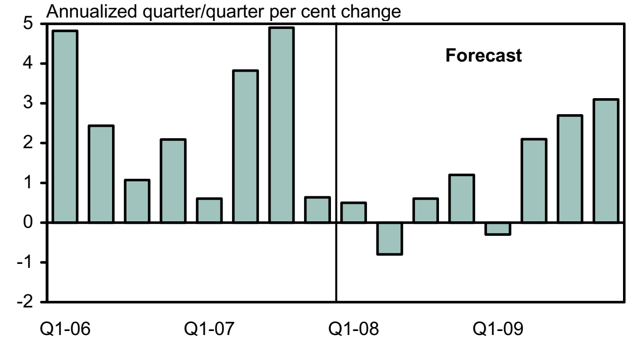
*Share of 2006 world gross domestic product (GDP)
Forecast as at March 2008
Source: National statistical agencies, TD Economics

1 Recent revisions by the IMF to the relative sizes of economies used to weight these figures accounted for 0.4 percentage points of the decline in each year. 0.2 percentage points of the decline in 2008 and 0.6 percentage points in 2009 were the result of downgrades to our forecasts.

U.S. ECONOMIC OUTLOOK

The U.S. economy has entered a period of protracted weakness. In addition to the barrage of negative developments impacting U.S. consumers, a major crisis of confidence in financial markets has limited the effectiveness of monetary policy in stimulating demand and forestalled a recovery in the housing market. A major retrenchment in consumer spending will lead the U.S. economy to contract in the second quarter of the year. The fiscal stimulus package will see growth edge into positive territory in the second half of the year, but underlying weakness in domestic demand will cause real GDP growth to dip into negative territory in the first quarter of 2009 when spending returns to pre-stimulus levels. While export growth will remain solid, it will not be enough to offset the significant weakness in the domestic economy. Economic growth is expected to return to trend pace in the second half of 2009, on a return to normalcy in credit conditions and a bottoming out in the housing market. Continued action by policy makers to provide liquidity to financial markets in combination with significant further monetary stimulus will be vital to bringing the economy back to a moderate pace of growth by the end of the forecast period. As a result, economic growth is expected to come in at a sluggish pace of 1.1% in both 2008 and 2009.

U.S. REAL GROSS DOMESTIC PRODUCT (GDP)



F: Forecast by TD Economics as at March 2008
Source: U.S. Bureau of Economic Analysis/Haver Analytics

U.S. ECONOMIC INDICATORS
Annual per cent change unless otherwise indicated

			Forecast	
	2006	**2007**	**2008**	**2009**
Real GDP	2.9	2.2	1.1	1.1
Consumer Expenditure	3.1	2.9	0.6	0.7
Durable Goods	3.8	4.7	-3.3	-0.3
Business Investment	6.6	4.8	2.8	-1.0
Non-Residential Structures	8.4	13.1	4.0	-4.4
Machinery & Equipment	5.9	1.3	2.3	0.7
Residential Construction	-4.6	-17.0	-21.1	-4.4
Govt. Exp. on Goods & Svcs.	1.8	2.0	2.1	1.5
Final Domestic Demand	2.7	1.8	0.2	0.5
Exports	8.4	8.0	7.0	4.1
Imports	5.9	1.9	-0.7	0.9
Change in Non-Farm Inventories ($96 Bn.)	41.7	2.0	-5.1	7.6
Final Sales	2.8	2.5	1.2	0.9
Int'l Curr. Acct. Bal. ($Bn.)	-811	-747	-768	-734
% of GDP	-6.2	-5.4	-5.4	-5.0
Pre-tax Corporate Profits	13.2	3.5	-3.3	3.6
GDP Chain-type Deflator	3.2	2.7	2.4	1.9
Employment	1.8	1.1	0.0	-0.2
Unemployment Rate (%)	4.6	4.6	5.3	6.7
Productivity *	1.0	1.6	2.2	3.2
Real Pers. Disp. Inc. (PDI)**	3.1	3.0	1.7	0.7
Real PDI Per Person**	2.1	2.1	0.8	-0.2
Consumer Price Index (CPI)	3.3	2.9	3.8	2.3
Housing Starts (mn units)	1.81	1.34	0.96	0.92

Real GDP: Real gross domestic product; * Real private non-farm business output per hour; ** After-tax income adjusted for inflation; Forecast by TD Economics as at Mar 2008; Source: Bureau of Labor Statistics, Bureau of Economic Analysis, TD Economics

Housing and credit markets in a vicious cycle

We are now into the third year of the longest and worst housing collapse in the post-war period. The breadth of the decline in home prices is unprecedented both in the length of time that prices have fallen and the scope of the declines across the country. The stock of vacant unsold homes has reached the equivalent of a full-year's worth of housing starts and until these inventories are worked off, prices are unlikely to show improvement. Adding to the pressure on home prices is the continued rise in mortgage foreclosures. Foreclosures reached record levels in the fourth quarter of 2007, topping 2% of total mortgage loans and likely still have further to go. The fall in home prices has created a vicious cycle that raises the risk that homeowners facing negative equity will walk away from their mortgages, thereby adding to the stock of unsold homes and putting more downward pressure on home prices. Though the Federal Reserve has pulled out all the stops in an attempt to keep financial markets functioning, capital constraints and heightened risk aversion continue to limit new mortgage financing. Until financial institutions can rebuild their balance sheets and are able to pass lower interest rates onto would-be homebuyers, the housing market will continue to flounder. As a result of continued instability in credit markets, housing starts are expected to fall through the remainder of this year. When starts finally reach a bottom in the first quarter of 2009 they will have fallen to below 900,000 units, 60% below their peak and slightly over half the level necessary to keep pace with underlying household growth. In addition to the negative wealth impacts, residential construction will directly subtract 0.9% from GDP growth in 2008 and a further 0.1% in 2009.

U.S. consumers vulnerable

Despite nearly two years of housing doldrums, consumer spending has remained a source of strength to U.S. economic growth. Spending growth has averaged 3% in recent years and had been supported by strong income and employment growth and gains in financial market wealth, which helped to offset the drag from housing. These supports deteriorated in the final months of 2007 and have now become hindrances. Real personal disposable income declined in the final quarter of 2007, as surging energy prices ate away at already slowing nominal gains. Employment growth also decelerated in the final months of the year and gave way to job losses in the first two months of this year. Weakness has spread from the goods producing sectors to the broader service sector and job losses are likely to continue into the first quarter of 2009. In addition, declines in global stock markets have now added to the negative wealth impact on consumers. Having taken a hit from both falling home and equity prices, household networth deteriorated by $533 billion in the final quarter of 2007 for the first time since 2002, and has likely worsened as both stock and housing markets continued to plummet early this year.

The Congress' quick passing of the *Economic Stimulus Act of 2008* will see rebate checks of up to $600 for individuals ($1200 for couples) sent out in May and June of this year. Given the increased stresses on household balance sheets, we have assumed that consumers save two-thirds of their rebate checks and spend the remaining one-third over the second to fourth quarters of the year. The added spending should provide a boost to consumer expenditure growth of 1 percentage point (annualized) in the second quarter and 2 percentage points in the third quarter with payback – as spending levels begin to return to pre-stimulus levels – occurring over the following two quarters. Still, the drop in spending, particularly on durable goods, such as motor vehicles, will be considerable. If not for the increased spending due to the rebate checks, consumption growth would likely be negative through the first three quarters of 2008. Even with the stimulus, economic growth in the third quarter is expected to remain a paltry 0.6% as offsets will come from increased imports and a downward movement in inventory investment, limiting the overall impact of increased spending on GDP growth.

U.S. ECONOMIC INDICATORS

Fourth-quarter-over-fourth-quarter per cent change

			Forecast	
	Q4-06	**Q4-07**	**Q4-08**	**Q4-09**
Real GDP	2.6	2.5	0.4	1.9
Real Final Sales	3.0	2.7	0.2	1.7
Employment	1.7	0.8	-0.6	0.3

Real GDP: Real gross domestic product; Forecast by TD Economics as at Mar 2008; Source: Bureau of Labor Statistics, Bureau of Economic Analysis, TD Economics

While exports will continue to provide a lift to the economy, an expected slowdown in world economic growth will limit the ability of the external sector to offset weakness in the domestic economy. GDP growth will likely stumble again in the first quarter of 2009 as the stimulus wears off and a slowdown in world growth cuts into exports. The light at the end of the tunnel will have to wait until the second half of the year when conditions in credit markets should have steadied enough to allow the more than 400 basis points in cumulative Fed interest rate cuts to gain traction. After seven consecutive quarters of restrained growth, the large amount of pent-up demand for housing and durable goods will lead the domestic economy to rebound strongly in the second half of the year. Export growth should also pick up, but since this will come along side increased demand for consumer product imports, the overall impact on the current account balance will be fairly small.

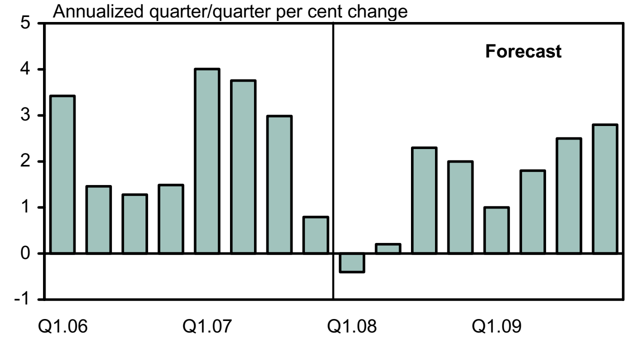
James Marple 416-982-2557

CANADA'S ECONOMIC OUTLOOK

There are now clear-cut signs that the slowdown that has gripped the U.S. economy has made its way across the border. After powering ahead at an ebullient 3.6% annualized average growth rate over the first three quarters of 2007, the Canadian economy slowed noticeably in the final quarter , with real GDP growth cooling off to an anemic 0.8%. Canada's export sector was a key culprit behind the weak fourth quarter showing, recording a whopping 8.5% drop. Meanwhile, imports continued to soar on the back of a strong loonie, rising by an incredibly strong 10.9%. As a result, net exports chopped growth by 6.4 percentage points. On the flip side, the domestic side of the economy continued to fare extremely well, with final domestic demand growing at a 6.9% annualized clip in the fourth quarter. The message is clear – no matter how resilient the domestic side of the economy, Canada cannot fully evade weak conditions south of the border.

CANADIAN REAL GDP

Annualized quarter/quarter per cent change



F: Forecast by TD Economics as at March 2008;
Source: Statistics Canada/Haver Analytics

CANADA'S ECONOMIC INDICATORS

Annual per cent change unless otherwise indicated

		Forecast	
	2007	**2008**	**2009**
Real GDP	2.7	1.1	1.8
Consumer Expenditure	4.7	4.3	2.6
Durable Goods	7.7	5.2	2.1
Business Investment	4.4	3.1	4.1
Non-Residential Structures	3.9	1.3	2.8
Machinery & Equipment	5.1	5.2	4.9
Residential Construction	3.2	3.6	1.2
Govt. Exp. on Goods & Svcs.	3.6	4.3	3.2
Final Domestic Demand	4.4	4.2	2.9
Exports	0.9	-3.7	0.8
Imports	5.7	5.2	3.0
Change in Non-Farm Inventories ($97 Bn.)	10.4	8.9	7.4
Final Sales	2.5	0.7	2.1
Int'l Curr. Acct. Bal. ($Bn.)	14.2	-8.6	0.1
% of GDP	0.9	-0.5	0.0
Pre-tax Corporate Profits	5.8	2.9	2.6
GDP Chain-type Deflator	3.1	2.4	1.8
Employment (%)	2.3	1.5	0.6
Employment ('000)	380	251	103
Unemployment Rate (%)	6.0	6.0	6.3
Real GDP per employee	0.2	-0.6	1.2
Real Pers. Disp. Income (PDI)**	4.0	3.8	1.4
Real PDI Per Person**	2.9	2.7	0.5
Consumer Price Index	2.1	1.5	1.9
Core CPI	2.1	1.4	1.9
Housing Starts ('000 units)	228	214	205

**After-tax income adjusted for inflation; Forecast by TD Economics as at March 2008; Source: , BoC Statistics Canada, CMHC, Haver Analytics

Canada weak, but narrowly avoids recession

This brings us to the issue of how severely Canada's economy is going to be sideswiped by a downturn in the U.S. economy. Clearly, growth in Canada will suffer heavily, as U.S. demand falters this year; after all, exports to the U.S. account for a sizeable 25% of Canadian GDP. However, Canada's economy should narrowly avoid a recession. For one, the housing market is much healthier than in the U.S. And, although residential activity in Canada is likely to moderate in late 2008 and through 2009, the cooling should proceed in an orderly fashion. Meanwhile, corporate earnings will be supported by the recent commodity boom, which – while likely to slow – will continue to remain at lofty levels. Nevertheless, a significantly weaker U.S. growth outlook has prompted us to shave our 2008 Canadian GDP growth forecast by 0.8 percentage points to a mere1.1%. Notably, the economy is likely to be extremely weak over the first half of this year, with GDP contracting by an annualized 0.4% in Q1 and then growing by a measly 0.2% in Q2.

By the second half of 2009, the easing in monetary settings and an anticipated recovery in the U.S. economy should kick in, raising Canadian GDP growth into a range of 2.5 to 2.8%.

U.S. to lean heavily on exports…

Canada's heavy exposure to the fortunes of the U.S. economy is reason enough to expect it to throttle back significantly. In addition to the challenges posed by flagging U.S. demand, Canadian exporters will continue to struggle with the effects of the elevated currency and enhanced global competition. Thus, Canada is likely to see an outright drop of 3.7% in exports in 2008. While most export sectors will feel the pinch, the auto and forestry industries, will stand out as notable sources of weakness.

The fourth quarter saw a second consecutive large buildup of inventories on the Canadian side of the border. Typically, these include a significant weighting of imported goods. This implies a slower pace to further imports in 2008, as firms pare back their inventory levels – with the likelihood of a slight decline in the opening quarter of this year. Beyond that, however, import growth should remain fairly healthy in the face of the elevated loonie and resilient domestic demand. As a result, not only will the trade sector weigh on Canadian economic growth this year, but it will also take a bite out of Canada's current account surplus. In fact, in the final quarter of last year, the current account balance actually turned negative and it is likely to remain in deficit in 2008, for the first time in a decade. However, exports should start to recover in the second half of 2009, alongside a bounce back in U.S. GDP growth.

...while domestic strength supports growth

The major offset to the weakness in Canada's export profile will be sustained growth in domestic demand, led by consumer expenditures. Up to this point, consumer spending has been on fire, surging ahead by 7.4% in the final quarter of 2007. Low interest rates, tax cuts, Canadian dollar-inspired discounts and robust labour market conditions have been instrumental in encouraging consumers to keep their wallets open. However, the current pace of consumer activity is unsustainable, meaning that some easing in spending is inevitable. For one, the pace of job creation in Canada is bound to weaken significantly (3,000 to 5,000 jobs per month) relative to last year's out-sized gains (32,000 jobs per month). This should take some of the zip off personal expenditures. In addition, it's unreasonable to expect Canadian consumers to be fully insulated from a U.S. recession, given the impact of a slowdown south of the border on many of the local economies in Canada.

That said, in contrast to the U.S., there is little risk that the Canadian consumer will throw in the towel. Low borrowing costs and robust gains in disposable income should continue to support decent consumer spending. And, given that Canadian retailers are likely to remain under the competitive gun, since the loonie is still elevated, further discounting should also provide support to consumer spending. Moreover, housing markets should continue to exhibit high levels of activity, although they are likely to cool towards more sustainable levels by late 2008. All told, consumer spending will continue to grow at a healthy clip, but slow sharply from 4.3% in 2008 to 2.6% in 2009.

CANADA'S ECONOMIC INDICATORS

Fourth-quarter-over-fourth-quarter per cent change

					Forecast	
	Q4-04	Q4-05	Q4-06	Q4-07	Q4-08	Q4-09
Real GDP	11.7	3.2	1.9	2.9	1.0	2.1
Real Final Sales	10.0	3.9	2.8	1.1	1.4	2.6
Employment (%)	1.6	1.6	1.9	2.4	0.8	0.9

Real GDP: Real gross domestic product; Forecast by TD Economics as at March 2008; Source: Statistics Canada, Haver Analytics

Global uncertainty and weak financial-market conditions will also weigh on business investment in Canada. In fact, the opening quarter for 2008 is unfolding on a weak note for investment in machinery and equipment (M&E). After growing at a phenomenal pace since the second quarter, real imports of M&E, have been negative on a monthly basis for three consecutive months now. Based on this data, we are forecasting a drop of 4.3% in M&E investment in the first quarter of 2008. However, this likely represents only a temporary blip and investment should return to a positive territory by the second quarter of this year, since business conditions remain favourable for a respectable – though by no means breathtaking – pace of spending (5.2% for 2008 as a whole). The strong currency has reduced the cost of imported equipment, the majority of which is priced in U.S. dollars. Moreover, manufacturers are likely to take advantage of the accelerated capital cost allowances, extended for 3 years in the 2008 Federal budget.

In the fourth quarter of last year, corporate profits suffered a sharp deceleration, as gains for domestic-focused wholesalers and retailers were offset by declines in manufacturing. Looking ahead, while profits should continue to grow at only a modest clip, as a combination of weaker U.S. demand and lower commodity prices cut into the margins, they will remain at high levels, giving firms the means to maintain a respectable pace of investment. Low interest rates over the forecast horizon are also supportive for the outlook of a fairly healthy pace of investment.

Strong inventory accumulation over the last two quarters also poses a risk that firms might scale back their stocks in the coming months. Most of the increase in inventories was in retail and wholesale durable goods. Given the likelihood of a more modest pace of personal spending, inventory accumulation should slow substantially in early 2008.

Ritu Sapra 416-982-6420

FINANCIAL OUTLOOK

Fed Limbo – How Low Will They Go?

To say that financial markets have deteriorated over the first quarter of 2008 would be somewhat of an understatement. The rate cuts to date have attempted to shore up financial markets at a time when economic data continues to point to recession. What has become clear is that the U.S. is undergoing a massive contraction in balance sheets and what was once thought of as a liquidity crisis, if not managed properly, could easily spiral into a solvency crisis.

Drastic Times Call for Drastic Measures

The Fed has done what is necessary, but the rate cuts to date have not proven sufficient. A number of liquidity facilities were announced in March as the turmoil in the credit market intensified. First, the Federal Reserve announced that they were increasing the size of the amount outstanding in the Term Auction Facility TAF to $100 billion.

Another provision called the Term Securities Lending Facility (TSLF) was subsequently announced and leveraged commitments of liquidity by the BoC, ECB, SNB and BoE. However, many of these unorthodox measures have proven stubbornly slow to get traction, reflecting a general lack of confidence to lend.

For monthly updates and a more in-depth discussion of the interest rate and foreign exchange rate forecasts, please see the monthly Global Markets report, available at www.td.com/economics.

Credit markets continue to reflect risk aversion. There has been a notable widening in even the high quality bond spreads, such as a AAA spread over Treasuries, which is now at 258 bps and a cycle high. In addition, money market dislocations also remain obvious. The LIBOR spread over the fed funds rate widened to 153 bps, which is shy of the 240bps gap when the credit turmoil first hit the markets, but well ahead of historical averages. It is clear the credit market is still not healthy.

INTEREST RATE OUTLOOK

	Spot Rate	2007				2008				2009			
	3/18/2008	Q1	Q2	Q3	Q4	Q1F	Q2F	Q3F	Q4F	Q1F	Q2F	Q3F	Q4F
CANADIAN FIXED INCOME													
Overnight Target Rate (%)	3.50	4.25	4.25	4.50	4.25	3.50	2.50	2.00	2.00	2.00	2.00	2.50	3.25
3-mth T-Bill Rate (%)	2.06	4.20	4.40	4.01	3.84	2.00	1.90	1.85	1.90	1.95	2.10	2.70	3.35
2-yr Govt. Bond Yield (%)	2.47	3.98	4.59	4.08	3.75	2.35	2.25	2.25	2.55	2.70	2.90	3.00	3.30
5-yr Govt. Bond Yield (%)	2.88	4.02	4.56	4.21	3.87	2.80	2.85	2.95	3.15	3.20	3.25	3.45	3.60
10-yr Govt. Bond Yield (%)	3.48	4.11	4.56	4.34	3.99	3.40	3.50	3.65	3.75	3.75	3.80	3.85	3.90
30-yr Govt. Bond Yield (%)	3.99	4.20	4.49	4.44	4.10	3.95	4.15	4.30	4.30	4.30	4.30	4.25	4.20
10-yr-2-yr Govt. Spread (%)	1.01	0.13	-0.03	0.26	0.24	1.05	1.25	1.40	1.20	1.05	0.90	0.85	0.60
U.S. FIXED INCOME													
Fed Funds Target Rate (%)	2.25	5.25	5.25	4.75	4.25	2.25	1.25	1.00	1.00	1.00	1.25	2.00	3.00
3-mth T-Bill Rate (%)	0.86	5.06	4.81	3.91	3.27	0.90	0.85	0.80	0.90	1.05	1.35	2.40	3.25
2-yr Govt. Bond Yield (%)	1.60	4.57	4.86	3.98	3.05	1.50	1.30	1.25	1.60	1.80	2.30	2.70	3.20
5-yr Govt. Bond Yield (%)	2.44	4.53	4.92	4.24	3.44	2.45	2.40	2.40	2.65	2.75	3.10	3.50	3.75
10-yr Govt. Bond Yield (%)	3.47	4.64	5.02	4.59	4.02	3.50	3.50	3.55	3.65	3.75	3.95	4.25	4.30
30-yr Govt. Bond Yield (%)	4.34	4.84	5.12	4.84	4.45	4.35	4.20	4.15	4.20	4.25	4.40	4.60	4.60
10-yr-2-yr Govt. Spread (%)	1.87	0.07	0.16	0.61	0.97	2.00	2.20	2.30	2.05	1.95	1.65	1.55	1.10
CANADA-U.S. SPREADS													
3-mth T-Bill Rate (%)	1.20	-0.86	-0.41	0.10	0.57	1.10	1.05	1.05	1.00	0.90	0.75	0.30	0.10
2-yr Govt. Bond Yield (%)	0.87	-0.59	-0.27	0.10	0.70	0.85	0.95	1.00	0.95	0.90	0.60	0.30	0.10
5-yr Govt. Bond Yield (%)	0.44	-0.51	-0.36	-0.03	0.43	0.35	0.45	0.55	0.50	0.45	0.15	-0.05	-0.15
10-yr Govt. Bond Yield (%)	0.01	-0.53	-0.46	-0.25	-0.03	-0.10	0.00	0.10	0.10	0.00	-0.15	-0.40	-0.40
30-yr Govt. Bond Yield (%)	-0.35	-0.64	-0.63	-0.40	-0.35	-0.40	-0.05	0.15	0.10	0.05	-0.10	-0.35	-0.40

f: Forecast by TD Economics as at Mar. 2008; All forecasts are for end of period. Source: Bloomberg, TD Economics

But the undoing of Bear Stearns was a turning point. Its widely-known struggles with mortgage related debt forced a 25bps reduction in the discount rate in a rare weekend decision just days before the FOMC's formal meeting. This galvanized fears that the credit market turmoil is actually messier than feared as it seemed that the Fed could not wait two days to cut the discount rate.

The Fed's Response

The Fed's approach has turned from risk management to crisis management, leaving little scope to be coy. On March 18, the FOMC delivered a 75 bps rate cut leaving the fed funds rate at 2.25%.

The tone of the statement was a shade more dovish than previously, and with good reason. The FOMC noted that "economic activity has weakened further. Growth in consumer spending has slowed and labor markets have softened." On top of that, financial markets remain under pressure.

Although the FOMC noted upside inflation risk in its March 18 communiqué, the Fed is unlikely to be deterred from its easing path any time soon. They cite that "downside risks to growth remain." Given recession worries and the seriousness of the credit situation, the best way forward is through the turmoil. But since the Fed appeared unwilling to deliver an aggressive 100 bps rate cut on March 18, we think the Fed will take a slightly slower approach to easing going forward. This will appease the hawks on the FOMC but still accomplish the end goal of monetary easing. As such, we look for three more rate cuts of 50 bps on April 30, another 50 bps on June 25 and a final 25bps rate cut on August 5.

Risk of Spillover from the U.S. Will Keep BoC in Easing Mode

Despite the present resilience in the Canadian economy, tides may soon turn. Recent economic data has shown a clear dichotomy in Canada, as domestic drivers of growth remain strong, but trade poses a sizable drag on GDP. As the U.S. economy continues to unwind, and the C$ trades near parity with the U.S. dollar, Canadian exports have come upon some difficult times. In the fourth quarter, trade posed a 6.2 percentage point drag on GDP growth thanks to strong import growth but a virtual collapse in export growth. As such, there is more downside expected for one of Canada's largest growth drivers. We have pencilled in a 1.1% pace of growth for 2008 based on an expected weaker profile for growth and weakening consumer spending by the second half of 2008.

Aside from growth considerations, scope for further rate cuts by the Bank of Canada is supported by weak inflation trends. At 1.5% Y/Y in February, Canadian core inflation remains well below the BoC's 2% target. The BoC's latest inflation forecast predicts that it will move even lower towards the middle of 2008, and will not return to target until the end of 2009.

Finally, BoC Governor Carney's recent address on financial market turbulence illuminated the Bank's view on the matter and also provides support for further easing. He noted that the end to the turmoil in the credit market is "not yet in sight", especially since the strains in financial markets have intensified recently.

On balance, the combination of weakening economic growth, soft Canadian inflation and continued dislocations in credit markets underpin our expectation that the Bank of Canada to remain on an easing trend. We look for three more 50bps rate cuts leaving the overnight rate at a cyclical low of 2%. In our view, this is sufficient monetary stimulus to buoy the Canadian economy against the rocky road ahead.

Charmaine Buskas 416-982-3297

FOREIGN EXCHANGE OUTLOOK

Currency	Exchange Rate	Spot Price	2007				2008				2009			
		3/18/2008	Q1	Q2	Q3	Q4F	Q1F	Q2F	Q3F	Q4F	Q1F	Q2F	Q3F	Q4F
Canadian dollar	USD per CAD	1.007	0.894	0.930	1.005	1.002	1.000	0.980	0.960	0.950	0.950	0.940	0.930	0.920
Canadian dollar	CAD per USD	0.993	1.119	1.065	0.995	0.998	1.000	1.020	1.042	1.053	1.053	1.064	1.075	1.087
Japanese yen	JPY per USD	99.5	118	123	115	112	100	96	95	90	93	92	98	98
Euro	USD per EUR	1.564	1.337	1.354	1.410	1.459	1.580	1.600	1.550	1.500	1.450	1.420	1.400	1.370
U.K. pound	USD per GBP	2.008	1.978	2.009	2.014	1.985	2.026	1.975	1.890	1.807	1.813	1.797	1.772	1.756
Swiss franc	CHF per USD	1.002	1.214	1.221	1.170	1.133	0.981	0.963	0.987	1.013	1.034	1.056	1.086	1.109
Australian dollar	USD per AUD	0.927	0.809	0.840	0.875	0.875	0.920	0.900	0.890	0.880	0.870	0.870	0.840	0.840
Mexican peso	MXN per USD	10.69	11.05	10.81	10.92	10.90	10.80	10.85	10.85	10.90	10.95	10.95	11.00	11.00

f: Forecast by TD Economics as at March 18, 2008; All forecasts are for end of period; Source: Federal Reserve of New York, TD Economics

CANADIAN ECONOMIC OUTLOOK

Period-Over-Period Annualized Per Cent Change Unless Otherwise Indicated

	2007				2008				2009				Annual Average			4th Qtr/4th Qtr		
	Q1	Q2	Q3	Q4	Q1F	Q2F	Q3F	Q4F	Q1F	Q2F	Q3F	Q4F	07	08F	09F	07	08F	09F
Real GDP	4.0	3.8	3.0	0.8	-0.4	0.2	2.3	2.0	1.0	1.8	2.5	2.8	2.7	1.1	1.8	2.9	1.0	2.1
Consumer Expenditure	4.0	5.8	4.5	7.4	4.0	3.2	2.2	2.0	2.4	2.7	3.3	3.5	4.7	4.3	2.6	5.4	2.9	3.0
Durable Goods	6.4	15.2	-0.9	11.9	6.2	2.2	1.5	1.1	2.1	2.3	3.4	3.6	7.7	5.2	2.1	8.0	2.7	2.8
Business Investment	-0.9	3.3	5.5	7.2	-1.6	3.5	3.4	3.9	4.4	4.4	4.4	4.6	4.4	3.1	4.1	3.7	2.3	4.4
Non-Res. Structures	1.8	-2.8	-2.4	0.4	2.9	2.9	2.3	2.5	2.8	3.1	3.3	3.4	3.9	1.3	2.8	-0.8	2.7	3.1
Machinery & Equipment	-3.4	9.6	13.7	14.3	-4.3	3.9	4.2	4.8	5.4	5.2	5.1	5.3	5.1	5.2	4.9	8.3	2.1	5.2
Residential Construction	9.8	6.5	5.5	2.4	4.5	3.7	1.4	1.0	0.9	0.8	1.0	1.2	3.2	3.6	1.2	6.0	2.7	1.0
Government Expenditure on Goods & Services	2.6	4.1	6.2	6.9	3.3	3.4	2.6	3.1	3.4	3.5	3.1	3.0	3.6	4.3	3.2	5.0	3.1	3.3
Final Domestic Demand	3.3	5.4	5.5	7.2	3.1	3.4	2.5	2.5	2.8	3.0	3.3	3.4	4.4	4.2	2.9	5.3	2.9	3.1
Exports	1.0	2.3	0.7	-8.5	-5.3	-6.4	1.9	1.3	-1.0	1.9	3.3	3.4	0.9	-3.7	0.8	-1.2	-2.2	1.9
Imports	1.0	7.3	18.4	10.9	-0.5	1.3	2.9	3.1	3.0	3.0	3.3	3.6	5.7	5.2	3.0	9.2	1.7	3.2
Change in Non-Farm Inventories ($97 Bn)	3.2	4.4	16.1	17.7	9.5	8.4	8.5	9.2	10.2	8.4	6.2	4.9	10.4	8.9	7.4	---	---	---
Final Sales	3.4	3.5	-1.7	-0.7	1.5	0.5	2.1	1.8	1.3	2.6	3.3	3.3	2.5	0.7	2.1	1.1	1.4	2.6
International Current Account Balance ($Bn)	27.8	25.6	5.3	-2.1	-5.8	-11.3	-10.1	-7.1	-5.1	-0.6	1.6	4.4	14.2	-8.6	0.1	---	---	---
% of GDP	1.9	1.7	0.3	-0.1	-0.4	-0.7	-0.6	-0.4	-0.3	0.0	0.1	0.3	0.9	-0.5	0.0	---	---	---
Pre-tax Corp. Profits	9.3	5.7	7.9	2.2	1.7	1.2	3.3	1.9	1.8	2.6	4.2	5.1	5.8	2.9	2.6	6.2	2.0	3.4
% of GDP	13.8	13.6	13.8	13.7	13.7	13.7	13.7	13.6	13.6	13.6	13.5	13.5	13.7	13.7	13.5	---	---	---
GDP Deflator (Y/Y)	2.5	3.4	2.8	3.9	3.2	2.1	2.6	1.6	1.0	1.5	2.0	2.7	3.1	2.4	1.8	3.9	1.6	2.7
Nominal GDP	10.8	9.4	2.0	5.4	3.5	1.1	3.6	2.5	2.3	5.0	5.7	6.3	5.9	3.5	3.6	6.8	2.6	4.8
Labour Force	3.5	1.3	1.4	2.5	1.2	1.0	0.9	0.7	1.3	1.2	1.1	1.1	2.0	1.3	1.1	2.2	0.9	1.2
Employment (%)	3.7	1.5	1.7	2.9	2.2	0.3	0.2	0.4	0.6	0.8	1.0	1.3	2.3	1.5	0.6	2.4	0.8	0.9
Employment ('000s)	151	63	73	120	93	12	8	15	25	33	42	54	380	251	103	406	128	154
Unemployment Rate (%)	6.1	6.1	6.0	5.9	5.8	5.9	6.0	6.1	6.2	6.3	6.4	6.4	6.0	6.0	6.3	---	---	---
Personal Disp. Income	9.4	2.6	4.9	6.4	4.0	3.6	3.5	3.0	3.4	3.3	4.3	4.5	5.6	4.3	3.5	5.8	3.5	3.9
Pers. Savings Rate (%)	2.6	1.3	1.3	0.8	0.9	1.0	1.3	1.4	1.0	0.5	0.1	0.0	1.5	1.1	0.4	---	---	---
Cons. Price Index (Y/Y)	1.8	2.2	2.2	2.4	1.8	1.1	1.4	1.7	1.8	1.9	1.9	2.1	2.1	1.5	1.9	2.4	1.7	2.1
Core CPI (Y/Y)	2.3	2.4	2.2	1.6	1.3	1.2	1.3	1.7	1.9	1.9	1.9	2.0	2.1	1.4	1.9	1.6	1.7	2.0
Housing Starts ('000s)	226	228	243	214	226	215	210	207	207	205	202	203	228	214	205	---	---	---
Productivity: Real GDP / worker (Y/Y)	-0.6	0.6	0.6	0.1	-0.7	-1.2	-0.8	0.3	1.0	1.3	1.2	1.2	0.2	-0.6	1.2	0.1	0.3	1.2

F: Forecast by TD Economics as at March 2008

Source: Statistics Canada, Bank of Canada, Canada Mortgage and Housing Corporation, Haver Analytics

U.S. ECONOMIC OUTLOOK

Period-Over-Period Annualized Per Cent Change Unless Otherwise Indicated

	2007				2008				2009				Annual Average			4thQtr/4th Qtr		
	Q1	Q2	Q3	Q4	Q1F	Q2F	Q3F	Q4F	Q1F	Q2F	Q3F	Q4F	07	08F	09F	07	08F	09F
Real GDP	0.6	3.8	4.9	0.6	0.5	-0.8	0.6	1.2	-0.3	2.1	2.7	3.1	2.2	1.1	1.1	2.5	0.4	1.9
Consumer Expenditure	3.7	1.4	2.8	1.9	-0.2	-1.5	1.6	-0.4	-0.6	2.0	2.5	2.8	2.9	0.6	0.7	2.5	-0.1	1.7
Durable Goods	8.8	1.7	4.5	2.3	-7.2	-13.2	1.8	-2.5	-0.8	1.8	3.2	4.7	4.7	-3.3	-0.3	4.3	-5.4	2.2
Business Investment	2.1	11.0	9.3	6.9	-0.5	-0.2	-0.2	-0.5	-3.0	-1.1	-0.2	2.3	4.8	2.8	-1.0	7.3	-0.4	-0.5
Non-Res. Structures	6.4	26.2	16.4	14.7	-2.7	-3.0	-3.2	-4.1	-7.8	-4.2	-3.1	1.2	13.1	4.0	-4.4	15.7	-3.3	-3.5
Machinery & Equipment	0.3	4.7	6.2	3.3	0.5	1.2	1.4	1.3	-0.6	0.4	1.2	2.9	1.3	2.3	0.7	3.6	1.1	1.0
Residential Construction	-16.3	-11.8	-20.5	-25.2	-27.2	-22.3	-11.6	-5.2	-5.5	-0.6	5.8	8.9	-17.0	-21.1	-4.4	-18.6	-17.0	2.0
Govt. Consumption & Gross Investment	-0.5	4.1	3.8	2.2	2.0	1.1	1.3	1.7	1.6	1.5	1.3	1.3	2.0	2.1	1.5	2.4	1.5	1.4
Final Domestic Demand	1.7	2.1	2.5	1.2	-1.0	-1.7	0.9	-0.2	-0.6	1.5	2.1	2.7	1.8	0.2	0.5	1.9	-0.5	1.4
Exports	1.1	7.5	19.1	4.8	6.0	5.4	5.0	4.1	1.8	3.8	6.4	6.8	8.0	7.0	4.1	7.9	5.1	4.7
Imports	3.9	-2.7	4.4	-1.9	-1.6	-3.2	2.0	0.3	-0.2	1.5	2.9	3.5	1.9	-0.7	0.9	0.9	-0.6	1.9
Change in Non-Farm Inventories ($96 Bn)	-5.8	1.3	26.0	-13.4	3.9	-3.8	-22.5	2.0	1.2	6.6	10.7	11.8	2.0	-5.1	7.6	---	---	---
Final Sales	1.3	3.6	4.0	2.1	0.0	-0.6	1.2	0.3	-0.3	1.8	2.5	3.0	2.5	1.2	0.9	2.7	0.2	1.7
International Current Account Balance ($Bn)	-788	-756	-714	-732	-812	-767	-756	-738	-734	-735	-735	-734	-747	-768	-734	---	---	---
% of GDP	-5.8	-5.5	-5.1	-5.2	-5.7	-5.4	-5.3	-5.1	-5.0	-5.0	-5.0	-4.9	-5.4	-5.4	-5.0	---	---	---
Pre-tax Corporate Profits including IVA&CCA	4.4	26.8	-4.9	-0.5	-15.8	-4.4	4.7	7.0	-5.9	9.2	10.1	10.7	3.5	-3.3	3.6	5.8	-2.5	5.8
% of GDP	11.4	11.9	11.6	11.5	10.9	10.8	10.8	10.9	10.7	10.8	11.0	11.2	11.6	10.8	10.9	---	---	---
GDP Deflator (Y/Y)	2.9	2.7	2.4	2.6	2.3	2.3	2.6	2.5	2.4	2.1	1.7	1.4	2.7	2.4	1.9	2.6	2.5	1.4
Nominal GDP	4.9	6.6	6.0	3.3	3.3	1.7	3.1	3.4	1.8	3.4	3.8	4.0	4.9	3.5	3.0	5.2	2.9	3.3
Labour Force	1.1	-0.1	1.0	1.2	-0.3	-0.2	-0.2	0.2	0.3	0.4	0.4	0.5	1.1	0.2	0.2	0.8	-0.1	0.4
Employment	0.7	0.9	0.8	0.8	-0.1	-0.8	-1.0	-0.6	-0.4	0.4	0.6	0.8	1.1	0.0	-0.2	0.8	-0.6	0.3
Change in Empl. ('000s)	233	316	259	286	-35	-277	-346	-207	-137	137	205	274	1,530	-44	-261	1,093	-864	479
Unemployment Rate (%)	4.5	4.5	4.7	4.8	4.8	5.0	5.4	5.8	6.2	6.6	6.9	7.1	4.6	5.3	6.7	---	---	---
Personal Disp. Income	9.1	3.4	5.9	3.8	5.5	9.8	2.3	-2.1	4.2	3.1	2.5	3.6	5.7	5.0	2.6	5.5	3.8	3.3
Pers. Savings Rate (%)	1.0	0.3	0.4	0.0	0.4	2.4	1.9	0.9	1.5	1.4	1.1	1.1	0.4	1.4	1.3	---	---	---
Cons. Price Index (Y/Y)	2.5	2.4	2.3	4.1	4.0	3.9	3.8	3.4	3.0	2.4	2.1	1.8	2.9	3.8	2.3	4.1	3.4	1.8
Core CPI (Y/Y)	2.6	2.3	2.1	2.3	2.4	2.4	2.3	2.2	2.1	2.0	1.9	1.7	2.3	2.3	1.9	2.3	2.2	1.7
Housing Starts (mns)	1.46	1.46	1.30	1.15	1.00	0.98	0.94	0.91	0.89	0.91	0.93	0.97	1.34	0.96	0.92	---	---	---
Productivity: Real Output per hour (y/y)	0.4	0.7	2.6	2.6	2.7	2.3	1.7	2.0	2.4	3.3	3.5	3.7	1.6	2.2	3.2	2.6	2.0	3.7

F: Forecast by TD Economics as at Mar 2008
Source: U.S. Bureau of Labor Statistics, U.S. Bureau of Economic Analysis, TD Economics

Rates Scenario

ECONOMIC RESEARCH

BMO Capital Markets

DR. SHERRY COOPER, CHIEF ECONOMIST • www.bmonesbittburns.com/economics

Highlights

April 1, 2008

Michael Gregory, CFA
Senior Economist

Benjamin Reitzes
Economist

- Bank of Canada easing to continue in April, likely a 25 bp cut, with rates bottoming at 2.75% by the summer.
- Fears of U.S. weakness spreading north and a pullback in commodity prices have backed the loonie away from par. Look for the Canadian dollar to meander around current levels with a weaker bias through 2008.
- With the U.S. economy in recession, the Fed will continue to slice rates, but at a more tepid pace as inflation worries linger. Look for a pair of 25 bp cuts in Q2, with rates flooring at 1.75%.
- The U.S. dollar will have trouble gaining traction as long as the Fed continues to ease. However, hopes that financial headwinds may soon be over could give the greenback a boost.
- Treasuries should rally modestly from current levels, as the U.S. trudges through recession. Canadas should follow suit, but underperform. As economic prospects improve in H2, bond yields on both sides of the border should rise.
- Sixteen-year high inflation should continue to keep the ECB on hold. A change of tone will only come after inflation has clearly peaked, or growth slows markedly. Until then, the euro could hit new highs.
- While inflation is a concern, financial market dislocations, a weakening housing market and signs of a general slowdown will likely prompt the Bank of England to cut 25 bps in April. Look for further gradual cuts into H2.
- With no governor in place, the Bank of Japan will likely stay on hold. However, signs of weakness are multiplying, and BoJ members are talking of being "flexible", which could mean a rate cut if conditions weaken sufficiently.

Forecast Summary

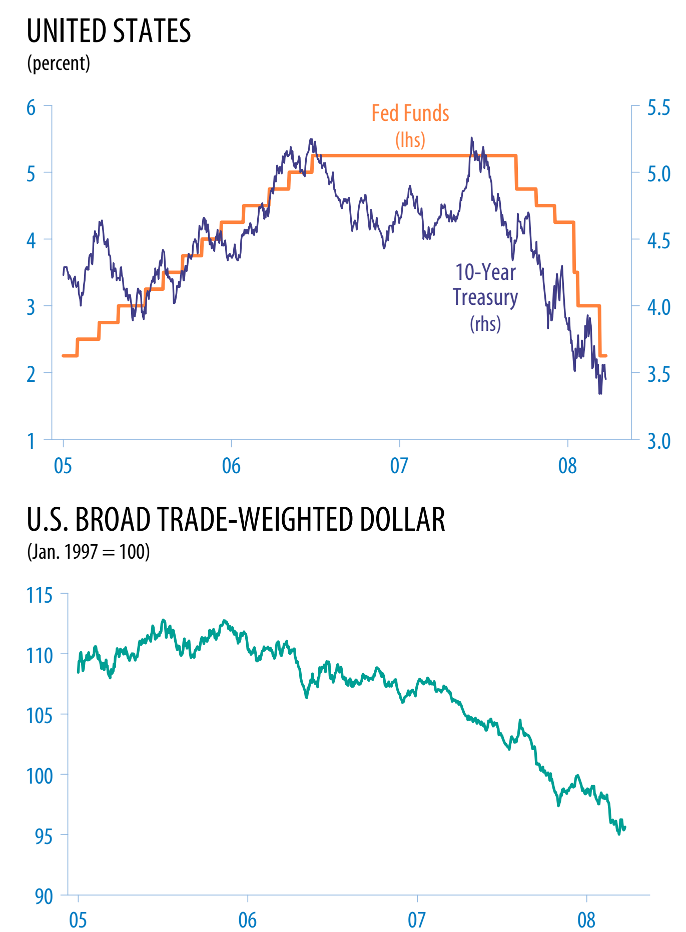
	Actual	2008			2009			
	31-Mar	Jun	Sep	Dec	Mar	Jun	Sep	Dec
Fixed Income								
BoC overnight	3.50	3.00	2.75	2.75	2.75	3.00	3.50	3.75
10-yr Canadas	3.45	3.35	3.35	3.55	3.68	3.80	3.93	4.05
Fed funds	2.25	1.75	1.75	1.75	1.75	2.25	2.75	3.25
10-yr Treasuries	3.45	3.25	3.25	3.50	3.69	3.88	4.06	4.25
Currencies								
C$ per US$	1.027	1.000	1.016	1.031	1.037	1.042	1.048	1.053
US$/€	1.58	1.60	1.55	1.50	1.46	1.43	1.39	1.35
US$/£	1.98	1.97	1.95	1.93	1.91	1.89	1.87	1.85
¥/US$	100	95	98	100	103	105	108	110

Filed: 2008-05-09, EB-2007-0905, Exhibit M, Tab 12.0, Schedule 17, Attachment 2, Page 2 of 8

U.S. Rates

The Federal Reserve reduced its policy rates 75 bps to 2.25% for fed funds and 2.50% for the discount rate on March 18. The move capped an unprecedented display of monetary policy manoeuvrings during the preceding 11 days including a beefed-up Term Auction Facility (by $40 billion to $100 billion), a new $200 billion Term Securities Lending Facility, a second round of (increased) coordinated global central bank intervention in money markets, a new Primary Dealer Credit Facility, an inter-meeting 25-bp cut in the discount rate, and a $29 billion loan guarantee for the JPMorgan Chase-Bear Stearns deal.

The flurry of activity emphasized the extent to which the Fed was prepared to use non-interest rate measures to complement its easing efforts, and was probably a precursor of a more cautious approach to rate cuts. The FOMC Statement noted that the latest rate cut *"combined with those taken earlier, including measures to foster market liquidity, should help to promote moderate growth over time and to mitigate the risks to economic activity."* Also signalling more nimbleness was the Statement's assertion that *"uncertainty about the inflation outlook has increased"* and the Fed would *"act in a timely manner as needed to promote sustainable economic growth and price stability."* At the January FOMC meeting, the timeliness of the Fed's prospective actions was to be driven solely by the downside risks to growth. We look for the Fed to continue cutting rates at a 25-bp-per-meeting pace, pulling the funds target down to 1.75% by mid-year, but with risks clearly skewed to larger, more prolonged parings.



Source: U.S. Federal Reserve Board

Ten-year Treasury yields dropped from around 3.70% to below 3.35% during the first two-thirds of March but bounced off their lows to close the month around 3.45%. We judge that yields will continue to trend down in the months ahead, below March lows. A further 50 bps in Fed rate cuts by June is no longer fully priced in, and the data are going to worsen as the U.S. economy slips deeper into recession during the months ahead, probably prodding some bond buying by equity market refugees. Once there appears a light at the end of the U.S. recession tunnel, yields should start drifting up, with gains restrained by bank buying (in lieu of making loans in order to shore up capital) and ebbing core inflation.

The trade-weighted U.S. dollar hit record lows against the major currencies in March, as the Fed's multi-pronged aggressive easing stood in stark contrast to other central banks. As the Fed continues to cut rates during H1, the greenback should continue to weaken, a trend exacerbated by heightened risk aversion—supporting the carry-trade currencies (Japanese yen and Swiss franc)—and the Chinese

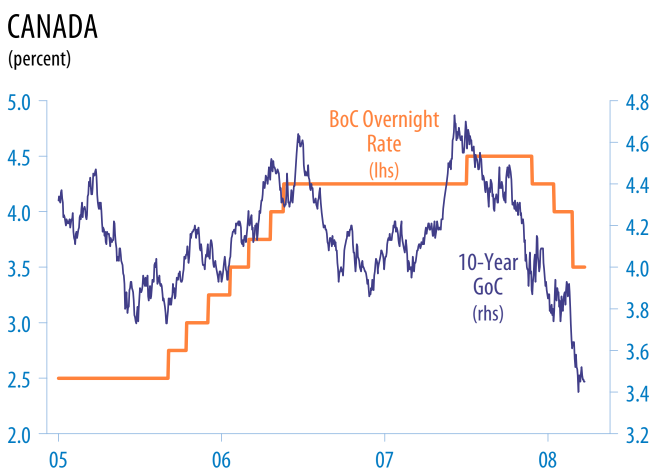
Filed: 2008-05-09, EB-2007-0905, Exhibit M, Tab 12.0, Schedule 17, Attachment 2, Page 3 of 8

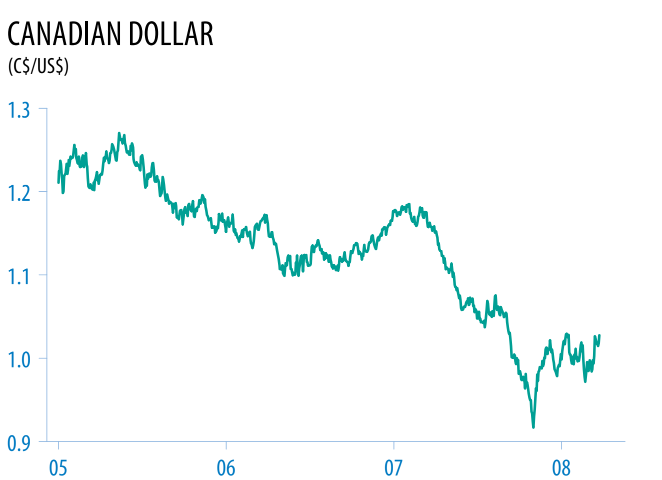
authorities' willingness to permit faster yuan appreciation to counter local inflation pressures (lifting most other Asian currencies along with it). However, once the Fed stops easing and slower global growth during H2 digs into commodity prices (and the commodity-linked currencies), the U.S. dollar should finally stabilize.

Canadian Rates

The Bank of Canada cut its policy rate 50 bps to 3.50% on March 4, stating that *"the deterioration in economic and financial conditions in the United States can be expected to have significant spillover effects on the global economy."* In turn, these spillover effects were *"intensifying"* the net downside risks to Canadian economic growth and inflation (risks that had been perceived as "roughly balanced" as recently as January). Since then, U.S. economic indicators have continued to deteriorate. However, the stability of U.S. financial conditions got a shot in the arm from the Fed's unprecedented myriad of policy manoeuvres.

Meantime, the latest Canadian CPI reading suggested that core inflation might no longer be on a path to a sub-1% print. Not only did the annual change drift up a notch, to 1.5% y/y in February (the first rise in seven months), but the three-month change surged to 2.2% annualized from outright deflation at the end of last year. Elsewhere, Canadian domestic spending remains solid, and might even be picking up, if the recent reports on January retail sales along with February housing starts and employment are any guides. Even the Canadian dollar now appears to be cooperating with the Bank's US$0.98 working assumption, a level "not inconsistent with fundamental factors".





Amid less-worrisome U.S. financial conditions, these domestic developments point to incrementally improved net downside risks that might no longer be perceived by the Bank as "intensifying" and, thus, cause their sense of easing urgency to wane. We look for the Bank to shift back to quarter-point rate cuts, and continue them until the Fed stops cutting (which would be a signal that U.S.-related risks had been adequately addressed).

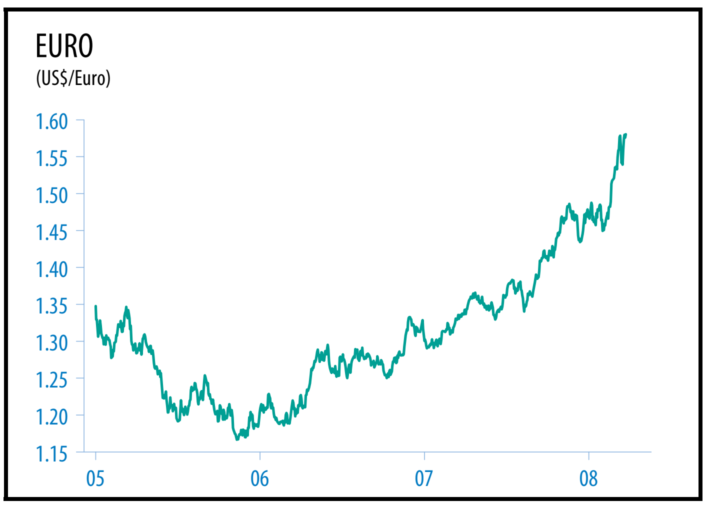
In March, Government of Canada bond yields followed U.S. Treasuries, falling from around 3.65% to 3.40% through the first two-thirds of the month, to establish record lows. This modestly underperformed Treasuries, pushing Canada-U.S. yield spreads above +10 bps from a slight negative start. The latter-month rebound in Canada yields lagged

Treasuries, paring spreads back to zero. We expect this pattern of underperforming U.S. Treasuries to continue as the latter rally. However, once yields resume rising on both sides of the border, Canada's superior inflation and fiscal fundamentals should prod narrower yield spreads.

Although Canada-U.S. overnight spreads widened during the month, from 100 bps to 125 bps, the Canadian dollar drifted down more than three cents. Softer commodity prices late in the month might have contributed to this, although the currency didn't garner much support from the prior upswing. Nevertheless, elevated commodity prices and wide overnight spreads should help offset the impact of deteriorating trade performance and GDP growth to keep the loonie close to parity in the months ahead. During the latter part of the year, as U.S. recession and tighter global credit conditions become a catalyst for slower global economic growth and even lower commodity prices, the loonie should end the year at 97 U.S. cents.

Euro

The euro continued its ascent in March to almost $1.60. Fed rate cuts, U.S. financial turmoil and still-soft U.S. data pushed the common currency into record territory. Also fuelling the rise, Eurozone data have held up well for the most part, with retail sales even perking up after a dismal Q4. Importantly, Germany's Ifo business confidence rose for a third straight month in March, pointing to solid Q1 growth (the Ifo correlates well with Eurozone & German GDP growth). The one blemish was the March manufacturing and services PMI figures, re-establishing the downtrend in place before February's surprise rise, perhaps signalling trouble on the horizon. However, that probably won't be enough to soften the ECB's anti-inflation stance.



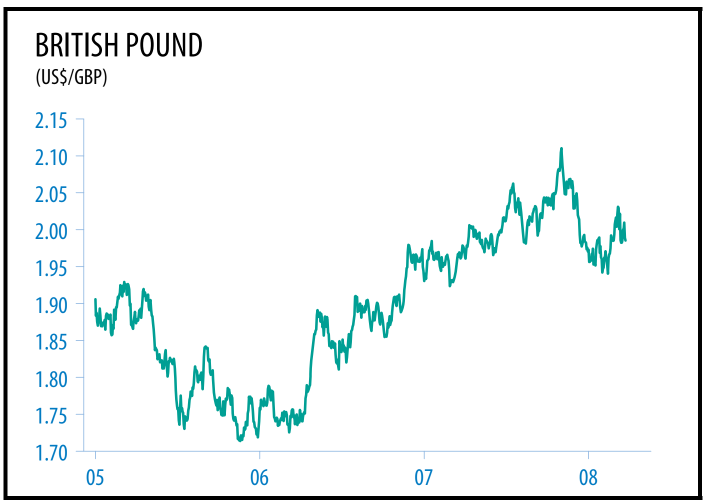
ECB President Trichet maintained a hawkish tone in the March press conference. The staff projections for 2008-2009 inflation were upgraded, while growth was downgraded. Trichet also highlighted the ECB's different policy approach from the Fed, stating that "*maintaining price stability in the medium term is our primary objective in accordance with our mandate.*" Therefore, with inflation (+3.5% y/y in March, a 16-year high) expected to be sticky, the ECB is unlikely to adopt a more dovish posture unless the economic data weaken markedly.

We look for weakness to start showing up in Q2. So, while we don't expect any change in ECB tone or policy this month, Trichet & Co. could sound more dovish by the summer. In the meantime, with the U.S. economy likely weakening further, there's little to restrain the euro from testing its high and potentially rising above $1.60, at least temporarily.

Bunds were mixed in March, with 2 years selling off sharply and 10 years unchanged, flattening the curve. The short-end underperformed Treasuries and Gilts, while the longer-end performed on par with Gilts and underperformed Treasuries. As expectations of a rate cut solidify closer to mid-year, expect the curve to steepen.

British Pound

The pound continued to hang around $2 in March, trading in a 3-to-4 cent band around the big figure, and closing the month near $1.985. On the euro cross, the pound fell to a record low, as the Bank of England and ECB appear to be moving in opposing directions. U.K. economic data have weakened, especially on the housing front. Home prices have fallen for six consecutive months according to some indicators. This will likely put a dent in consumer spending, yet retail sales remained very firm in the first two months of 2008. Despite resilient domestic spending, growth likely slowed somewhat in Q1, and will continue to soften through at least mid-year. Look for the pound to slowly back away from the $2 mark, and continuing to hit new lows on the euro cross.



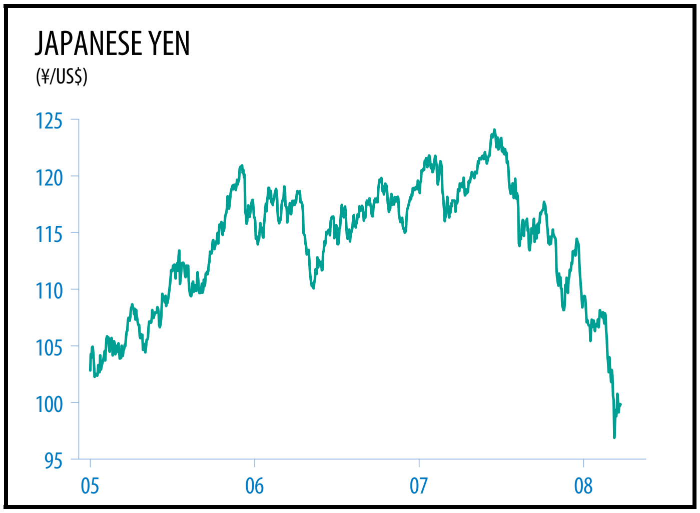
While the data alone aren't likely enough to induce a rate cut, tight credit markets and widening credit spreads should tip the balance towards easing at the April meeting. GBP LIBOR has risen consistently since late January despite February's 25-bp rate cut. Three-month LIBOR is about 75 bps above the repo rate, the widest spread since mid-December. The BoE is keenly aware of this issue, and John Gieve, responsible for the Bank's Financial Stability work and one of the two MPC members who called for a March cut, could be a little more persuasive this time around.

Similar to the ECB, however, the BoE faces stiff inflation pressures. Governor King recently stated that he expected inflation to accelerate to around 3% y/y in the next few months, but also noted that the increase was temporary, due to higher utility, energy and food costs. The Bank doesn't appear concerned about the coming higher inflation, but rather about the impact on inflation expectations. Look for further rate cuts through at least mid-year and likely at a similar pace (every other month). However, if the economy weakens or inflation turns down faster than expected, the tempo of cuts may accelerate.

The Gilts curve steepened slightly in March, with 2 years rallying and 10 years flat, outperforming Treasuries and Bunds on the short-end and underperforming at the longer-maturities. With the BoE likely cutting further, Gilts should strengthen over the next few months.

Japanese Yen

Falling global equity markets and risk aversion gave the yen a further boost in March, strengthening to its best level in a dozen years and nearly touching 95. Japan's sagging economic fundamentals could limit further gains. Industrial production fell for a second straight month in February and consumption has remained flat, squeezed by high food and energy prices, pointing to lacklustre first quarter growth. The outlook for Q2 isn't any rosier according to the latest Tankan survey, which fell to a four-year low, as Japanese businesses cope with a surging yen, rising input costs and a U.S. recession.



Meantime, the Bank of Japan is rudderless as the government is unable to agree on a suitable candidate. For now, Deputy Governor Shirakawa has filled the void, and he along with two other board members said the Bank is ready to take "flexible" policy steps if necessary. This likely means the BoJ is not entirely opposed to cutting rates if the economy were to weaken sufficiently. Despite the weaker outlook, the Bank of Japan will probably keep rates steady through the rest of the year.

Look for the yen to continue to be influenced by financial market events rather than economic data. If equity markets swoon and test recent lows, don't be surprised if the yen strengthens further, to the dismay of Japanese exporters. JGB 10 years had a decent month, rallying down to 2½-year lows as fears of a Japanese recession grew.

Global Roundup

- The Reserve Bank of Australia kept rates steady at 7.25% after hiking in back-to-back meetings to start the year. Look for the RBA to stay on hold for a few months as it evaluates the impact of its previous tightening.
- In its battle against surging inflation (mostly due to food prices), China allowed yuan appreciation to accelerate, ending March 9.3% stronger than year-ago levels. Bank reserve requirements were hiked 50 bps to slow money supply growth.
- Balancing rising inflation pressures and downside economic risks, both the Swiss National Bank and Norges Bank left rates steady in March. The Norges Bank was, however, more hawkish, hinting at another rate hike by mid-year.

FX Forecasts Local Currency per U.S. Dollar (averages)

	Actual	2008			2009			
	31-Mar	Jun	Sep	Dec	Mar	Jun	Sep	Dec
Canadian Dollar								
C$ per US$	1.027	1.000	1.016	1.031	1.037	1.042	1.048	1.053
US$ per C$	0.974	1.000	0.984	0.970	0.964	0.960	0.954	0.950
Trade-Weighted	114.8	117.9	116.5	115.2	114.6	114.0	113.4	112.8
U.S. Dollar								
Trade-Weighted*	95.6	93.9	94.7	95.8	96.5	97.2	97.9	98.6
European Currencies								
Euro**	1.58	1.60	1.55	1.50	1.46	1.43	1.39	1.35
Danish Krone	4.72	4.65	4.80	5.00	5.10	5.25	5.35	5.55
Norwegian Krone	5.09	4.95	5.10	5.20	5.40	5.55	5.75	5.90
Swedish Krona	5.94	5.95	6.10	6.25	6.35	6.45	6.55	6.65
Swiss Franc	0.99	0.97	1.03	1.08	1.13	1.16	1.19	1.22
U.K. Pound**	1.98	1.97	1.95	1.93	1.91	1.89	1.87	1.85
Asian Currencies								
Chinese Yuan	7.01	6.80	6.60	6.50	6.40	6.28	6.15	6.05
Japanese Yen	100	95	98	100	103	105	108	110
Korean Won	990	935	930	925	920	915	915	910
Indian Rupee	40.0	40.0	40.1	40.2	40.3	40.3	40.4	40.4
Singapore Dollar	1.38	1.36	1.34	1.32	1.30	1.29	1.27	1.26
Malaysian Ringgit	3.20	3.15	3.10	3.05	3.00	2.95	2.90	2.85
Thai Baht	31.5	31.0	30.5	30.1	29.6	29.2	28.7	28.3
Philippine Peso	41.6	40.3	39.4	38.5	38.1	37.6	37.2	36.7
Taiwan Dollar	30.4	30.3	30.0	29.7	29.4	29.1	28.8	28.5
Indonesian Rupiah	9208	9110	9060	9030	9000	8970	8940	8910
Other Currencies								
Australian Dollar**	0.914	0.930	0.903	0.875	0.856	0.838	0.819	0.800
N.Z. Dollar**	0.787	0.800	0.775	0.750	0.733	0.715	0.698	0.680
Mexican Peso	10.64	10.70	10.85	11.00	11.10	11.20	11.30	11.40
Brazilian Real	1.75	1.78	1.82	1.86	1.90	1.94	1.97	2.00
Russian Ruble	23.5	23.8	24.0	24.2	24.4	24.6	24.8	25.0
South African Rand	8.1	8.3	8.5	8.7	8.9	9.0	9.2	9.3

* Federal Reserve Broad Index ** (US$ per local currency)

Cross Rates

	Actual	2008			2009			
	31-Mar	Jun	Sep	Dec	Mar	Jun	Sep	Dec
Versus Canadian Dollar								
Euro (C$/€)	1.62	1.60	1.57	1.55	1.52	1.48	1.45	1.42
U.K. Pound (C$/£)	2.04	1.97	1.98	1.99	1.98	1.97	1.96	1.95
Japanese Yen (¥/C$)	97	95	96	97	99	101	103	104
Australian Dollar (C$/A$)	0.938	0.930	0.917	0.902	0.888	0.873	0.858	0.842
Versus Euro								
U.K. Pound (£/€)	0.80	0.81	0.79	0.78	0.77	0.75	0.74	0.73
Japanese Yen (¥/€)	157	152	152	150	151	150	150	149

Interest Rate Forecasts
Percent (averages)

	Actual	2008			2009			
	31-Mar	Jun	Sep	Dec	Mar	Jun	Sep	Dec
Cdn. Yield Curve								
Overnight	3.50	3.00	2.75	2.75	2.75	3.00	3.50	3.75
3 month	1.87	2.52	2.73	2.77	2.80	3.05	3.52	3.77
6 month	2.24	2.60	2.72	2.78	2.85	3.10	3.54	3.79
1 year	2.52	2.65	2.69	2.82	2.94	3.20	3.57	3.83
2 year	2.58	2.61	2.63	2.88	3.14	3.39	3.65	3.90
3 year	2.64	2.64	2.65	2.91	3.16	3.42	3.68	3.93
5 year	2.91	2.88	2.88	3.10	3.32	3.54	3.76	3.98
7 year	3.10	3.03	3.04	3.23	3.43	3.63	3.82	4.02
10 year	3.45	3.35	3.35	3.55	3.68	3.80	3.93	4.05
30 year	3.95	3.85	3.85	4.02	4.12	4.21	4.31	4.40
U.S. Yield Curve								
Fed funds	2.25	1.75	1.75	1.75	1.75	2.25	2.75	3.25
3 month	1.38	1.31	1.31	1.31	1.33	1.86	2.39	2.92
6 month	1.51	1.39	1.39	1.41	1.44	1.97	2.50	3.03
1 year	1.55	1.49	1.49	1.72	1.94	2.42	2.90	3.38
2 year	1.62	1.63	1.63	2.05	2.48	2.90	3.33	3.75
3 year	1.79	1.74	1.74	2.17	2.60	3.03	3.45	3.88
5 year	2.46	2.36	2.36	2.70	3.03	3.37	3.70	4.03
7 year	2.88	2.73	2.73	3.02	3.31	3.60	3.88	4.17
10 year	3.45	3.25	3.25	3.50	3.69	3.88	4.06	4.25
30 year	4.30	4.10	4.10	4.32	4.48	4.64	4.79	4.95

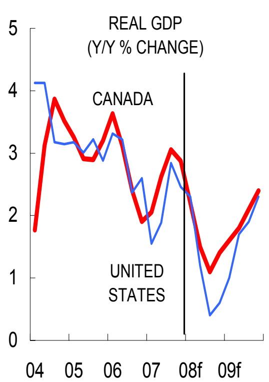
Forecast Update

Duration, Not Depth

We now expect U.S. output growth to average only 1.1% in 2008, a reduction of 0.2 percentage points from our last forecast. The slower growth rate this year drags down the expected advance in 2009 by 0.1 percentage points to 1.7%.

Our view remains that the severity of the current U.S. setback will be measured in terms of duration, not the depth of the downturn. Despite the significant contraction in housing-related activity and the sharp retrenchment underway in consumer spending, the continuing improvement in net trade is providing an effective offset to the meaningful deterioration in domestic demand. But the key differentiation between prior 'V-shaped' end-of-cycles and the current one is the lengthy period of convalescence as Americans unwind their exceptional leverage, and businesses readjust to lower profit and expenditure trajectories. Reinforcing this longer adjustment phase is the ailing financial sector that must recapitalize its balance sheets.

Output Growth Slows



In this environment, the inflationary spillover from high energy and food costs will be muted by the growing excess capacity freed up by slower growth, competitive pricing, and increasing joblessness. Look for the Fed to trim its bellwether funds rate another percentage point (50 bps each at its April 30th and June 25th FOMC meetings) to 1.25% by the end of Q2, a development that will lead to a further steepening of the yield curve. Monetary officials are expected to keep borrowing costs low over the next year to underpin the recovery process. A renewed tightening in the second half of 2009 will likely raise the Fed funds rate 75 bps to 2% by the end of next year.

The period of U.S. dollar depreciation has not yet ended. Intensifying economic weakness, compounded by the persistent strains in the financial sector in the wake of the sub-prime mortgage crisis, suggests that the greenback will remain under intermittent downward pressure for the foreseeable future. Encouraging improvements to net trade will provide only a partial offset to the further weakening in consumer spending and business investment. Furthermore, the continuing process of global asset diversification will add to the selling pressure on the U.S. dollar.

Although estimates for overall real GDP growth in Canada were left unchanged for this year and next, we have made some further changes to the underlying components of growth. Domestic spending has remained quite robust, a function of firm labour markets, lower retail prices stemming from the strong loonie, solid construction activity supported by expanded government infrastructure expenditures, and continued gains in service sector activity across the country. At the same time, the erosion in net trade has accelerated due to the steepening turndown in U.S. demand, the ongoing slowdown in domestic manufacturing activity, and lingering competitive issues, including the persistent strength of the Canadian dollar.

We continue to expect that the Bank of Canada will lower interest rates pre-emptively. The financial turmoil roiling global capital markets poses considerable downside risks to overall domestic growth, especially with the Canadian dollar hovering around parity with the U.S. dollar. Look for the central bank to cut the overnight rate another 75 bps by the end of Q2 (50 bps and 25 bps, respectively, at the April 22nd and June 10th rate setting meetings).

Scotia Economics

Scotia Plaza 40 King Street West, 63rd Floor
Toronto, Ontario Canada M5H 1H1
Tel: (416) 866-6253 Fax: (416) 866-2829
Email: scotia_economics@scotiacapital.com

Forecast Update is available on: **www.scotiabank.com, Bloomberg at SCOE** and **Reuters at SM1C**

CANADA	2000-2004 (ann.avg.)	2005	2006	2007	2008f	2009f
Real GDP (% change)	3.0	3.1	2.8	2.7	1.5	2.0
Consumer Prices (% change)	2.4	2.2	2.0	2.1	2.1	2.0
Core CPI (% change)	1.9	1.6	1.9	2.1	1.4	1.8
Pre-Tax Profits (% change)	8.8	11.9	5.0	5.8	-2.0	3.0
Employment (% change)	2.1	1.4	1.9	2.3	1.5	0.9
thousands of jobs created	308	223	314	380	250	145
Unemployment Rate (%)	7.3	6.8	6.3	6.0	6.0	6.2
Current Account Balance (C$ bn.)	236.0	27.9	23.6	14.2	**-6.0** ↑	**-15.0** ↑
per cent of GDP	2.0	2.0	1.6	0.9	**-0.4** ↑	**-0.9** ↑
Merchandise Trade Balance (C$ bn.)	63.4	63.5	51.3	49.6	**34.0** ↓	**27.0** ↓
Federal Budget Balance (C$ bn.)	9.0	13.2	13.8	10.2	2.3	1.3
Housing Starts (thousands)	195	225	227	228	208	192
Motor Vehicle Sales (thousands)	1,593	1,583	1,614	1,654	1,610	1,625
WTI Oil (US$/bbl)	30.9	56.6	66.2	72.3	95.0	95.0
Nymex Natural Gas (US$/mmbtu)	4.68	9.00	6.99	7.12	8.60	8-8.50
Gold, London PM Fix (US$/oz)	326	445	604	697	**950** ↓	900

UNITED STATES						
Real GDP (% change)	2.4	3.1	2.9	2.2	**1.1** ↓	**1.7** ↓
Consumer Prices (% change)	2.5	3.4	3.2	2.9	3.2	2.1
Core CPI (% change)	2.1	2.2	2.5	2.3	2.2	1.8
Pre-Tax Profits (% change)	7.7	11.5	13.2	3.0	**-6.0** ↓	3.0
Employment (% change)	0.4	1.7	1.8	1.1	0.3	0.8
millions of jobs created	0.49	2.28	2.40	1.53	0.45	1.15
Unemployment Rate (%)	5.2	5.1	4.6	4.6	**5.3** ↓	5.6
Current Account Balance (US$ bn.)	-485	-755	-811	-739	**-650** ↓	**-640** ↓
per cent of GDP	-4.5	-6.1	-6.2	-5.3	**-4.6** ↓	**-4.3** ↓
Merchandise Trade Balance (US$ bn.)	-518	-787	-838	-815	-800	-800
Net Federal Financial Surplus (US$ bn.)	-117	-318	-248	-162	-440	-430
Housing Starts (millions)	1.74	2.07	1.80	1.35	**0.99** ↓	1.10
Motor Vehicle Sales (millions)	17.0	16.9	16.5	16.1	15.0	15.5

MEXICO						
Real GDP (% change)	2.5	2.8	4.8	3.3	2.9	3.6
Consumer Prices (% change)	6.0	4.0	3.6	3.9	4.0	4.1
Current Account Balance (US$ bn.)	-13.1	-5.1	-2.2	-7.4	**-17.9** ↑	**-24.4** ↑
per cent of GDP	-2.2	-0.7	-0.3	-0.9	**-2.0** ↑	**-2.5** ↑

INTERNATIONAL						
Real GDP (% change)						
Japan	1.5	1.9	2.2	2.1	1.3	1.6
United Kingdom	2.8	1.8	2.9	3.1	1.9	1.9
Euro Zone	1.9	1.5	2.9	2.6	**1.6** ↓	1.7
China	9.2	10.4	11.1	11.4	10.5	9.8
India	5.9	9.0	9.4	8.8	8.2	8.0
Brazil	3.0	2.3	3.4	5.1	5.0	4.8
Consumer Prices (% change)						
Japan	-0.5	-0.3	0.2	0.1	0.4	0.4
United Kingdom	1.2	2.0	2.3	2.4	2.0	1.9
Euro Zone	2.2	2.2	2.0	2.1	**2.6** ↑	**1.8** ↑
China	1.1	1.8	1.5	4.8	5.2	3.3
India	3.9	4.2	5.8	4.8	4.2	4.5
Brazil	8.8	6.0	3.6	4.0	4.2	4.3

Filed: 2008-05-09, EB-2007-0905, Exhibit M, Tab 12.0, Schedule 17, Attachment 3, Page 3 of 3

CANADA	08Q1f	08Q2f	08Q3f	08Q4f	09Q1f	09Q2f	09Q3f	09Q4f
BoC Overnight Target Rate	3.50	2.75 ↓	2.75 ↓	2.75 ↓	2.75 ↓	2.75 ↓	3.00 ↓	3.50
Prime Rate	5.25	4.50 ↓	4.50 ↓	4.50 ↓	4.50 ↓	4.50 ↓	4.75 ↓	5.25
3-month T-bill	1.70 ↓	1.40 ↓	1.60 ↓	1.80 ↓	2.05 ↓	2.25 ↓	2.60 ↓	2.85 ↓
2-year Canada	2.65 ↑	2.00 ↓	2.20 ↓	2.40 ↓	2.65	2.90	3.20 ↑	3.50
5-year Canada	2.95 ↑	2.60 ↓	2.70 ↓	2.90 ↓	3.10	3.30	3.55 ↑	3.80 ↓
10-year Canada	3.50 ↑	3.30	3.45	3.70 ↑	3.95	4.10 ↑	4.30 ↑	4.50 ↓
30-year Canada	3.95 ↓	3.85 ↓	4.05 ↓	4.30 ↓	4.60 ↑	4.75 ↑	4.85 ↑	4.90 ↑
Real GDP (q/q, ann. % change)	1.2 ↑	1.0 ↑	1.6 ↓	1.8 ↓	1.8 ↓	2.0 ↓	2.6 ↑	3.0 ↑
Real GDP (y/y, % change)	2.2 ↑	1.5 ↑	1.1	1.4	1.6 ↓	1.8 ↓	2.1	2.4 ↑
Consumer Prices (y/y, % change)	2.2	1.8	2.0	2.2	2.0	1.8	2.0	2.1
Core CPI (y/y % change)	1.4	1.3	1.4	1.6	1.7	1.7	1.8	1.8
UNITED STATES								
Fed Funds Target Rate	2.25	1.25 ↓	1.25 ↓	1.25 ↓	1.25 ↓	1.25 ↓	1.50 ↓	2.00 ↓
Prime Rate	5.25	4.25 ↓	4.25 ↓	4.25 ↓	4.25 ↓	4.25 ↓	4.50 ↓	5.00 ↓
3-month T-bill	1.30 ↓	1.00 ↓	1.20 ↓	1.40 ↓	1.65	1.90	2.25	2.55
2-year Treasury	1.70 ↑	1.05 ↓	1.25 ↓	1.45 ↓	1.70	1.95	2.30 ↑	2.60
5-year Treasury	2.50 ↑	2.20 ↓	2.30 ↓	2.55 ↓	2.80	3.05	3.35 ↑	3.60 ↑
10-year Treasury	3.50	3.35 ↓	3.55 ↓	3.85	4.15	4.30 ↑	4.45 ↑	4.55 ↑
30-year Treasury	4.35 ↓	4.25 ↓	4.45 ↓	4.70 ↓	5.00 ↓	5.15 ↑	5.25 ↑	5.30 ↑
Real GDP (q/q, ann. % change)	0.0 ↓	-0.5	1.6 ↓	1.4 ↓	1.6 ↓	2.0	2.6	2.8
Real GDP (y/y, % change)	2.3 ↓	1.2 ↓	0.4 ↓	0.6 ↓	1.0 ↓	1.7 ↓	1.9	2.3
Consumer Prices (y/y, % change)	4.1	3.2	3.2	2.6	2.1	2.1	2.1	2.1
Core CPI (y/y % change)	2.4	2.3	2.2	2.0	1.8	1.8	1.8	1.8
SPREADS								
Target Rate	1.25	1.50	1.50	1.50	1.50	1.50	1.50	1.50
3-month T-bill	0.40	0.40	0.40	0.40	0.40	0.35	0.35	0.30
2-year	0.95	0.95	0.95	0.95	0.95	0.95	0.90	0.90
5-year	0.45	0.40	0.40	0.35	0.30	0.25	0.20	0.20
10-year	0.00	-0.05	-0.10	-0.15	-0.20	-0.20	-0.15	-0.05
30-year	-0.40	-0.40	-0.40	-0.40	-0.40	-0.40	-0.40	-0.40
EXCHANGE RATES								
Canadian Dollar (USD/CAD)	1.01 ↑	0.99 ↑	0.97	0.96	0.96 ↑	0.97 ↑	0.98 ↑	0.98 ↑
Canadian Dollar (CAD/USD)	0.99 ↓	1.01 ↓	1.03	1.04	1.04 ↓	1.03 ↓	1.02 ↓	1.02 ↓
Yen (USD/JPY)	100 ↓	97 ↓	95 ↓	95 ↓	93 ↓	93 ↓	95 ↓	95 ↓
Euro (EUR/USD)	1.58 ↑	1.60 ↑	1.61 ↑	1.60 ↑	1.57 ↓	1.55 ↓	1.55 ↓	1.55
Euro (EUR/GBP)	0.78 ↑	0.79 ↑	0.81 ↑	0.80 ↑	0.80 ↑	0.78 ↑	0.76	0.75
Sterling (GBP/USD)	2.01 ↑	2.01	2.00 ↓	2.00 ↓	1.96 ↓	1.99 ↓	2.04 ↓	2.07 ↑
Australian Dollar (AUD/USD)	0.92	0.95 ↑	0.97 ↑	0.98	0.97 ↓	0.95 ↓	0.93 ↓	0.92 ↓
Mexican Peso (USD/MXN)	10.8	10.8	10.9	11.1	11.1	11.1	11.2	11.4
Chinese Yuan (USD/CNY)	7.0 ↓	6.9	6.7 ↓	6.5 ↓	6.3 ↓	6.2 ↓	6.0 ↓	5.9 ↓

OPG INTERROGATORY #18 TO POLLUTION PROBE

Ref: Footnotes 50 and 52

Preamble:

Drs. Kryzanowski and Roberts reference an article of which Dr. Kryzanowski was a co-author.

Interrogatory:

Please provide a copy of the article.

Response:

A copy of the requested article is attached as Attachment 1 to this Schedule.

ELSEVIER

North American Journal of Economics and Finance
18 (2007) 215–229

THE NORTH AMERICAN JOURNAL OF ECONOMICS AND FINANCE

Cost of equity for Canadian and U.S. sectors

Zhongzhi He[a,*], Lawrence Kryzanowski[b,1]

[a] *Faculty of Business, Brock University, 500 Glenridge Avenue, St. Catharines, Ont., Canada L2S 3A1*
[b] *GM300-77, John Molson School of Business, Concordia University, 1455 De Maisonneuve Blvd. West, Montreal, Que., Canada H3G 1M8*

Received 1 September 2006; accepted 21 May 2007
Available online 2 June 2007

Abstract

A two-stage CAPM approach is used to generate cost-of-equity estimates and sources of their uncertainty for 10 GICS sectors in Canada and the U.S. under the assumption of relatively integrated North American economies and equity markets. The estimated cost of equity for the Canadian sectors is, on average, about the same as that of the U.S. sectors, but with a higher estimation error. The estimation error of the market risk premium is the most important uncertainty component for the equity cost estimates, except for Canadian Utilities where beta uncertainty is the most important component. Beta and interaction effects play a relatively more important role in Canada due to relatively more volatile sector betas in Canada. Our study suggests that: (1) Canadian cost of equity should be estimated in an integrated market rather than a segmented market and (2) higher importance should be given to estimating the dynamics of betas for the Canadian sectors.

JEL classification: C13; G12; G30; G31; G32

Keywords: Cost of equity; Uncertainty components; Market integration

1. Introduction

Estimating the cost of equity is crucial for many financial decisions such as capital budgeting, capital structure, and performance evaluation. According to survey studies conducted by Bruner, Eades, Harris, and Higgins (1998) and by Graham and Harvey (2001), the Capital Asset Pricing Model (CAPM) is still the most common method favored by practitioners in estimating the equity

* Corresponding author. Tel.: +1 905 688 5550x4540; fax: +1 905 688 9779.
E-mail addresses: lhe@brocku.ca (Z. He), lkryzan@alcor.concordia.ca (L. Kryzanowski).
[1] Tel.: +1 514 848 2424x2782.

1062-9408/$ – see front matter © 2007 Elsevier Inc. All rights reserved.
doi:10.1016/j.najef.2007.05.002

cost of capital.[1] Thus, it is important to determine the level of the cost of equity and the source of errors using the CAPM.

Fama and French (1997) estimate the costs of equity for 48 U.S. industry portfolios using the CAPM and the three-factor model of Fama and French (1993).[2] They find that, for a typical U.S. industry, the annualized standard error (as the measure of uncertainty) is similar and more than 3% for both models. To gauge this magnitude of uncertainty, suppose that a manager obtains a cost-of-equity estimate of 10% for a given firm. Then the traditional two-standard-error rule of thumb (95% confidence interval) suggests that the estimate may range from 4% to 16%, or even wider.

To determine the sources of the errors, Fama and French (1997) and Ferson and Locke (1998) decompose the variance of the cost-of-equity estimates into three components: beta effect, market premium effect, and the interaction effect. Both studies find that the premium effect is the most important source of uncertainty, and that the beta and interaction effects are relatively small.

The existing cost-of-equity studies have so far focused on U.S. firms/industries or broad international markets.[3] However, comparative studies that examine the sector- or industry-level costs of equity across different markets that are highly integrated have not been conducted, mainly because of the apple-to-orange comparison if assets of different markets do not share the same classification scheme. Fortunately, such a limitation has recently been removed by the inception of the Global Industry Classification Standard (GICS) that enables meaningful comparisons of sectors and industries globally.[4] In this paper, we conduct the first comparative study on the cost of equity for the Canadian and U.S. sectors at both aggregate and individual levels under the assumption of partly integrated North American financial markets. Such a comparative study is useful not only for a corporate manager to obtain comparable estimates and errors of a given sector's equity cost, but also for a sector-based investor to make asset allocations among the Canadian–U.S. sector portfolios.

The primary focus of this paper is on the Canadian sector portfolios with the corresponding larger U.S. sectors used as the comparison benchmark. Specifically, we address three questions. First, what are the cost-of-equity estimates and the sources of uncertainty for the Canadian sectors? Second, how are the cost-of-equity estimates and sources of uncertainty for the Canadian

---

[1] Canadian regulators primarily rely on estimates based on the logic underlying the CAPM for the establishment of the cost of equity for utilities under their jurisdictions.

[2] The survey of Bruner et al. (1998) finds that only a small minority of U.S. firms uses multi-factor asset-pricing models to estimate equity costs. Furthermore, recent studies by Ang, Hodrick, Xing, and Zhang (2006a,b) strongly demonstrate that for 23 developed markets (including the U.S.) over a sample period that spans January 1980 to December 2003 that only the market factor is consistently priced. Furthermore, the small-minus-big capitalization factor and the high-minus-low book-to-market factor are almost always insignificant and often have the wrong sign predicted by Fama and French (1993). Therefore, our paper only considers versions of the CAPM for the cost-of-equity estimates.

[3] For example, Pastor and Stambaugh (1999) use a Bayesian method to estimate the cost of equity for a large sample of U.S. firms. Hail and Leuz (2006) employ four different analyst forecast models to estimate the cost of equity capital for 40 developed and developing countries over the period from 1992 to 2001. Koedijk et al. (2002) examine to what extent international and domestic asset-pricing models determine the estimates of the costs of equity for nine developed countries. Over the period of 1980:02 to 1999:06, they find that the primary determinant is the domestic market factor. Mishra and O'Brien (2005) obtain ex ante cost of equity estimates for emerging market firms using the residual income valuation model.

[4] The GICS classification is jointly developed by Morgan Stanley Capital International (MSCI) and Standard & Poor's (S&P). Since its inception in 2000, the GICS has been widely used in sector-based investing in global financial markets. See http://www.msci.com/equity/gics.html for details.

sectors compared to those for the U.S. sectors? Third, what explains the comparative findings between the Canadian and U.S. sectors for the cost-of-equity estimates and sources of uncertainty?

Using data on 10 GICS sectors from January 1988 to December 2005, we employ a two-stage market model under the assumption that the Canadian and U.S. financial markets are relatively integrated as are their economies through the NAFTA trade agreement.[5] The main findings of our comparative analysis are now summarized. First, the average level of the cost of equity is 10.55% (annualized) for a typical Canadian sector, and the overall standard error (a measure of uncertainty) is 2.34%. At the individual sector level, the cost-of-equity estimates range from 8.30% for Utilities to 15.31% for the IT sector,[6] with the range of standard errors from 1.86% (Utilities) to 4.82% (IT). Consistent with the U.S. studies, we find that, *on average*, the estimation error associated with the market risk premium is the most important source of uncertainty, whereas the estimation errors of betas and the interaction effects are relatively small. Nevertheless, for the Canadian Utilities sector, time variation in beta is the most important determinant of its cost-of-equity uncertainty.

Second, comparatively speaking, a typical U.S. sector has about the same level of cost of equity (10.52%), but with a smaller standard error (2.13%) than its Canadian counterpart. This level of standard error is lower than the 3% standard error reported by Fama and French (1997) for a typical U.S. industry. This is because we use a much longer sample (50 years) of market returns, which significantly reduces the estimation error in the equity risk premia. Furthermore, in terms of the relative importance of the three sources of uncertainty, we find that Canadian sectors generally have more significant beta and interaction effects than the corresponding U.S. sectors.

We attribute our comparative findings between the Canadian and U.S. sectors to two main sources. First, on average, the U.S. market makes a positive contribution to the Canadian sector premium, whereas the Canadian market has little impact, on average, on the U.S. sector premium. This evidence of material market integration, coupled with the higher level of the risk-free rate for Canada, explains the levels of the cost-of-equity estimates for the Canadian and U.S. sectors. Second, we attribute the different sources of uncertainty in the cost-of-equity estimates to the finding that the betas of the Canadian sectors are much more volatile than those of the corresponding U.S. sectors. The comparative study suggests that the so-called value discount for non-cross-listed Canadian firms suggests that one should not rely solely on the domestic CAPM to estimate the Canadian cost of equity, and it also highlights the importance of modeling beta dynamics for the Canadian sectors.

The rest of the paper is organized as follows. Section 2 describes the data for the Canadian and U.S. markets and the GICS sectors. Section 3 conducts the full analysis and presents the comparative results. Section 4 concludes the paper and discusses some methodological implications.

---

5 The empirical evidence for the Canadian and U.S. equity markets finds evidence of partial market integration (or conversely partial market segmentation), where the level of partial market integration is stronger for cross-listed securities. For example, see Jorion and Schwartz (1986), Koutoulas and Kryzanowski (1994), Mittoo (1992), amongst others. Faff and Mittoo (2003) investigate whether capital market integration varies across industries and by geographical proximity where companies are matched by size and industry from the Australian, Canadian and U.S. capital markets using a multi-factor pricing framework over the 1983–1997 period. Doukas and Switzer (2000), Foerster and Karolyi (1998), Mittoo (2003), among others, identify favorable price and liquidity changes for shares that cross-list internationally into a more liquid market, such as non-U.S. companies listing in the U.S.

6 The cost-of-equity estimate for the Canadian utility sector is 7.95% if measured in a segmented market setting due to this sector's insignificant U.S. market beta.

Table 1
Sector classifications and summary statistics (1988:01–2005:12)

GICS sector	Industry groups	Canada		U.S.	
		Mean	S.D.	Mean	S.D.
Energy	Energy	1.23	6.00	1.19	4.60
Materials	Materials	0.59	5.96	0.87	5.16
Industrials	Capital goods, Commercial Services & Supplies, Transportation	0.65	5.38	1.07	4.47
Cons. Disc.	Automobiles & Components, Consumer Services, Consumer Durables & Apparel, Media, Retailing	0.76	4.36	0.99	5.21
Cons. Stpl.	Food & Staples Retailing, Food, Beverage & Tobacco, Household & Personal Products	1.17	3.66	1.10	4.13
Health	Health Care Equipment & Services, Pharmaceuticals & Biotechnology	0.76	7.78	1.23	4.72
Financials	Banks, Diversified Financials, Insurance, Real Estate	1.34	4.68	1.38	5.26
IT	Software & Services, Technology Hardware & Equipment, Semiconductors & Semiconductor Equipment	1.21	11.45	1.20	7.91
Telecom	Telecommunication Services	1.24	5.39	0.80	5.85
Utilities	Utilities	1.00	3.72	0.86	4.37
Average		1.00	5.84	1.07	5.17

This table reports the corresponding industry groups, the mean, and standard deviation (S.D.) of returns for each of 10 economic sectors according to the global industry classification standard (GICS). The sample period is from 1988:01 to 2005:12. All the figures are in monthly percentage.

2. Data

For the Canadian sectors, we obtain monthly total-return indices for 10 GICS economic sectors from *Datastream* under the S&P/TSX provider.[7] Monthly index values for the 10 GICS sectors are taken for the sample period between December 1987 and December 2005. Monthly returns are calculated as the percentage changes of index values between two consecutive months. The GICS index values for the 10 U.S. sectors are available only since December 1994, so we calculate sector returns accordingly for the 10 sectors from 1995:01 to 2005:12. To fill the sector returns from 1988:01 to 1994:12, we take the value-weighted returns of the corresponding U.S. industries from the website of Professor French.[8] Table 1 reports the sample means and standard deviations of returns for each of the 10 Canadian and U.S. sectors, along with a description of their corresponding industry groups. For the studied sample period, the average Canadian sector generates a return of 1% per month with a standard deviation of 5.84% per month. The average U.S. sector has a slightly higher return of 1.07% per month with a standard deviation of 5.17%. The lower average standard deviation of the U.S. sectors reflects the fact that the U.S. sectors are more diversified

[7] More details on the GICS classification and its ongoing maintenance are available at: http://www.mscibarra.com/products/gics/index.jsp. Specifically, the general sector is the most aggregated level of analysis. The classification structure accurately reflects the state of industries in the universe of equity investment opportunities and annual reviews conducted by MSCI and Standard & Poor's ensure that it remains fully representative of that universe of investment opportunities.

[8] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

Table 2
Equity risk premium (1956:01–2005:12)

	R_f	$E(R_m)$	$E(R_m) - R_f$	S.E. $(R_m - R_f)$
Canada	0.52	0.88	0.36	0.18
U.S.	0.43	0.92	0.49	0.17

This table reports the average risk-free rate, the average returns of the S&P/TSX index (Canada) and the S&P 500 index (U.S.), the equity risk premia $E(R_m) - R_f$, and the standard errors of the equity risk premia S.E. $(R_m - R_f)$ for the Canadian and U.S. markets over the period from 1956:01 to 2005:12. The standard error is calculated as the standard deviation of the equity risk premium divided by the square root of the number of observations, which is 600. All the figures are in monthly percentage.

than the Canadian sectors. In both markets, Financials is the best performing sector, and the IT (Consumer Staples) sector has the highest (lowest) volatility.

While the GICS sector data begin on January 1988, the S&P/TSX index value (as the proxy for the Canadian market portfolio) begins as early as January 1956, and the S&P 500 index value (as the proxy for the U.S. market portfolio) begins even earlier. We extract total return index values for the common period of 1956:01–2005:12, which amounts to a series of 600 monthly index returns. The market risk premium is then calculated as the mean of index returns in excess of each country's risk-free rate (proxied by the 3-month T-bill rate).[9] As we show later, using the long sample for market returns (as opposed to the short sample for sector returns) improves the precision of the sector cost-of-equity estimates.[10] From Table 2, we observe that during the past 50 years, the Canadian market has an equity premium of 0.36% per month (t-stat = 2.00), as compared to 0.49% per month (t-stat = 2.88) for the U.S. equity premium.[11] The higher U.S. market premium comes from two sources: (1) the U.S. market realizes a slightly higher mean return (0.92%) than that of the Canadian market (0.88%); (2) The average Canadian risk-free rate (0.52%) is higher than the average U.S. risk-free rate (0.43%). As the measure of uncertainty, the standard error of the equity premium is 0.18% per month for Canada and 0.17% per month for the U.S. Due to the long sample of market data, this magnitude of standard error is considerably lower than if the sector sample (1988:01–2005:12) is used. The standard error of the equity premium is 0.28% per month for both the Canadian and U.S. markets for the shorter sector time period.

3. Methodology and findings

Given the data, our comparative study is conducted within three subsections. Section 3.1 allows for partially integrated Canadian and U.S. equity markets, and estimates the sector risk premiums

[9] We report the arithmetic means although there is considerable debate in the literature on whether the arithmetic or geometric mean should be used when measuring the equity risk premium. For example, see Ritter (2002).

[10] Fama and French (1997) and Ferson and Locke (1998) find that the estimation error in the market risk premium constitutes the largest source of uncertainty in the cost-of-equity estimates. Pastor and Stambaugh (1999) use the market data as early as July 1927 to estimate the cost of equity for U.S. firms with various lengths of historical returns.

[11] Our annualized estimates of equity risk premia are 4.32% and 5.88% for Canada and the U.S., respectively. Our estimates are slightly higher than those estimated by Booth (2001), who reports a 3.29% equity premium for Canada, and a 5.61% equity premium for the U.S. over the period of 1957–2000. Two reasons contribute to the different estimates: (1) We use a longer sample period from 1956 to 2005, in which the Canadian and U.S. markets realized lower average returns than those in Booth's sample; (2) Booth determines the equity premium with respect to the long-term bond yields (8.04% for Canada and 7.32% for the U.S.), which are significantly higher than the short-term Treasury bill yields (6.24% for Canada and 5.16% for the U.S.) used in our study.

using a two-stage market model. Section 3.2 estimates the magnitude of uncertainty in estimating the sector betas. Section 3.3 decomposes the cost-of-equity variances into the beta effect, premium effect, and interaction effect. Section 3.4 discusses the economic significance of our comparative results.

3.1. Estimating the sector risk premium

Given the assumption that the Canadian and U.S. equity markets are relatively integrated, a two-stage market model is adopted to estimate the sector risk premium. The two-stage approach is in the spirit of the "global beta" model of Koedijk, Kool, Schotman, and Dijk (2002), which combines the domestic CAPM with some global factors. Briefly, the first stage performs a domestic market model for the excess returns of each sector, assuming that only the domestic market factor is relevant when pricing domestic assets. The second stage then examines to what extent the foreign market factor can further explain the residual returns or pricing errors that are left over from the first stage. By orthogonizing the U.S. (Canadian) market effect while examining the Canadian (U.S.) sectors, each sector's risk premium as well as each of its variance components can naturally be seen as the sum of the domestic effect and the foreign effect. A further motivation for using both market indices is that the stock returns of international cross-listed companies are likely to be affected by both domestic and foreign stock market risk (Foerster & Karolyi, 1999; Kryzanowski & Rubalcava, 2004). Based on the much greater proportion of Canadian firms cross-listed on U.S. trade venues compared to U.S. firms cross-listed on Canadian trade venues, we expect the U.S. sector to be relatively more important for the pricing of Canadian firms than the Canadian factor is for the pricing of U.S. firms.

In the first stage, for each sector p, we run an OLS regression of the sector excess returns r_p on the excess returns of the domestic market r_{m0}:

$$r_{p,t} = \alpha_p + \beta_{p0} r_{m0,t} + u_{p,t}, \quad t = 1988:01 \text{ to } 2005:12 \tag{1}$$

Eq. (1) specifies the effect of the domestic market on the given sector through the domestic beta β_{p0}. From the domestic market model, the sector risk premium is given by $\beta_{p0}E(r_{m0})$, where $E(r_{m0})$ is the domestic market premium reported in Table 2. In addition to this domestic sector premium, if the domestic market (Canada) is materially integrated with the foreign market (U.S.), then the foreign market index should serve as an *incremental* factor that determines the domestic sector returns. To capture this integration effect, the residuals from Eq. (1) are regressed on the excess returns of the foreign market r_{m1}:

$$u_{p,t} = \beta_{p1} r_{m1,t} + \varepsilon_{p,t}, \quad t = 1988:01 \text{ to } 2005:12 \tag{2}$$

where $r_{m1,t}$ is expressed in the numeraire currency 0 by applying the exchange rate to the foreign market index at each month. The incremental sector premium due to the foreign market factor is given by $\beta_{p1}E(r_{m1})$, where the foreign beta β_{p1} specifies the magnitude and direction of the foreign effect, and $E(r_{m0})$ is the foreign market premium reported in Table 2.

Domestic beta β_{p0} and foreign beta β_{p1} along with their respective t-statistics are reported in Table 3 for each Canadian and U.S. sector. All the domestic betas are highly significant; the IT (Utilities) sector has the highest (lowest) beta. The sign of the foreign betas exhibits an intuitive pattern that reflects the nature of the Canadian and U.S. economies. Given that Canada is a net importer of industrial and consumer products and technology from the U.S., a rise or decline in the U.S. market returns leads to an *incremental* (after controlling for the Canadian market effect)

Table 3
Estimating the sector risk premia based on the two-stage market model

Sector	Canada			U.S.		
	β_{p0} (*t*-stat)	β_{p1} (*t*-stat)	$E(r_p)$	β_{p0} (*t*-stat)	β_{p1} (*t*-stat)	$E(r_p)$
Energy	0.64 (7.21)	−0.14 (−1.61)	0.16	0.60 (9.03)	0.11 (1.95)	0.33
Materials	0.89 (11.58)	−0.09 (−1.12)	0.27	0.90 (14.46)	0.08 (1.50)	0.47
Industrials	0.97 (16.67)	0.13 (2.11)	0.42	0.98 (28.29)	0.01 (0.37)	0.49
Cons. Disc.	0.80 (17.40)	0.11 (2.23)	0.34	1.03 (19.41)	0.02 (0.52)	0.52
Cons. Stpl.	0.37 (6.76)	0.11 (1.95)	0.19	0.63 (11.55)	−0.11 (−2.44)	0.27
Health	0.86 (7.67)	0.21 (1.82)	0.42	0.74 (12.08)	−0.14 (−2.70)	0.32
Financials	0.80 (15.00)	0.10 (1.73)	0.34	1.06 (20.77)	−0.06 (−1.38)	0.50
IT	1.81 (12.86)	0.42 (2.94)	0.87	1.56 (19.14)	0.09 (1.30)	0.80
Telecom	0.76 (10.65)	0.03 (0.42)	0.29	1.02 (14.54)	−0.13 (−2.20)	0.46
Utilities	0.26 (4.44)	0.02 (0.47)	0.11	0.42 (6.26)	−0.01 (−0.14)	0.21
Average	0.82 (6.19)	0.10 (1.82)	0.34	0.90 (8.85)	−0.01 (−0.47)	0.44

The first column reports the domestic beta (and its associated *t*-statistic) from the OLS regressions of excess returns of sector *p* on excess returns of the S&P/TSX or S&P 500 index, i.e., $r_{p,t} = \alpha_p + \beta_{p0} r_{m0,t} + u_{p,t}$, where t = 1988:01–2005:12. The second column reports the foreign beta (and its associated *t*-statistic) from the regression of the residuals on excess returns of the foreign markets, or $u_{p,t} = \beta_{p1} r_{m1,t} + \varepsilon_{p,t}$. The third column is the expected risk premium for sector *p*, which is calculated as $E(r_p) = \beta_{p0}E(r_{m0}) + \beta_{p1}E(r_{m1})$, where $E(r_{m0})$ and $E(r_{m1})$ are, respectively, the domestic and foreign market risk premium in Table 2. $E(r_p)$ is a monthly percentage.

increase or decrease in the corresponding Industrials, Consumer Discretionary, Consumer Staples, and IT sectors in Canada. On the other hand, the U.S. is a net importer of Energy and Materials from Canada, so the Canadian market returns exert a positive impact on the U.S. Energy and Materials sectors. Overall, the U.S. market positively affects the Canadian sectors, as reflected by the positive average foreign beta of 0.10, whereas the Canadian market has almost no impact on the U.S. sectors, as reflected by the near zero average foreign beta of −0.01.

The sector risk premium is estimated by $E(r_p) = \beta_{p0}E(r_{m0}) + \beta_{p1}E(r_{m1})$. For both countries, the IT sector has the highest risk premium due to its high domestic betas, and positive foreign betas especially for Canada ($\beta_{p1} = 0.42$). The Utilities sector has the smallest betas, which result in the lowest risk premium for both the Canadian and U.S. utilities. On average, the U.S. sector premium is 10 basis points (per month) higher than the Canadian sector premium. This is primarily driven by the higher realized risk premium of the S&P 500 during the past 50 years.

3.2. *Estimating beta uncertainty*

Section 3.1 assumes that the betas are constant over the whole sample period. However, there exists ample evidence (see Kryzanowski & To, 1984, amongst others) that betas are time varying, which results in uncertainty in the estimates of beta. The time variation in the beta estimates and the correlation between beta and market premium errors will contribute further to the overall uncertainty in the cost-of-equity estimates.

The 60-month rolling-regression procedure is used to estimate the expected beta $E(\beta_p)$ and the variance of beta $V(\beta_p)$ for both domestic and foreign betas.[12] In the first stage, we start with

[12] According to the survey of Bruner et al. (1998), the 60-month rolling regression is a commonly used procedure to estimate time-varying betas among practitioners. This is also the case in the academic literature.

Table 4
Estimating the cost of equity based on time-varying betas

Sector	Canada				U.S.			
	$E(\beta_{p0})$	$V(\beta_{p0})$	$E(\beta_{p1})$	$V(\beta_{p1})$	$E(\beta_{p0})$	$V(\beta_{p0})$	$E(\beta_{p1})$	$V(\beta_{p1})$
Energy	0.63	0.029	−0.06	0.000	0.60	0.000	0.08	0.000
Materials	0.99	0.089	−0.14	0.020	0.89	0.000	0.13	0.014
Industrials	1.05	0.026	0.11	0.000	1.00	0.000	0.04	0.003
Cons. Disc.	0.86	0.015	0.09	0.002	1.00	0.000	0.06	0.000
Cons. Stpl.	0.51	0.102	0.15	0.000	0.76	0.090	−0.09	0.000
Health	0.84	0.000	0.24	0.018	0.87	0.079	−0.09	0.000
Financials	0.90	0.053	0.09	0.000	1.11	0.007	−0.06	0.000
IT	1.55	0.441	0.36	0.010	1.41	0.101	0.06	0.000
Telecom	0.68	0.032	0.05	0.000	0.95	0.008	−0.10	0.000
Utilities	0.39	0.117	0.05	0.000	0.44	0.007	−0.03	0.000
Average	0.84	0.090	0.10	0.005	0.91	0.029	0.00	0.002

For each sector p, time-varying betas are calculated from rolling regressions of the sector excess returns on the market excess returns for each month t = 1990:01–2005:12. The regression starts at 1990:01 with a 24-month regression window, which increments every month until a 60-month window is created and the rolling regression is conducted until 2005:12. $E(\beta_p)$ is the time-series average of the rolling betas, and $V(\beta_p)$ is the implied variance of the betas. $V(\beta_p)$ is calculated as $V(\beta_{p,t}) - V$ (sample), where $V(\beta_{p,t})$ is the variance of the rolling betas, and V (sample) is taken to be the time-series average of the squared standard errors of the rolling betas. The implied variance of the betas $V(\beta_p)$ is set to zero if $V(\beta_{p,t}) < V$ (sample).

a 24-month regression (using data from 1988:01 to 1989:12) of a given sector's excess returns on the excess returns of the domestic market to obtain the domestic beta $\beta_{p0,t}$ where t = 1990:01. In the second stage, the residuals from the first stage are then regressed on the excess returns of the foreign market to obtain the foreign beta $\beta_{p1,t}$ where t = 1990:01. The size of the regression window increments by 1 month until it reaches a fixed 60-month window. From then on, the 60-month two-stage rolling regressions are performed at each month until the end of the sample. The beta time series $\beta_{p0,t}$ and $\beta_{p1,t}$ are therefore generated from t = 1990:01 to 2005:12. Then, the time-series averages of $\beta_{p0,t}$ and $\beta_{p1,t}$ are taken to be the estimate of the expected beta $E(\beta_{p0})$ and $E(\beta_{p1})$.

Table 4 reports $E(\beta_{p0})$ and $E(\beta_{p1})$ in the first and third data columns for each country. Compared to the full-period domestic betas in Table 3, the time-series averages of the domestic betas are less dispersed. For the Canadian sectors, the IT and Utilities domestic betas are, respectively, 1.55 and 0.39 using the time-series means of the rolling betas, as compared to 1.81 and 0.26 using the full-period OLS beta. The time-series averages of the foreign betas $E(\beta_{p1})$ have the same sign and are about of the same magnitude as the full-period foreign betas.

To estimate the variance of the domestic beta $V(\beta_{p0})$ and foreign beta $V(\beta_{p1})$, we follow the Fama and French (1997) procedure that uses the implied variance of the beta. Under the standard assumption that the sampling error of the beta is uncorrelated with the true value of the beta, the implied variance of the beta is the time-series variance of the rolling regression beta $V(\beta_{p,t})$ minus the variance of the sampling error of the beta, i.e.,

$$V(\beta_p) = V(\beta_{p,t}) - V(\text{sampling error}) \tag{3}$$

where V (sampling error) is taken to be the time-series average of the sampling-error variance (i.e., squared standard error) of the rolling beta estimates. If $V(\beta_{p,t}) < V$ (sampling error), then the implied variance $V(\beta_p)$ is set to zero. In this case the estimation error in betas dominates the observed time-variation in betas, so the beta is better treated as a constant.

The variances of the domestic and foreign betas are calculated from Eq. (3) for each Canadian and U.S. sector. Table 4 reports $V(\beta_{p0})$ and $V(\beta_{p1})$ for each sector p in the second and fourth data columns for each country. The average values in the last row indicate that the Canadian sector betas generally have much higher uncertainty than the corresponding U.S. sector betas. This is best visualized in Fig. 1 that plots the time series of domestic betas for some selected Canadian and U.S. sectors including Energy, Materials, Consumer Staples, and Health. The solid lines represent the rolling domestic beta estimates at each month, and the broken lines represent plus and minus one standard error of the beta estimates.

3.3. Variance decomposition of the cost of equity

In this section, we follow Fama and French (1997) and Ferson and Locke (1998) to decompose the variation in the sector costs of equity estimates into three sources: beta effect, market premium effect, and interaction effect. Specifically, the three sources of error variance are obtained from the following decomposition equation[13]:

$$\begin{aligned} V(E(r_p)) = {} & \underbrace{[E(r_{m0})]^2 V(\beta_{p0}) + [E(r_{m1})]^2 V(\beta_{p1})}_{\text{beta effect}} \\ & + \underbrace{[E(\beta_{p0})]^2 V(E(r_{m0})) + [E(\beta_{p1})]^2 V(E(r_{m1}))}_{\text{premium effect}} \\ & + \underbrace{V(\beta_{p0}) V(E(r_{m0})) + V(\beta_{p1}) V(E(r_{m1}))}_{\text{interaction effect}} \end{aligned} \tag{4}$$

Given that the domestic and foreign market effects are orthogonal to each other by construction, each of the beta, premium and interaction effects is the sum of the domestic effect and foreign effect. The beta effect (i.e., contribution of the variance of the errors in estimating the betas) is the variance of the beta multiplied by the squared market premium. The premium effect (i.e., contribution of the variance of the errors in estimating the expected risk premium) is the variance of the expected market premium multiplied by the square of the expected betas. The third term captures the cross effect that arises when the errors in the beta estimates are correlated with the errors in the estimates of the market premium. To assess the relative importance of the three sources of uncertainty, we first note from Table 2 that $[E(r_m)]^2$ and $V(E(r_m))$ are of the same order of magnitude, but $[E(r_m)]^2$ is higher than $V(E(r_m))$ for both the Canadian and U.S. market indices. Specifically, $[E(r_m)]^2 = 0.0036^2$ and $V(E(r_m)) = 0.0018^2$ for the S&P/TSX; and $[E(r_m)]^2 = 0.0049^2$ and $Var(E(r_m)) = 0.0017^2$ for the S&P 500. Later on, we present evidence that the square of the expected beta $[E(\beta_p)]^2$ is of a much larger magnitude than the variance of beta $V(\beta_p)$ for most sectors. Therefore, by examining Eq. (4), we expect the market premium effect to be the most important source of uncertainty for most sectors, the beta effect to be of second-order importance, and the interaction effect to be the least important component.

Table 5 presents the results of the variance decomposition based on Eq. (4). We first examine the beta effect: $[E(r_{m0})]^2 Var(\beta_{p0}) + [E(r_{m1})]^2 Var(\beta_{p1})$. The variance of the betas contributes different

[13] The decomposition equation comes from a Taylor series expansion where the error in the cost of equity is a function of the beta error and the market premium error. See Fama and French (1997) and Ferson and Locke (1998) for details.

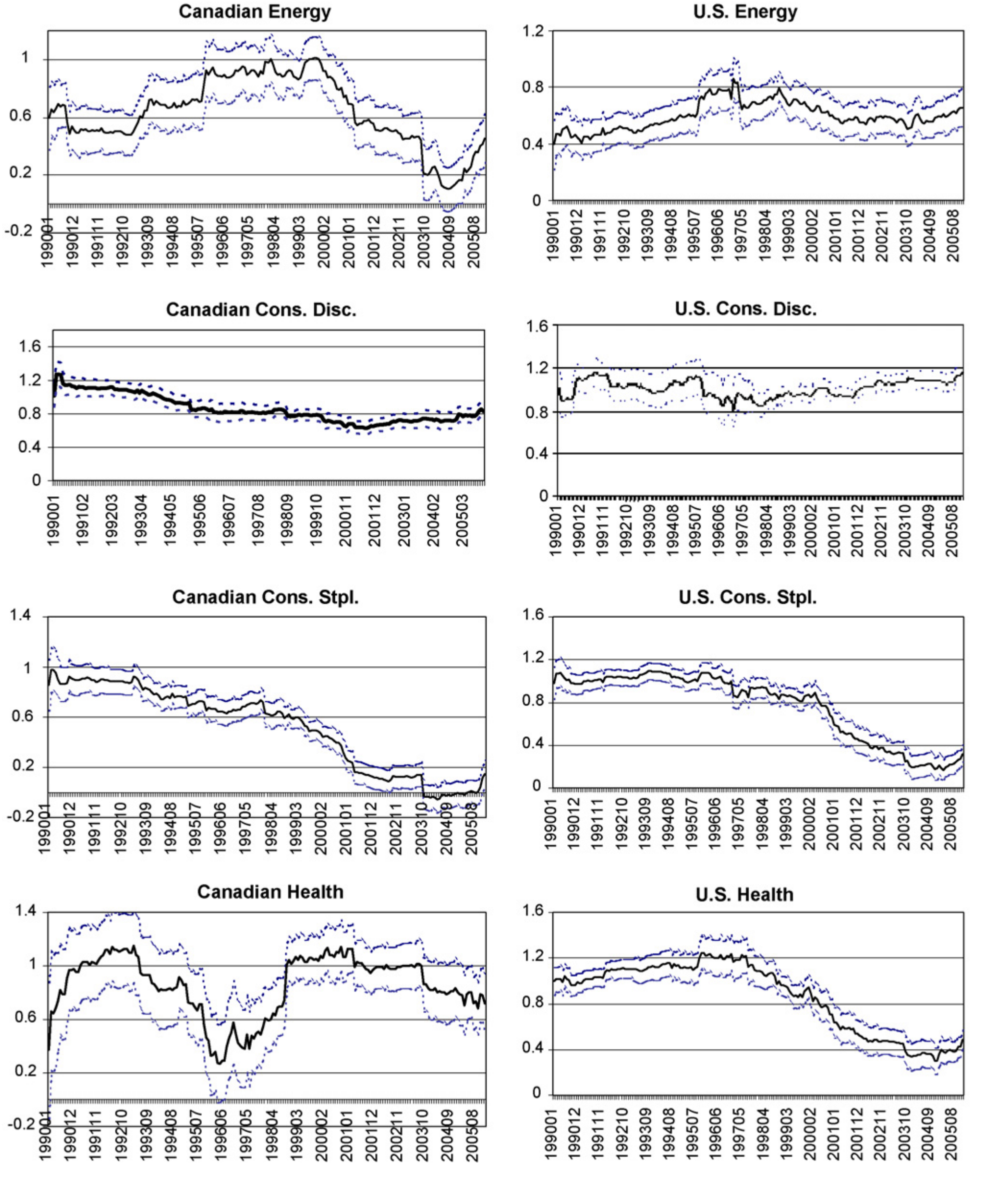


Fig. 1. Beta time series and standard errors. The solid line represents the time-varying estimates of rolling betas from 1990:01 to 2005:12. The broken lines represent plus and minus one standard error around the estimated rolling betas. The rolling regression procedure is described in Table 4.

degrees of uncertainty to the cost-of-equity estimates for different sectors. Two U.S. sectors, Energy and Consumer Discretionary, have no beta effect due to their relatively stable betas. Fig. 1 presents these two U.S. sectors as examples, where the Energy and Consumer Discretionary betas vary smoothly over time relative to their larger standard error intervals. In general, Table 5 shows that most Canadian sectors have higher beta uncertainty than their corresponding U.S. sectors. The exceptions are Consumer Staples and Health, where the U.S. sectors have greater beta uncertainty.

Table 5
Variance decomposition

Sector	Canada				U.S.			
	Beta ($\times 10^{-6}$)	Prm ($\times 10^{-6}$)	Inter ($\times 10^{-6}$)	Prm as % of total variance	Beta ($\times 10^{-6}$)	Prm ($\times 10^{-6}$)	Inter ($\times 10^{-6}$)	Prm as % of total variance
Energy	0.37	1.33	0.10	0.74	0.00	1.07	0.00	1.00
Materials	1.71	3.34	0.35	0.62	0.15	2.37	0.05	0.92
Industrials	0.34	3.67	0.09	0.90	0.03	2.95	0.01	0.99
Cons. Disc.	0.24	2.48	0.05	0.90	0.00	2.98	0.00	1.00
Cons. Stpl.	1.33	0.92	0.34	0.36	2.20	1.74	0.27	0.41
Health	0.48	2.53	0.05	0.83	1.93	2.24	0.23	0.51
Financials	0.69	2.70	0.18	0.76	0.17	3.62	0.02	0.95
IT	6.02	8.41	1.50	0.53	2.45	5.86	0.30	0.68
Telecom	0.41	1.56	0.10	0.75	0.18	2.70	0.02	0.93
Utilities	1.56	0.50	0.39	0.20	0.18	0.57	0.02	0.74
Average	1.32	2.74	0.32	0.66	0.73	2.61	0.09	0.81

The first to third data columns of this table report the variance components due to the beta effect, market premium effect, and the interaction effect, respectively. The three variance components are calculated as: $V(E(r_p)) = \{[E(r_{m0})]^2 V(\beta_{p0}) + [E(r_{m1})]^2 V(\beta_{p1})\} + \{[E(\beta_{p0})]^2 V(E(r_{m0})) + [E(\beta_{p1})]^2 V(E(r_{m1}))\} + \{V(\beta_{p0})V(E(r_{m0})) + V(\beta_{p1})V(E(r_{m1}))\}$. The last column reports the percentage of the premium effect in the total variance. The last row of the table reports the average of the three-variance components and the average percentage of the premium effect.

In terms of the relative importance between the three sources of uncertainty, we find that the variation associated with the market premium is the most important for the majority of Canadian and U.S. sectors. The beta effect is less important, and the interaction effect is the least important component. This is reflected by the fact that, on average, the premium effect accounts for 66% and 81% of the overall variance of the costs of equity for the Canadian and U.S. sectors, respectively. As explained earlier, this order of importance occurs because the implied variance of beta $V(\beta_p)$ is much smaller than the square of beta $[E(\beta_p)]^2$ for most sectors.

Although the dominant role of the market premium effect is the general rule, Table 5 also indicates that the beta effect plays an important role for at least a few low-beta sectors. For the U.S. Consumer Staples, the beta effect contributes 53%, i.e., 2.20/(2.20 + 1.74 + 0.27), to the total error variance. For the Canadian Consumer Staples and Utilities, the beta effect, respectively, explains 51% and 64% of the overall variances of their cost-of-equity estimates. The dominant beta component for Canadian Utilities is due to two effects: (1) small expected Utilities beta (i.e., 0.39 is the smallest among the 10 sectors, and even smaller at 0.26 if estimated with the full-period OLS regression); and (2) the large implied variance of the Utilities beta (i.e., 0.117 is the second largest among the 10 sectors), so that the square of the expected beta $[E(\beta_p)]^2$ is of the same magnitude as the implied beta variance $V(\beta_p)$. The important beta effect suggests that modeling beta dynamics is very important for the Canadian Utilities sector. To this end, He and Kryzanowski (2006) describe a new beta process that significantly improves the out-of-sample performance of beta predictions for the Canadian Utilities sector.

3.4. Annualized cost-of-equity estimates and standard errors: cross-market comparison

Table 6 summarizes the annualized cost-of-equity estimates, the three components of the standard errors, and the aggregate standard errors for each sector for the two countries. For each sector, the cost-of-equity estimate is the sum of the risk-free rate, domestic sector premium, and

Table 6
Annualized cost-of-equity estimates and standard errors

Sector	C.E. Est.	Beta S.E.	Prm. S.E.	Inter S.E.	Overall S.E.
Panel A: Canada					
Energy	8.67 (8.97 − 0.30)	0.67	1.36	0.34	1.55
Materials	9.71 (10.56 − 0.85)	1.51	2.18	0.69	2.73
Industrials	11.53 (10.81 + 0.71[a])	0.68	2.29	0.35	2.42
Cons. Disc.	10.60 (9.97 + 0.64[a])	0.61	1.87	0.28	1.98
Cons. Stpl.	9.46 (8.49 + 0.98[a])	1.39	1.15	0.70	1.94
Health	11.49 (9.92 + 1.57[a])	0.93	1.90	0.30	2.14
Financials	10.79 (10.17 + 0.62[a])	1.00	1.97	0.50	2.26
IT	15.31 (13.02 + 2.29[a])	2.99	3.48	1.48	4.82
Telecom	9.57 (9.25 + 0.33)	0.75	1.50	0.38	1.72
Utilities	8.30 (7.95 + 0.35)	1.48	0.85	0.75	1.86
Average—all betas	10.55 (9.91 + 0.63)	1.20	1.85	0.58	2.34
Average—sig. betas	10.59 (9.91 + 0.68)				
Panel B: U.S.					
Energy	9.03 (8.71 + 0.32[a])	0.00	1.24	0.00	1.24
Materials	10.92 (10.39 + 0.53)	0.46	1.85	0.27	1.92
Industrials	11.26 (11.08 + 0.18)	0.21	2.06	0.13	2.08
Cons. Disc.	11.31 (11.03 + 0.28)	0.00	2.07	0.00	2.07
Cons. Stpl.	9.36 (9.71 − 0.35[a])	1.78	1.58	0.62	2.46
Health	9.99 (10.35 − 0.36[a])	1.67	1.79	0.58	2.52
Financials	11.50 (11.70 − 0.20)	0.50	2.28	0.17	2.34
IT	13.75 (13.48 + 0.28)	1.88	2.90	0.65	3.52
Telecom	10.41 (10.79 − 0.38[a])	0.52	1.97	0.18	2.05
Utilities	7.68 (7.80 − 0.12)	0.51	0.91	0.18	1.05
Average—all betas	10.52 (10.50 + 0.02)	0.75	1.87	0.28	2.13
Average—sig. betas	10.43 (10.50 − 0.08)				

This table reports the annualized cost-of-equity (C.E.) estimates and standard errors (S.E.) due to the beta effect, premium effect, interaction effect, and the overall annualized standard error. All the numbers are in percentages. The annualized C.E. estimate is expressed as the sum of the domestic effect $r_f + E(\beta_{p0})\,E(r_{m0})$ and the foreign effect $E(\beta_{p1})\,E(r_{m1})$, as shown in the parentheses. The average C.E. estimates are reported with all the foreign betas, and for those with only significant foreign betas (those with the superscript a). The beta, premium, and interaction S.E. is calculated as the square root of the corresponding items in Table 5, annualized to a percentage. The overall S.E. is the square root of the sum of the beta, premium, and interaction S.E., annualized to a percentage.

foreign sector premium: $r_f + E(\beta_{p0})E(r_{m0}) + E(\beta_{p1})E(r_{m1})$, annualized to a percentage.[14] In the past 50 years, the average Canadian risk-free rate is 6.24%, and the average U.S. risk-free rate is 5.16%. The higher Canadian risk-free rate partially offsets the lower risk premium $E(r_{m0})$ of the Canadian market. In addition, due to the effect of any equity market integration, the U.S. market premium positively affects the expected returns of the Canadian sectors (0.63% on average), whereas the Canadian market premium has little impact on the expected returns of the U.S. sectors (−0.02% on average), though the cross-market risk premia for individual sectors exhibit some variability and are significant for some individual sectors. Each parenthesis in Table 6 shows the breakdown of the cost-of-equity estimate into the domestic effect $r_f + E(\beta_{p0})E(r_{m0})$ and the

[14] We recognize that including the foreign sector premium when its sector beta is not significantly different from zero is subject to debate and is the conservative choice. To address this issue, we report the average estimate of sector cost of equity with all the foreign betas, and with only those with significant foreign betas. The two sets of results are not materially different.

incremental foreign effect $E(\beta_{p1})E(r_{m1})$ for individual sectors and the average sector. As shown, the U.S. market effect on the Canadian sectors is much greater than the Canadian market effect on the U.S. sectors, both across individual sectors and on average. As a result, market integration makes the average cost-of-equity estimates very similar for the Canadian and U.S. sectors, i.e., the average Canadian sector cost of equity is 10.55%, as compared to 10.52% for the average U.S. sector. Our cost-of-equity estimates are largely consistent with those estimated by Hail and Leuz (2006), who report that the average cost of equity for Canada is 10.53% versus 10.24% for the U.S. over the period of 1992–2001.[15]

The overall uncertainty in the cost-of-equity estimates, as measured by the aggregate standard error in the last column, is smaller for the U.S. sectors: 2.34% for the average Canadian sector versus 2.13% for the average U.S. sector. This magnitude of uncertainty is lower than the 3% finding of Fama and French (1997) for a typical U.S. industry portfolio because our use of the 50-year long sample of market data significantly reduces the estimation error of the equity risk premia. Across individual sectors, the IT sector has the largest standard error of 4.82% (Canada) or 3.52% (U.S.), and all the other sectors have a standard error below three percent.

The second to fourth data columns in Table 6 present the economic breakdown of the three sources of uncertainty for each sector. The numbers indicate the annualized standard error for the corresponding effect, while holding the other two effects constant. For example, the beta effect of the Canadian Utilities sector means that, given a perfectly estimated market risk premium, the uncertainty in estimating the Utilities betas results in a one-standard-error interval of ±1.48% around the estimated equity cost of 8.30%. Consistent with the results in Table 5, the largest source of uncertainty comes from the market premium effect, which itself contributes to nearly a 2% standard error. Nevertheless, the beta effect is economically important for the IT, Consumer Staples and Health sectors in the U.S., and for the IT, Utilities, and Materials sectors in Canada.

Finally, we compare the relative composition of the three effects between the Canadian and U.S. sectors. For the Canadian sectors, while the premium effect is still the major source of estimation errors, its importance is not as strong as for its U.S. counterparts. Furthermore, the beta effect plays a relatively more important role, and the interaction effect is closer to the beta effect and typically much larger for the Canadian sectors. The main reason for the differences is due to both the lower S&P/TSX risk premium and the higher beta volatilities for the Canadian sectors. The last term of Eq. (4) suggests that the stronger interaction effects for the Canadian sectors are primarily driven by higher beta volatilities, given that the S&P/TSX and S&P 500 have similar standard errors. In addition, the stronger beta components for the Canadian sectors are a product of two offsetting effects, with the effect of larger implied beta variances dominating the effect of a lower S&P/TSX risk premium.

A comparison of the beta volatilities is visually demonstrated in Fig. 1. One explanation for the higher volatilities of the Canadian sector betas is that the Canadian sectors are less diversified than their U.S. counterparts, so the estimated betas may contain larger firm-specific errors. The direct supporting evidence for this explanation is the number of firms on average in a Canadian GICS sector of 22 (based on the 222 firms in the S&P/TSX Composite index as of 2005), compared to 50 firms in the S&P 500.

[15] This is the case even though Hail and Leuz restrict their sample to firms that have earnings forecast data in IBES and use a shorter time period. Hail and Leuz state their concern with measurement error contained in analyst forecast data. Furthermore, Chan, Karceski, and Lakonishok (2003), amongst others, find that IBES growth forecasts are overly optimistic and add little predictive power. If the upward bias in analyst forecasts differs across markets, this could make comparisons of equity costs across markets based on analyst forecasts less reliable.

4. Conclusion and implications

Using the two-stage CAPM approach, this paper provides cost-of-equity estimates and sources of uncertainty for 10 GICS sectors for Canada and the U.S. under the assumption of partial market integration. While the cross-sector average annual cost of equity is about the same in Canada (10.55%) as in the U.S. (10.52%), the overall uncertainty of these estimates is higher in Canada (2.34%) than in the U.S. (2.13%). At the individual sector level, the cost-of-equity estimates are the lowest for utilities (8.30% and 7.68%) and the highest for IT (15.31% and 13.75%) in Canada and the U.S. Generally speaking, the most important uncertainty component of the cost of equity estimates is the estimation error of the market risk premium, whereas the components due to the estimation error of betas and the interaction effect are relatively small. Yet this general rule does not apply to the Canadian Utilities sector for which the beta effect is the most important source of uncertainty. In comparison, the beta and interaction effects for the Canadian sectors play a relatively more important role than those effects for their U.S. counterparts. This is mainly attributable to the betas of the Canadian sectors being much more volatile than those for the corresponding U.S. sectors.

As a methodological contribution, we highlight the importance of relying on the relatively integrated North American market to estimate the cost of equity for the Canadian sectors. It is readily apparent from Table 6 that if markets are assumed to be segmented, then the domestic CAPM assigns lower sector risk premia to most sectors, so that the average cost of equity for the Canadian sectors would have been lower over this period of time. This problem reflects the perception that growth prospects are lower in Canada given lower actual and expected productivity growth, causing non-cross-listed Canadian firms to be valued at a discount relative to comparable U.S. firms.[16] This so-called value discount for many Canadian firms questions the reliability of relying on just the domestic CAPM to estimate the cost of equity for Canadian firms.[17] We provide a two-stage solution to this problem: first, use the domestic CAPM to obtain the cost of equity for Canadian sectors; and second, adjust the cost-of-equity estimate by the incremental effect due to the U.S. market. We find that this incremental U.S. effect contributes 63 basis points to the cost-of-equity estimate for the average Canadian sector over the studied period. The second implication of our comparative study suggests that the manager will have to bear large uncertainty in the cost-of-equity estimates, and that it is relatively more important to estimate beta dynamics for Canadian firms. To this end, He and Kryzanowski (2006) describe a better beta estimation procedure. In future research, we plan to examine the impact of other global factors on the cost of equity for Canadian firms.

Acknowledgments

Financial support from the Concordia University Research Chair in Finance, SSQRC_CIRPÉE, IFM2 and SSHRC (-CREF) is gratefully acknowledged. We would like to thank the managing editor (Pierre Siklos) and an anonymous referee of this journal for their many helpful comments. The usual disclaimer applies.

[16] King and Segal (2003) find that different corporate governance regulations between Canada and the U.S. explain the relative underperformance of Canadian firms over the 1990–2000 period.

[17] In a related study, Stulz (1995) argues that the cost of capital for firms in small countries should be estimated using the global CAPM rather than a local CAPM.

References

Ang, A., Hodrick, R. J., Xing, Y., & Zhang, X. (2006a). The cross-section of volatility and expected returns. *Journal of Finance*, *61*(1), 259–299.

Ang, A., Hodrick, R. J., Xing, Y., & Zhang, X. (2006b). High idiosyncratic volatility and low returns: International and further U.S. evidence. *Working Paper*, Columbia University, New York.

Booth, L. (2001). Equity risk premiums in the US and Canada. *Canadian Investment Review*, *14*(3), 34–43.

Bruner, R. F., Eades, K. M., Harris, R. S., & Higgins, R. C. (1998). Best practices in estimating the cost of capital: Survey and synthesis. *Financial Practice and Education*, *8*(1), 13–28.

Chan, L. K. C., Karceski, J., & Lakonishok, J. (2003). The level and persistence of growth rates. *The Journal of Finance*, *58*(2), 643–685.

Doukas, J., & Switzer, L. N. (2000). Common stock returns and international listing announcements: Conditional tests of the mild segmentation hypothesis. *Journal of Banking and Finance*, *24*, 471–502.

Faff, R., & Mittoo, U. (2003). Capital market integration and industrial structure: The case of Australia, Canada and the United States. *Journal of Economic Integration*, *18*(3), 433–465.

Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on bonds and stocks. *Journal of Financial Economics*, *33*, 3–56.

Fama, E. F., & French, K. R. (1997). Industry costs of equity. *Journal of Financial Economics*, *43*, 153–193.

Ferson, W., & Locke, W. E. (1998). Estimating the cost of capital through time: An analysis of the sources of error. *Management Science*, *44*, 485–500.

Foerster, S. R., & Karolyi, A. (1998). Multi-market trading and liquidity: A transaction data analysis of Canada–US interlistings. *Journal of International Financial Markets, Institutions and Money*, *8*, 393–412.

Foerster, S. R., & Karolyi, A. (1999). The effects of market segmentation and investor recognition on asset prices: Evidence from foreign stock listings in the US. *Journal of Finance*, *54*(3), 981–1013.

Graham, J. R., & Harvey, C. R. (2001). The theory and practice of corporate finance: Evidence from the field. *Journal of Financial Economics*, *60*, 187–243.

Hail, L., & Leuz, C. (2006). International differences in the cost of equity capital: Do legal institutions and securities regulation matter? *Journal of Accounting Research*, *44*, 485–531.

He, Z., & Kryzanowski, L. (2006). Dynamic betas for Canadian sector portfolios. *Working Paper*, Brock University and Concordia University, Canada.

Jorion, P., & Schwartz, E. (1986). Integration vs. segmentation in the Canadian stock market. *Journal of Finance*, *41*, 603–614.

King, M. R., & Segal, D. (2003). Corporate governance, international cross listing and home bias. *Canadian Investment Review*, *16*(4), 8–18.

Koedijk, K. G., Kool, C., Schotman, P. C., & Dijk, M. A. (2002). The cost of capital in international financial markets: Local or global? *Journal of International Money and Finance*, *21*, 905–929.

Koutoulas, G., & Kryzanowski, L. (1994). Integration or segmentation of the Canadian stock market: Evidence based on the APT. *Canadian Journal of Economics*, *27*(2), 329–351.

Kryzanowski, L., & Rubalcava, A. (2004). Valuation effects of domestic and international seasoned equity offerings by Canadian cross-listed firms. *Journal of Multinational Financial Management*, *14*, 171–186.

Kryzanowski, L., & To, M. C. (1984). The telescopic effect of past return realizations on ex-post beta estimates. *Financial Review*, *19*, 1–25.

Mishra, D. R., & O'Brien, T. J. (2005). Risk and ex ante cost of equity estimates of emerging market firms. *Emerging Markets Review*, *6*(2), 107–120.

Mittoo, U. R. (1992). Additional evidence on integration in the Canadian stock market. *Journal of Finance*, *47*, 2035–2054.

Mittoo, U. R. (2003). Globalization and the value of U.S. listings: Revisiting Canadian evidence. *Journal of Banking and Finance*, *27*(9), 1629–1661.

Pastor, L., & Stambaugh, R. F. (1999). Costs of equity capital and model mispricing. *Journal of Finance*, 64–121.

Ritter, Jay R. (2002). The biggest mistakes we teach. *The Journal of Financial Research*, *25*(2 (Summer)), 159–168.

Stulz, R. M. (1995). The cost of capital in internationally integrated markets: The case of Nestle. *European Financial Management*, *1*, 11–22.

OPG INTERROGATORY #19 TO POLLUTION PROBE

Ref: Page 66

Preamble:

Drs. Kryzanowski and Roberts state that it is preferable to use real returns to estimate the MERP when using historical data and that MERP estimates that include high inflation periods include an extra risk premium that grows with the rate of inflation to compensate investors for a loss in the purchasing power of the risk premium.

Interrogatory:

a) Since the MERP reflects the differential between stock and bond returns, does the preference to use real returns refer to both stock and bond returns? Please explain.

b) Does the extra risk premium that grows with the rate of inflation to compensate investors for a loss in purchasing power grow equally for stocks and bonds? Please provide support for the response.

c) If Drs. Kryzanowski and Roberts are claiming that it is the MERP, rather than the required returns on stocks and bonds, that grows with the rate of inflation, please explain why that would be the case, and provide all evidence in support of that claim.

Response:

a) – c) It applies to both stocks and bonds, but the impact on the expected inflation premium will differ due to various frictions such as differential taxes. There are also other rationales that favor real over nominal returns. For example, based on data for returns on stocks, bonds and bills in the U.S. over about two centuries, Siegel (1998) has argued that real returns on stocks, both in absolute terms and relative to competing assets, exhibit greater stability.[5]

[5] J.J. Siegel, J. J., *Stocks for the long run* (McGraw-Hill, 2nd edition, 1998).

OPG INTERROGATORY #20 TO POLLUTION PROBE

Ref: Footnote 75

Preamble:

Drs. Kryzanowski and Roberts reference an article of which Dr. Kryzanowski is a co-author.

Interrogatory:

Please provide a copy of the article.

Response:

A copy of the requested article is attached as Attachment 1 to this Schedule.

Available online at www.sciencedirect.com

ScienceDirect

ELSEVIER

International Review of Financial Analysis xx (2007) xxx–xxx

IRFA
INTERNATIONAL REVIEW OF
Financial Analysis

Dynamic betas for Canadian sector portfolios ☆

Zhongzhi (Lawrence) He [a,*], Lawrence Kryzanowski [b,1]

[a] *Faculty of Business, Brock University, 500 Glenridge Ave., St. Catharines, ON, Canada L2S 3A1*
[b] *GM300-77, John Molson School of Business, Concordia University, 1455 De Maisonneuve Blvd. West, Montreal, QC, Canada H3G 1M8*

Received 28 September 2006; received in revised form 19 July 2007; accepted 9 August 2007

Abstract

The dynamic betas for ten Canadian sector portfolios using the Kalman filter approach are estimated herein and are found to be best described by a mix of the random walk (trend) and mean-reverting (cycle) processes. The relative importance of the trend and cycle components of sector betas is related to different sensitivities of the corresponding sectors to business cycles. Dynamic betas significantly increase the explanatory power of the market model, and particularly for the utilities sector. A dynamic hedging strategy using the one-step-ahead beta forecasts as the hedge ratios produces smaller hedging errors for every sector compared with the hedge ratios calculated from the alternative beta specifications.

JEL classification: G100; G120; C110
Keywords: Dynamic betas; Sector portfolios; Kalman filter; Market model performance

1. Introduction

The market beta of a given asset is a widely used measure to determine the systematic risk of the asset, to calculate the cost of equity, and to evaluate the performance of managed investment funds. Early studies such as Sunder (1980), Kryzanowski and To (1984), Rahman, Kryzanowski, and Sim (1987) and others find considerable evidence that asset betas are unstable over time. To accommodate time-variation in betas, the literature has proposed a variety of approaches including the rolling regressions of Fama and MacBeth (1973), the GARCH-type conditional

☆ Financial support from the Concordia University Research Chair in Finance, SSHRC, SSQRC_CIRPÉE and IFM2 is gratefully acknowledged.
* Corresponding author. Tel.: +1 905 688 5550x4540; fax: +1 905 688 9779.
E-mail addresses: lhe@brocku.ca (Z.(L.) He), lawrence.kryzanowski@concordia.ca (L. Kryzanowski).
[1] Tel.: +1 514 848 2424x2782.

1057-5219/$ - see front matter © 2007 Elsevier Inc. All rights reserved.
doi:10.1016/j.irfa.2007.08.001

Please cite this article as: He, Z. (L.), & Kryzanowski, L., Dynamic betas for Canadian sector portfolios, *International Review of Financial Analysis* (2007), doi:10.1016/j.irfa.2007.08.001

betas of Schwert and Seguin (1990), and the Kalman filter applied by Wells (1994) and others. Among these various approaches, recent literature finds overwhelming evidence that the Kalman filter is the best approach to capture beta dynamics.[2]

In this paper, we estimate the dynamic betas for ten Canadian sector portfolios using the Kalman filter approach. We make two contributions to the existing literature. First, previous studies have estimated beta dynamics for the U.S. (e.g., Jostova & Philipov, 2005), Australian (e.g., Faff, Hillier, & Hillier, 2000), and many European (e.g., Mergner & Bulla, 2005) stock markets. Compared to the U.S. and European markets where the various economic sectors are well represented, the Canadian market has a much larger proportional representation of resource and financial firms.[3] To our knowledge, similar work of estimating beta dynamics for the Canadian stock market is still missing, and this paper attempts to fill this void using the unique Canadian sample. Furthermore, given the proliferation of sector mutual funds in the Canadian stock market, our focus on the betas of sector portfolios is of particular interest to individual and institutional investors who practice passive and active sector-based investing. Since the risk characteristics of sector funds exhibit very different time-varying behaviors (as our results show), estimating the beta dynamics for each sector is crucial for fund managers to make asset allocations, to implement active management strategies (such as sector rotations), to evaluate portfolio performance, and to alter or hedge the market risk of sector investments. To illustrate the merits of estimating the beta dynamics, we describe a practical application of dynamic betas to hedge the market risk of a sector portfolio.

Second and more important, although the existing literature generally favors the Kalman filter approach, little agreement exists on what type of stochastic process is the most appropriate for the beta of a given portfolio. Specifically, while Adrian and Franzoni (2005) and Jostova and Philipov (2005) support a stationary mean-reverting process of asset betas, other studies such as Fama and French (1997) and Mergner and Bulla (2005) find that the betas of (at least) some industry portfolios follow a non-stationary random walk. As Fama and French (1997) clearly suggest, the supply and demand conditions of a particular industry group may be subject to permanent shocks, such as changes in monetary or regulatory policies, new information or production technology, or changes in consumer tastes, which permanently shift the risk characteristics of the sector over the long run.

In this paper, we do not take a stand on whether the beta of a sector portfolio should be considered as a random walk or a mean-reverting process. Instead, we consider a more general process in which the beta is modeled as a combination of a trend (random walk) and a cyclical (mean-reverting) component. In other words, the beta process is allowed to revert to a stochastic trend that is itself varying over time. By decomposing the beta process into a trend and a cycle, our dynamic beta model embraces the existing beta models as special cases, so that the empirical estimates of model parameters will determine what mixture of the trend and cycle is more appropriate for the beta of a particular portfolio. Furthermore, the relative importance of the trend and cycle components can be empirically examined by their respective contributions to the time-variation of sector betas.

We estimate the dynamic beta model using the Kalman filter and extract the trend and cycle components, which are combined to form the time series of sector betas. We provide strong evidence of time-variation of sector betas for the time period of 1991 to 2004. To assess the relative importance of the two components, we calculate the trend-to-cycle ratios. Based on these ratios, the sector betas

[2] A partial list of the studies that support the Kalman filter approach (or more generally, the Bayesian learning model) include: Adrian and Franzoni (2005), Jostova and Philipov (2005) for U.S. stocks and portfolios; Brooks, Faff, and Mckenzie (1998) and Faff et al. (2000) for Australian industry portfolios; and Mergner and Bulla (2005) for the Pan-European industry portfolios.

[3] At the end of 2004, the Energy, Materials, and Financials sectors, respectively, represent 20%, 18% and 32% of the S&P/TSX index, whereas the Health sector represents less than 5% of the index.

Please cite this article as: He, Z. (L.), & Kryzanowski, L., Dynamic betas for Canadian sector portfolios, *International Review of Financial Analysis* (2007), doi:10.1016/j.irfa.2007.08.001

are classified into two broad categories: 1) those primarily driven by cycles; and 2) those primarily driven by trends. We find that the sectors in the first category are typical cyclical sectors (e.g., Consumer Discretionary, Industrials), and those in the second category are typical non-cyclical sectors (e.g., Consumer Staples, Utilities). This finding suggests that the risk characteristics of sector portfolios are closely related to different sensitivities of the corresponding sectors to business cycles.

We calculate both in-sample *R*-square values and out-of-sample hedging errors to evaluate the performance of different beta specifications. For both the in-sample and out-of-sample measures, the beta process specified as a mix of the trend (random walk) and cycle (mean reverting) components, namely the RWMR, significantly outperforms constant or rolling betas. Furthermore, the RWMR performs at least as well as the random walk (RW) or the mean reversion (MR) specification for each sector. These results support the RWMR as the best beta model for the Canadian sector portfolios overall, and in particular for the Utilities sector that has the most significant increase in *R*-square and the largest decrease in hedging errors.

The rest of the paper is organized as follows. Section 2 describes the data for ten Canadian sector portfolios. Section 3 introduces the specification of the dynamic beta model, with the focus on the trend and cycle components in the beta process. Section 4 discusses the time-series behaviors, and the classification of sector betas. Section 5 compares the in-sample *R*-square values and the out-of-sample hedging errors for various beta specifications. In Section 6, we conclude the paper and discuss some practical implications of our model and findings.

2. Data

We obtain monthly closing values (including distributions) for ten S&P/TSX sector indices from the 2004 Canadian Financial Markets Research Center (CFMRC) monthly index file. Monthly data for S&P/TSX sectors begin on Dec. 1987 for the ten economic sectors based on the Global Industry Classification Standard (GICS).[4] Continuously compounded returns are calculated by first taking the log differences of index values between two consecutive months, and then subtracting the 30-day return on Canadian T-bills to calculate excess returns on each sector. The market index is taken as the S&P/TSX Composite index value and excess returns are calculated in a similar way.[5] The whole sample covers the 204 monthly observations from 1988:01 to 2004:12. Table 1 reports the ten economic sectors, their corresponding industry groups, and the mean, standard deviation, minimum, 25% percentile, median, 75% percentile, and maximum values of excess returns for each sector over the studied period. The Financials sector is the top performer with an average monthly excess return of 0.70%, followed by Consumer Staples (0.67%). In terms of risk, the IT sector has a much higher volatility than the other sectors, whereas the Utilities sector has the lowest volatility.

3. Dynamic beta model

The decomposition of the sector beta into trend and cyclical components is motivated by the broad GICS classification into cyclical and non-cyclical sectors. In general, the productions of cyclical sectors such as the Consumer Discretionary (e.g., automobiles, leisure) and Industrials (e.g., transportation) are highly sensitive to the business cycles. So we expect the betas of these sectors to

[4] The GICS was jointly developed by Morgan Stanley Capital International (MSCI) and Standard & Poor's (S&P). Their classification has been widely used in sector-based investing. See http://www.msci.com/equity/gics.html for details.

[5] We also use the excess returns on the CFMRC value-weighted index as a proxy for the market portfolio. Empirical results are very similar, given that the returns on the S&P/TSX index and those on the CFMRC index have a correlation of 0.97.

Please cite this article as: He, Z. (L.), & Kryzanowski, L., Dynamic betas for Canadian sector portfolios, *International Review of Financial Analysis* (2007), doi:10.1016/j.irfa.2007.08.001

Filed: 2008-05-09, EB-2007-0905, Exhibit M, Tab 12.0, Schedule 20, Attachment 1, Page 3 of 13

Table 1
Sector classifications and summary statistics (1988:01–2004:12)

GICS sector	Industry groups	$\overline{r}_p$	$\sigma(r_p)$	Min	25%	Median	75%	Max
Energy	Energy	0.37	5.86	−24.2	−2.89	0.37	3.53	20.5
Materials	Materials	−0.13	6.03	−25.3	−3.75	−0.33	4.54	20.4
Industrials	Capital goods, commercial services and supplies, transportation	−0.04	5.53	−23.0	−3.11	−0.18	3.85	14.9
Consumer discretionary	Automobiles and components, consumer services, consumer durables and apparel, media, retailing	0.16	4.46	−15.9	−2.51	−0.02	2.89	11.2
Consumer staples	Food and staples retailing, food, beverage and tobacco, household and personal products	0.67	3.73	−13.6	−1.80	0.99	3.20	8.4
Health care	Health care equipment and services, pharmaceuticals and biotechnology	0.00	7.99	−32.0	−4.64	0.03	5.40	23.5
Financials	Banks, diversified financials, insurance, real estate	0.70	4.87	−31.3	−1.68	1.01	3.55	13.6
IT	Software and services, technology hardware and equipment, semiconductors and semiconductor equipment	0.17	11.89	−63.1	−4.70	0.48	6.95	40.5
Telecom	Telecommunication services	0.61	5.38	−18.4	−2.06	0.58	3.25	24.6
Utilities	Utilities	0.34	3.72	−11.0	−1.98	0.32	2.57	10.3

This table reports ten economic sectors according to the global industry classification standard (GICS), the corresponding industry groups, the means, standard deviations, minimum, 25% percentile, median, 75% percentile, and maximum values of excess returns for each sector. The sector data are taken from the Canadian Financial Markets Research Center (CFMRC) sector indices, and the sample period is from 1988:01 to 2004:12.

be primarily driven by the cyclical component. On the other hand, typical non-cyclical sectors, such as the Consumer Staples (e.g., food, tobacco products) and Utilities, are largely independent of the business cycles, so the trend is expected to be the major component of the betas of these relatively insensitive sectors. The dynamic beta model developed herein captures both components, and it allows us to empirically examine the relative importance of the two components for each sector.

Let $r_{p,t}$ and $r_{m,t}$ be the excess returns on sector portfolio p and market portfolio m. For each portfolio p, the dynamic beta model is given by the following equations:

$$r_{p,t} = \beta_{p,t} r_{m,t} + \varepsilon_{p,t} \tag{1}$$

$$\beta_{p,t} = B_{p,t} + C_{p,t} \tag{2}$$

$$B_{p,t} = B_{p,t-1} + w_{p,t} \tag{3}$$

$$C_{p,t} = \phi_p C_{p,t-1} + v_{p,t} \tag{4}$$

where
$\varepsilon_{p,t} \sim N(0, \sigma^2_{\varepsilon_p})$ is the idiosyncratic return on portfolio p;
$w_{p,t} \sim N(0, \sigma^2_{w_p})$ is the error term of the random walk process;
$v_{p,t} \sim N(0, \sigma^2_{v_p})$ is the error term of the AR(1) process; and
$\varepsilon_{p,t}$, $w_{p,t}$ and $v_{p,t}$ are uncorrelated to each other at all leads and lags.

Eq. (1) is the standard market model with a time-varying beta $\beta_{p,t}$ whose dynamics are specified by Eq. (2), which provides a decomposition of $\beta_{p,t}$ into two additive components, trend $B_{p,t}$ and cycle $C_{p,t}$. The trend (permanent) component is modeled as a random walk as in Eq. (3). Eq. (4) specifies the cycle (transitory) component as an AR(1) process in a demeaned form. Thus, $\beta_{p,t}$ is assumed to revert to its time-varying mean $B_{p,t}$, and the speed of this mean-reversion is given by the persistence parameter ϕ_p.

Please cite this article as: He, Z. (L.), & Kryzanowski, L., Dynamic betas for Canadian sector portfolios, *International Review of Financial Analysis* (2007), doi:10.1016/j.irfa.2007.08.001

The dynamic beta model encompasses a wide range of beta processes in the literature.[6] With $\sigma^2_{w_p}=0$, our model reduces to the smooth mean-reverting process of Adrian and Franzoni (2005) or the constant mean-reverting process of Jostova and Philipov (2005).[7] If the mean-reverting process is also non-persistent ($\phi_p=0$), then our model becomes the random coefficient model proposed by Fabozzi and Francis (1978) and others. On the other hand, if the transitory variation around the mean does not exist ($\sigma^2_{v_p}=0$), then the model reduces to the random walk process proposed by numerous studies such as Engle and Watson (1987).[8] Finally, if both $\sigma^2_{w_p}$ and $\sigma^2_{v_p}$ are zero, then Eq. (1) reduces to the standard market model whose constant beta can be estimated by OLS. Thus, given the general model specification, the relative importance between the trend and cyclical components for the beta of a given sector portfolio can be empirically assessed by their respective contribution to the time-variation of the betas.

The dynamic beta model is estimated using the Kalman filter where the trend and cycle are treated as unobserved latent variables whose values are taken as the contemporaneous conditional expectations at each time t, i.e., $B_{p,t|t}$ and $C_{p,t|t}$.[9] The key feature about the Kalman filter is that it gives us insight into how a rational agent would revise his estimates of the trends and cycles in a Bayesian type of learning fashion when new information becomes available. The appendix gives the details on the Kalman filter.

4. The dynamic behaviors of the sector betas

The parameter estimates of the dynamic beta model are reported in the first four columns of Table 2. These parameter estimates are used to extract the real-time conditional expectations of the trend component ($B_{p,t|t}$) and the cycle component ($C_{p,t|t}$), which are combined to form the dynamic betas for each sector, i.e., $\beta_{p,t|t}=B_{p,t|t}+C_{p,t|t}$. To assess the relative importance between the two components for each sector, we report, in the last two columns of Table 2, the standard deviations of $B_{p,t|t}$ and $C_{p,t|t}$ where $t=1991{:}01–2004{:}12$.[10] We then calculate the trend-to-cycle ratio $B/C=\sigma(B_{p,t|t})/\sigma(B_{p,t|t})$ to measure the relative importance of the two components, using $B/C=1$ as the benchmark for equal importance. The time series of $\beta_{p,t|t}$ (the dashed line) and $B_{p,t|t}$ (the solid line) for each sector from 1991:01 to 2004:12 are depicted in Fig. 1 in ascending order of the B/C ratios.[11]

In Fig. 1, we find strong time-variation of sector betas. For example, the Industrials betas range from 0.12 to 2.19, and the IT betas range from 0.55 to 3.55 during the past 14 years. The Utilities betas are mostly negative from 1999 to 2003, suggesting that the sector negatively co-varies with (i.e.,

[6] The dynamic beta model is in the spirit of Wells' (1994) moving mean beta model where the beta is assumed to revert to a time-varying mean that is also driven by a random walk. Moreover, our model is formulated as a structural time-series model proposed by Harvey (1989). According to Harvey (1989), the structural form provides a natural interpretation of the two beta components as the trend and the cycle.

[7] Given $\sigma^2_{w_p}=0$, whether the beta reverts to a smooth mean or constant mean depends on the prior belief of beta uncertainty, i.e., Var($B_{1|0}$). Adrian and Franzoni (2005) assume a large number for Var($B_{1|0}$), so $B_{t|t}$ is time-varying but very smooth in their model; whereas Jostova and Philipov (2005) assume that Var($B_{1|0}$)=0, so $B_{t|t}$ is a constant in their model. For the purpose of this study, we adopt the smooth mean-reverting process. This can be seen from Fig. 1, where the trends vary smoothly for those sectors with $\sigma^2_{w_p}=0$ (i.e., Energy, Financials, Consumer Discretionary, Health).

[8] With $\sigma^2_{v_p}=0$ and the prior $C_{1|0}=0$ (see the appendix), the cycle component plays no role in the beta process.

[9] The use of Gauss routines described in Kim and Nelson (1999) is gratefully acknowledged.

[10] The Kalman filter generates some outliers in the initial stage of data extraction. Thus, the first three years of data are excluded in the analysis and graphs.

[11] As a robustness check, we also perform the same analysis for the first-half of the studied time period (1988:01–1996:06) and for the second-half of the studied time period (1996:07–2004:12), and obtain qualitatively similar results.

Table 2
Parameter estimates of the dynamic beta model and volatilities of the trend and the cycle

Sector	Parameter values				Vol. of $B_{t\|t}$ and $C_{t\|t}$	
	$\sigma^2_{\varepsilon_p}$	$\sigma^2_{w_p}(\times 100)$	$\sigma^2_{v_p}$	ϕ_p	$\sigma(B_{p,t\|t})$	$\sigma(C_{p,t\|t})$
Energy	23.93	0.00	0.11	0.68	0.09	0.19
Materials	16.67	0.77	0.11	0.51	0.38	0.13
Industrials	9.17	0.03	0.12	0.68	0.12	0.26
Cons. Disc.	7.13	0.00	0.02	0.91	0.07	0.12
Cons. Stpl.	7.22	0.93	0.04	0.47	0.36	0.07
Health	48.90	0.00	0.00	0.91	0.11	0.03
Financials	7.90	0.00	0.02	0.95	0.09	0.24
IT	56.97	1.35	0.17	0.52	0.83	0.12
Telecom	12.96	0.10	0.18	0.67	0.20	0.31
Utilities	7.07	0.64	0.12	0.38	0.37	0.16

The four columns under Parameter Values report the maximum-likelihood estimates of parameters for the dynamic beta model as in Eqs. (1)–(4). The Kalman filter, as described in the appendix, is used to estimate the model parameters for the sample for the time period of 1988:01 to 2004:12. The last two columns report the volatilities (standard deviations) of the real-time conditional expectations of the trend ($B_{p,t|t}$) and the cycle ($C_{p,t|t}$) extracted from the Kalman filter for the time period of 1991:01 to 2004:12.

hedges against) the market index during that period. More important, the *B*/*C* ratios in each graph clearly suggest that we can classify the dynamics of sector betas into the following two categories.

4.1. Financials, energy, industrials, consumer discretionary and telecom sectors (B/C<1)

For these sector betas, the cyclical components ($C_{p,t|t}$) are more important than the trend components ($B_{p,t|t}$), with the *B*/*C* ratios ranging from 0.36 (Financials) to 0.63 (Telecom). This is best visualized by the fact that $\beta_{p,t}$ (the dashed lines) wander widely around their relatively stable means $B_{p,t}$ (the solid lines). The results are intuitive. By the GICS definition, the Consumer Discretionary sector encompasses those industries (e.g., automobiles, leisure) that tend to be the most sensitive to the business cycles. Major industrial groups in the Industrials and Energy sectors (e.g., transportation, fuel production) are also cyclical in nature. In addition, the Financials sector is the most sensitive to interest rate movements that are generally thought to follow a highly persistent mean-reverting process. This is reflected in the result that the Financials beta has the highest persistency parameter of 0.95 among all the ten sectors.

4.2. Utilities, materials, health, consumer staples, and IT sectors (B/C>1)

For these sector betas, the *B*/*C* ratios range from 2.37 (Utilities) to 7.09 (IT). This is best visualized by the fact that the movement of $B_{p,t|t}$ essentially drives the time-variation of $\beta_{p,t|t}$. It is intuitive that transitory shocks have only minor effects on the betas of these sectors. For example, by the GICS definition, the Consumer Staples sector contains those industries (e.g., food) that are the least sensitive to business cycles. The supply and demand conditions of the other four sectors are largely non-cyclical by nature. The IT sector beta exhibits the strongest trending effect, which increases (almost) monotonically during the whole time period, with the fastest rate of increase occurring at the turn of the millennium. The trend essentially reflects the effect of the permanent technology shocks on the risk characteristics of the IT sector.

In summary, we show that our dynamic beta model is able to accommodate various beta processes, and that the beta dynamics for the Canadian sector portfolios are described by a mix of the trend and cycle components. Our findings of the relative importance of the two components for each sector are generally consistent with the broad GICS classification of cyclical sectors and non-cyclical sectors. This implies that the risk characteristics of sector portfolios are closely related to different sensitivities of the corresponding sectors to business cycles.

5. Model performance

In this section, we evaluate the relative performance for four different beta processes within the dynamic beta framework of Section 3. The most general process is the full specification of

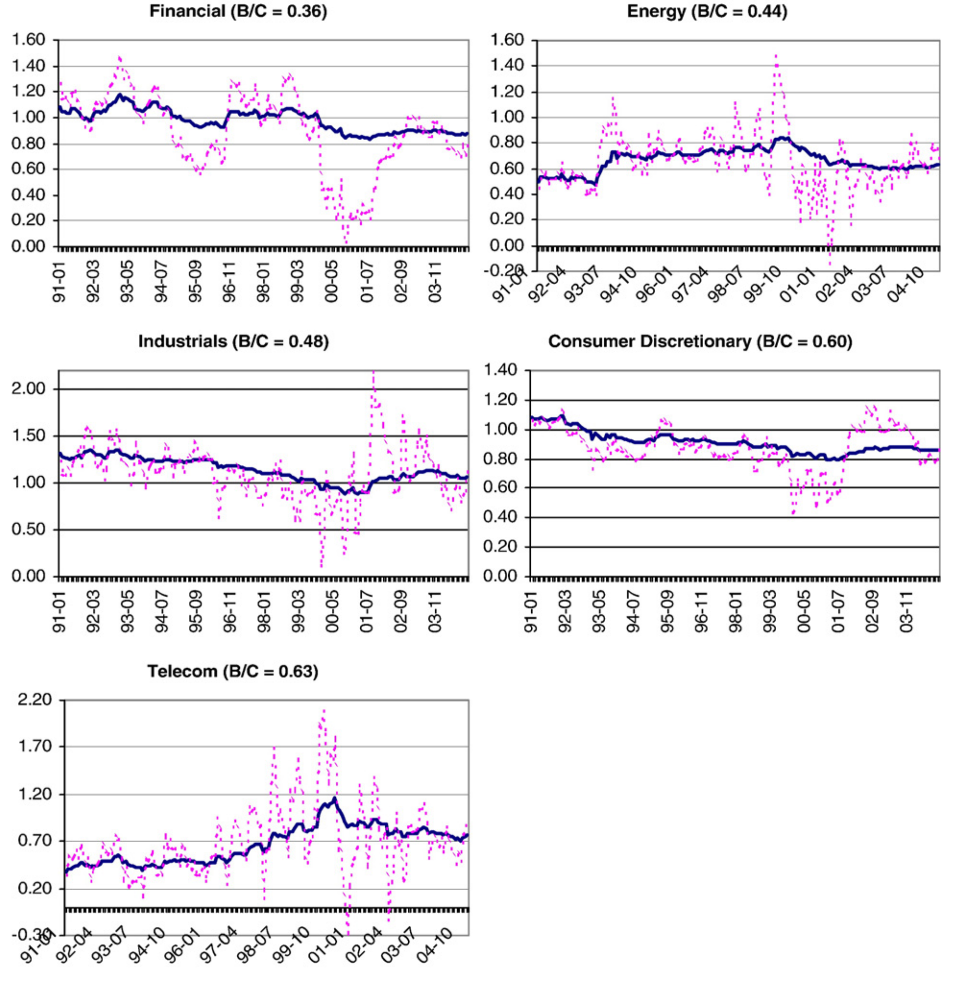


Fig. 1. Trends and betas for the Canadian sector portfolios (1991:01–2004:12). Each figure plots the trend $B_{p,t|t}$ (solid line) and the beta $\beta_{p,t|t}=B_{p,t|t}+C_{p,t|t}$ (dashed line) for each sector. $B_{p,t|t}$ and $\beta_{p,t|t}$ are the real-time conditional expectations of $B_{p,t}$ and $\beta_{p,t}$ and are extracted from the Kalman filter for the dynamic beta model as in Eqs. (1)–(4). The appendix gives details on the Kalman filter. In each graph, B/C is the trend-to-cycle ratio, defined as the standard deviation of the trend component to the standard deviation of the cycle component, i.e., $B/C=\sigma(B_{p,t|t})/\sigma(C_{p,t|t})$, where t=1991:01 to 2004:12. The values of $\sigma(B_{p,t|t})$ and $\sigma(C_{p,t|t})$ for each sector are reported in Table 2. The graphs are depicted in ascending order of the B/C ratios.

Please cite this article as: He, Z. (L.), & Kryzanowski, L., Dynamic betas for Canadian sector portfolios, *International Review of Financial Analysis* (2007), doi:10.1016/j.irfa.2007.08.001

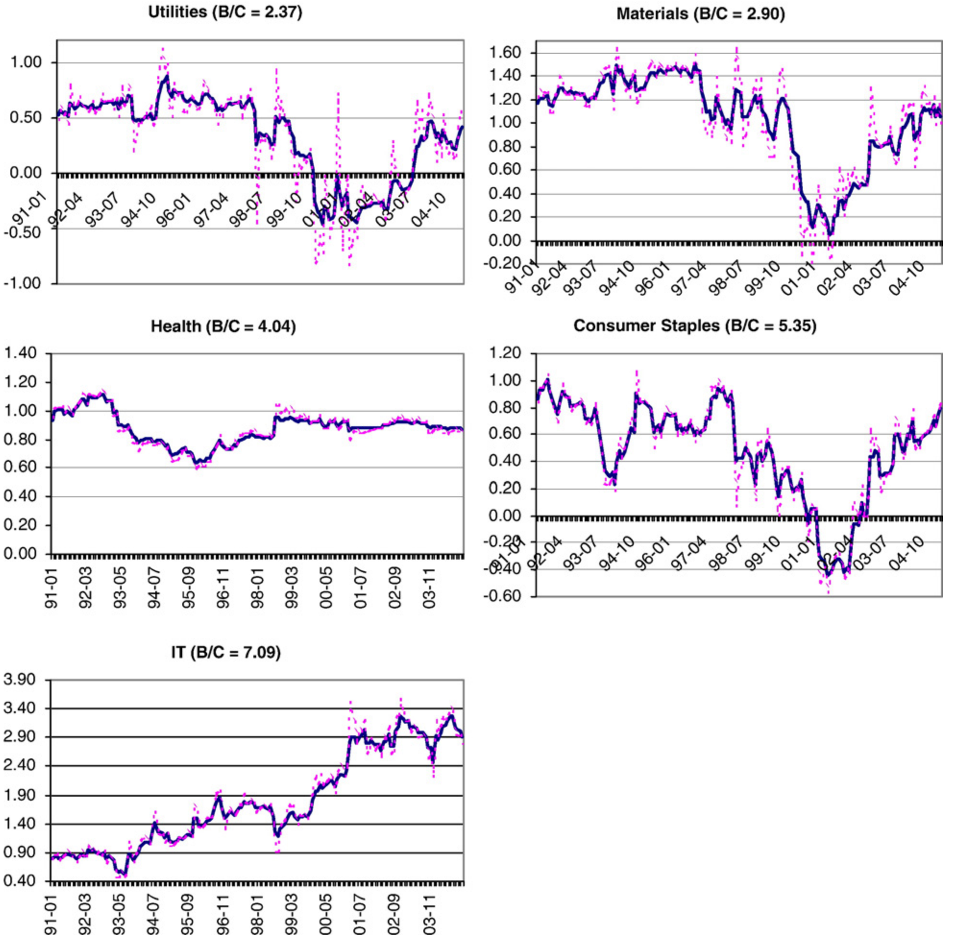


Fig. 1 (*continued*).

Eqs. (1)–(4), which is termed as the RWMR (random walk plus mean reversion) betas. With the diffuse priors given by the appendix, the RWMR reduces to the RW (random walk) betas by setting $\sigma^2_{v_p}=0$, to the MR (mean reversion) betas by setting $\sigma^2_{w_p}=0$, and to the OLS betas by setting both $\sigma^2_{v_p}$ and $\sigma^2_{w_p}$ to zeros.

5.1. In-sample R-squares

The first measure of model performance is the proportional variance explained by the market model (i.e., *R*-square) whose value is calculated as $R^2=1-\sigma^2_{\varepsilon_p}/\sigma^2_p$, where σ_p is the standard deviation of excess returns in Table 1, and σ_{ε_p} is the idiosyncratic standard deviation of excess returns (Table 2 reports $\sigma^2_{\varepsilon_p}$ for the RWMR betas). The four sets of *R*-square values for each sector are presented in Table 3 for both the full time period and the half sub-periods.

First, the *R*-square values increase significantly for any version of the dynamic beta models, as compared to the constant OLS model. This highlights the importance of modeling time-varying betas instead of assuming constant betas. Dynamic betas are especially important for the Utilities

Please cite this article as: He, Z. (L.), & Kryzanowski, L., Dynamic betas for Canadian sector portfolios, *International Review of Financial Analysis* (2007), doi:10.1016/j.irfa.2007.08.001

Table 3
Proportional variances explained by the beta models (*R*-squares)

Sector	1988:01–2004:12			
	OLS	RW	MR	RWMR
Energy	0.18	0.25	0.30	0.30
Materials	0.38	0.50	0.51	0.54
Industrials	0.57	0.65	0.70	0.70
Cons. Disc.	0.59	0.63	0.64	0.64
Cons. Stpl.	0.17	0.44	0.46	0.48
Health	0.23	0.23	0.23	0.23
Financials	0.52	0.66	0.67	0.67
IT	0.47	0.58	0.58	0.60
Telecom	0.35	0.49	0.55	0.55
Utilities	0.07	0.41	0.41	0.49
Avg.	0.35	0.48	0.51	0.52

	1988:01–1996:06				1996:07–2004:12			
	OLS	RW	MR	RWMR	OLS	RW	MR	RWMR
Energy	0.25	0.25	0.26	0.26	0.15	0.24	0.25	0.25
Materials	0.67	0.68	0.68	0.71	0.27	0.39	0.40	0.41
Industrials	0.69	0.69	0.69	0.69	0.52	0.64	0.67	0.68
Cons. Disc.	0.63	0.64	0.66	0.66	0.58	0.62	0.62	0.63
Cons. Stpl.	0.52	0.55	0.59	0.59	0.29	0.31	0.31	0.31
Health	0.10	0.12	0.12	0.12	0.30	0.30	0.35	0.36
Financials	0.64	0.68	0.68	0.68	0.45	0.65	0.65	0.65
IT	0.27	0.31	0.44	0.45	0.54	0.62	0.62	0.63
Telecom	0.32	0.32	0.37	0.37	0.37	0.49	0.53	0.54
Utilities	0.54	0.58	0.62	0.64	0.25	0.27	0.29	0.31
Avg.	0.46	0.48	0.51	0.52	0.37	0.45	0.47	0.48

This table reports the *R*-square values for four beta processes. For the OLS, the *R*-squares are obtained from the standard OLS regressions. For the RW, the dynamic beta model has only the trend component, i.e., no Eq. (4). For the MR, the dynamic beta model has only the cycle component, i.e., no Eq. (3). For the RWMR, the dynamic beta model has the full specification as in Eqs. (1)–(4). The *R*-square values are calculated as $1-\sigma_\varepsilon^2/\sigma_p^2$, where σ_p is the standard deviation of sector *p*'s excess returns, and σ_ε is the idiosyncratic standard deviation. The results are reported for the full studied time period (1988:01–2004:12), the first-half studied time period (1988:01–1996:06), and the second-half studied time period (1996:07–2004:12).

sector whose *R*-square value is only 7% with constant betas, but increases to nearly 50% with the RWMR betas for the full time period, suggesting that the time-variation in betas is the most important source of variation in the market model for this sector.

Second, the *R*-square values are quantitatively close to each other for the three versions of beta processes, which demonstrate a consistent pattern. For the full time period, the RWMR betas perform at least as well as the MR betas, which in turn outperform the RW betas for every sector. Specifically, the RWMR betas outperform the MR betas for the Energy, Consumer Staples, IT, and (especially) Utilities sectors, all of which have predominant trend components (i.e., trend-to-cycle ratios *B*/*C* greater than one), suggesting that the mix of RW and MR provides a better model fit than either MR or RW process alone. Finally, all the four beta processes produce similarly low *R*-squares for the Health sector. This is not surprising because with $\sigma_{w_p}^2=0$ and $\sigma_{v_p}^2=0$ (Table 2), the RWMR reduces to a constant beta for the Health sector. The results for the half sub-periods are generally consistent with those for the full time period.

5.2. Out-of-sample dynamic hedging strategies

For the second method of model evaluation, we compare the out-of-sample pricing errors for the four beta processes. This method can be motivated by a practical application of dynamic hedging strategies where a portfolio manager hedges the time-varying market risk of a sector fund using dynamic betas. Specifically, for each dollar invested in fund p at time t, the fund manager hedges the market risk by short selling $\beta_{p,t+1|t}$ units of the market portfolio, where

$$\beta_{p,t+1|t} \equiv E_t[\beta_{p,t+1}] = B_{p,t} + \phi_p C_{p,t} \tag{5}$$

is the optimal one-period-ahead forecast of the fund's beta, as implied from Eq. (2). The composition of the next-period's beta forecast is very intuitive. It is the sum of the current trend ($B_{p,t}$) plus the current deviation from the trend ($\phi_p C_{p,t}$) whose forecasting effect depends on the persistence parameter ϕ_p. To conduct the out-of-sample beta forecasts, the fund manager uses 120 data observations of $r_{p,t}$ and $r_{m,t}$ (i.e., from $t-120$ to t) to estimate the model parameters, upon which the hedge ratio $\beta_{p,t+1|t}$ is obtained from Eq. (5). At time $t+1$, the error of this hedged position is calculated by:

$$e_{p,t+1} = r_{p,t+1} - \beta_{p,t+1|t} r_{m,t+1} \tag{6}$$

The dynamic hedging strategy is implemented for each time t from 1997:12 to 2004:11, thereby generating 84 out-of-sample hedging errors $e_{p,t+1}$ over the last 7-year period in our sample.[12] The effectiveness of the hedging strategy is evaluated by two measures: mean absolute error (MAE) and root mean squared error (RMSE), which are respectively calculated as:

$$\mathrm{MAE}_p \equiv \frac{\sum_t |e_{p,t+1}|}{T} \text{ and } \mathrm{RMSE}_p \equiv \sqrt{\frac{\sum_t e_{p,t+1}^2}{T}},$$

where $t+1$ is from 1998:01 to 2004:12 and $T=84$. The MAE and RMSE account for different aspects of the hedging errors, with the MAE capturing the average level, and the RMSE capturing the variability of hedging errors over time. The more effective hedging strategy should produce smaller MAE and RMSE.

To compare model performance, we implement the above hedging strategy for the RW, MR, and RWMR beta processes, and also for the rolling OLS (ROLS) betas using the 60-month rolling regression procedure of Fama and MacBeth (1973) to forecast the one-period-ahead hedge ratios.[13] Table 4 summarizes the MAE and RMSE for the four beta forecasting procedures. Just like any other out-of-sample model comparisons (e.g., Fama & French, 1997), the improvement from one model to another is small relative to the large hedging errors. However, some consistent patterns emerge across the four models. First, compared to the ROLS betas, there is a noticeable decrease in both MAE and RMSE for the RW, MR, and RWMR processes. On average, the RWMR reduces the MAE (RMSE) by over 20 (nearly 30) basis points over the ROLS, suggesting that statistical modeling of dynamic betas indeed improves the beta forecasts over the ad hoc

[12] Due to data limitations, out-of-sample comparisons of model performance based on dynamic betas are not amenable to examination for the two half sub-periods.

[13] We also arrive at similar inferences when rolling betas are estimated using various window lengths, for example, 120-day rolling windows.

Table 4
Dynamic hedging results

Sector	MAE				RMSE			
	ROLS	RW	MR	RWMR	ROLS	RW	MR	RWMR
Energy	5.48	5.41	5.40	5.40	6.80	6.69	6.61	6.61
Materials	4.97	4.86	4.86	4.84	6.17	5.88	5.93	5.89
Industrials	3.49	3.54	3.50	3.47	4.82	4.93	4.79	4.71
Cons. Disc.	2.75	2.75	2.76	2.75	3.54	3.54	3.55	3.52
Cons. Stpl.	3.39	2.90	2.96	2.79	4.06	3.65	3.64	3.56
Health	5.70	5.70	5.72	5.72	7.68	7.64	7.63	7.63
Financials	3.13	2.83	2.82	2.83	4.34	3.76	3.71	3.68
IT	9.05	8.62	8.69	8.55	11.45	11.08	11.16	11.00
Telecom	4.67	4.96	4.65	4.57	5.98	6.00	5.92	5.88
Utilities	3.61	3.25	3.35	3.19	4.68	4.35	4.51	4.33
Avg.	4.62	4.48	4.47	4.41	5.95	5.75	5.74	5.68

This table reports the mean absolute error (MAE) and the root mean squared error (RMSE) for the hedging errors from the out-of-sample dynamic hedging strategies. For the ROLS, the rolling regression procedure of Fama and MacBeth (1973) is used to estimate the hedge ratio. For the RWMR, the dynamic beta model as in Eqs. (1)–(4) is used to estimate the one-period-ahead beta forecast as the hedge ratio. For the RW, the dynamic beta model has only the trend component, i.e., no Eq. (4). For the MR, the dynamic beta model has only the cycle component, i.e., no Eq. (3). The hedging strategy is implemented for each time t from 1998:01 to 2004:12. The values of the MAE and RMSE are in percentages.

rolling regressions. Second, among the three stochastic beta processes, the RW and MR produce very similar hedging errors, whereas the RWMR performs at least as well as either RW or MR for every sector. The RWMR performs particularly well for the Utilities sector, for which the increase in R-squares is also the largest. In summary, the out-of-sample model comparison produces consistent patterns with our in-sample analysis. Both tests support the RWMR as the best model that can further improve the beta estimate and risk management of sector funds.

6. Conclusion

This paper examines the dynamic processes of market betas for ten Canadian sector portfolios using the Kalman filter approach, and finds that the beta dynamics are best described as a mix of the random walk (trend) and mean reverting (cycle) processes. The relative importance of the trend and cycle components of sector betas is found to be consistent with the GICS classification of cyclical and non-cyclical sectors. Incorporating the beta dynamics into the standard market model greatly increases its explanatory power and produces smaller pricing or hedging errors than the alternative specifications of beta processes.

In addition to the dynamic hedging strategies described in the paper, the dynamic beta model carries other practical implications such as the fundamental analysis of individual stocks using the discounted cash flow (DCF) approach. The key component of the DCF model is the appropriate discount rate for a given stock. It is well known that the discount rate at the individual stock level is very difficult to measure, so the common practice in asset management is to use the betas estimated from the appropriate economic sector or industry group to replace the stock beta. Thus, the enhanced accuracy of the beta forecasts emanating from our model should provide better estimates of the discount rate in the application of the DCF model.

Furthermore, the dynamic beta model carries implications for establishing industry costs of capital, and especially for the Utilities sector at Canadian regulatory hearings. In a related study, He and Kryzanowski (2007) estimate the cost of equity for the Canadian sectors, and suggest that higher importance should be given to estimating the dynamics of betas for the Canadian sectors. In particular, time-variation in the betas is the most important source of variation in the market model for the Canadian Utilities sector. The dynamic beta methodology described in this paper delivered superior performance over traditional approaches, thereby leading to more precise estimates of industry costs of equity. For the Canadian Utilities sector in particular, our approach could potentially alleviate some of the difficulties in rendering decisions in utility rate-of-return hearings.

Finally, although the Kalman filter approach was favored by this paper and others, some caution should still be exercised in practice. As an econometric technique that optimally extracts time series data, the Kalman filter typically generates more volatile beta estimates than the traditional approach such as rolling regressions. For Canadian fund managers, this implies higher asset turnovers (which means higher transaction costs) when implementing dynamic hedging strategies. Managers should optimally balance the potential benefits and costs of using the Kalman filter approach for estimating dynamic betas when measuring and controlling the market risks of their investment portfolios.

Appendix A. Details on the Kalman filter

For each sector portfolio, we define the following matrices (subscript p is dropped):

$$\xi_t \equiv \begin{bmatrix} B_t \\ C_t \end{bmatrix} \quad \Phi \equiv \begin{bmatrix} 1 & 0 \\ 0 & \phi \end{bmatrix} \quad R_{m,t} \equiv [r_{m,t} \quad r_{m,t}] \quad \eta_t = \begin{bmatrix} w_t \\ v_t \end{bmatrix} \quad \Omega = \begin{bmatrix} \sigma_w^2 & 0 \\ 0 & \sigma_v^2 \end{bmatrix}$$

With this notation, Eqs. (1)–(4) are expressed in the following state-space form.

Observation equation: $r_t = R_{m,t}\xi_t + \varepsilon_t$

State equation: $\xi_t = \Phi\xi_{t-1} + \eta_t$

In the above equations, ξ_t is a vector of latent variables, which contain the trend (B_t) and cycle (C_t) components of the beta at each time t. ξ_t is unobserved, so its conditional expectations ($\xi_{t|t}$) are extracted from the Kalman filter using the following iterative procedure.

Beta forecast: $\xi_{t|t-1} = \Phi\xi_{t-1|t-1}$, with covariance matrix: $\Sigma_{t|t-1} = \Phi\Sigma_{t-1|t-1}\Phi' + \Omega$;

Forecast error: $e_{t|t-1} = r_t - R_{m,t}\xi_{t|t-1}$, with covariance matrix: $f_{t|t-1} = R_{m,t}\Sigma_{t|t-1}R'_{m,t} + \sigma_\varepsilon^2$

Beta update: $\xi_{t|t} = \xi_{t|t-1} + K_t e_{t|t-1}$, with covariance matrix: $\Sigma_{t|t} = \Sigma_{t|t-1} - K_t R_{m,t}\Sigma_{t|t-1}$, where $K_t = \Sigma_{t|t-1}R'_{m,t}f_{t|t-1}^{-1}$ is the gain matrix.

For the initial values of ξ_t and Σ_t, the following diffuse priors are used:

$$\xi_{1|0} = \begin{bmatrix} \beta_{\mathrm{OLS}} \\ 0 \end{bmatrix} \text{ and } \Sigma_{1|0} = \begin{bmatrix} \infty & 0 \\ 0 & \sigma_v^2/(1-\phi^2) \end{bmatrix}$$

where

β_{OLS} is the constant beta estimated from the OLS;
∞ is an arbitrary large number; and
$\sigma_v^2/(1-\phi^2)$ is the unconditional variance of the cyclical component of the beta process.

For further details on the Kalman filter, see Harvey (1989).

References

Adrian, T., & Franzoni, F. (2005). Learning about beta: Time-varying factor loadings, expected returns, and the conditional CAPM. *Working paper*: Federal Reserve Bank of New York.

Brooks, R. D., Faff, R. W., & Mckenzie, M. D. (1998). Time-varying beta risk of Australian industry portfolios: A comparison of modeling techniques. *Australian Journal of Management*, *23*, 1−22.

Engle, R. F., & Watson, M. (1987). Kalman filter: Applications to forecasting and rational-expectation models. *Advances in econometrics, fifth world congress*, *Vol. 1* (pp. 245-281).

Fabozzi, F. J., & Francis, J. C. (1978). Beta as a random coefficient. *Journal of Financial and Quantitative Analysis*, *13*, 101−116.

Faff, R. W., Hillier, D., & Hillier, J. (2000). Time varying beta risk: An analysis of alternative modeling techniques. *Journal of Business Finance and Accounting*, *27*, 523−554.

Fama, E. F., & French, K. R. (1997). Industry costs of equity. *Journal of Financial Economics*, *43*, 153−193.

Fama, E. F., & MacBeth, J. (1973). Risk, return, and equilibrium: Empirical tests. *Journal of Political Economy*, *71*, 607−636.

Harvey, A. C. (1989). *Forecasting, structural time series models and the Kalman filter.* Cambridge: Cambridge University Press.

He, Z., & Kryzanowski, L. (2007). 'Cost of equity for Canadian and U.S. sectors'. *North American Journal of Economics and Finance*, *18*, 215−229.

Jostova, G., & Philipov, A. (2005). Bayesian analysis of stochastic betas. *Journal of Financial and Quantitative Analysis*, *40*, 747−778.

Kim, C. J., & Nelson, C. R. (1999). *State-space models with regime switching: Classical and Gibbs-sampling approaches with applications.* MIT Press.

Kryzanowski, L., & To, M. C. (1984). The telescopic effect of past return realizations on ex-post beta estimates. *Financial Review*, *19*, 1−25.

Mergner, S., & Bulla, J. (2005). Time-varying beta risk of Pan-European industry portfolios: A comparison of alternative modeling techniques. *ECON working paper archive*.

Rahman, A., Kryzanowski, L., & Sim, A. B. (1987). Systematic risk in a purely random market model: Some empirical evidence for individual public utilities. *Journal of Financial Research*, *10*(2), 143−152.

Schwert, G. W., & Seguin, P. (1990). Heteroskedasticity in stock returns. *Journal of Finance*, *45*, 1129−1155.

Sunder, S. (1980). Stationarity of market risk: Random coefficients test for individual stocks. *Journal of Finance*, *35*, 883−896.

Wells, C. (1994). Variable betas on the Stockholm exchange 1971–1989. *Applied Financial Economics*, *4*, 75−92.

Please cite this article as: He, Z. (L.), & Kryzanowski, L., Dynamic betas for Canadian sector portfolios, *International Review of Financial Analysis* (2007), doi:10.1016/j.irfa.2007.08.001

OPG INTERROGATORY #21 TO POLLUTION PROBE

Ref: Page 84

Preamble:

"Based on a subjective consideration of the estimates from the above four estimation methods and balancing the other considerations just discussed above with providing an allowance for estimation error, we are forecasting a MERP of 5.00 percent for an average-risk utility for 2008 and 2009."

Interrogatory:

In their evidence in the matter of UtiliCorp Networks Canada (Alberta) Ltd. (UNCA) 2002 Distribution Tariff Application (DTA) No. 1250392, April 2002 (page 59), Drs. Kryzanowski and Roberts recommended a market risk premium of 3.7 - 4.1 percent. In response to ALP-CG-Kryzanowski/Roberts-5 in the Alberta Generic Cost of Capital (October 2003), Drs. Kryzanowski and Roberts agreed that while their initial risk premium estimate was 4.7 percent, their "best estimate" was below 4.5 percent. In their March 2007 evidence (page 59) filed on behalf of the Hydro Communities in Northwest Territories Power Corporation 2006/07 and 2008/09 General Rate Application, Drs. Kryzanowski and Roberts recommended a market risk premium of 4.9 percent. In the current case they are recommending an MERP of 5.0 percent. Given that Drs. Kryzanowski and Roberts argue that the market risk premium has declined, please explain why their estimates of the MERP have increased since 2002.

Response:

Drs. Kryzanowski and Roberts argued in their Evidence that the realized MERP has declined from that indicated by the periods beginning, particularly before 1951. They also provided evidence that realized MERP can differ materially from expected MERP. This is important because the determination of a forward-looking MERP is based on various inputs, including but not confined to the mean realized MERP and its associated measurement error. Since the determination of a forward-looking MERP uses all the information available at a point in time, it should not be surprising that the MERP estimate changes over time.

This is further explained on page 127 of the Evidence of Drs. Kryzanowski and Roberts as follows:

> It is incorrect to equate the Equity Risk Premium Estimation Method with the CAPM. Although the use of equity risk premiums in finance pre-dates the CAPM, the use of beta as a measure of priced risk can be derived from the CAPM.

However, the intuitions behind the conditional CAPM or one factor asset pricing model are used by many experts in determining the equity rate of return since they provide an updated estimate of the utility-specific measure of risk, MERP and prospective long Canada yield in their successive testimonies. Furthermore, their historical estimates of risks and equity risk premiums are estimated for various time periods in order to assess the time-series movement in these important inputs for determining their recommended ROE. In contrast, Ms. McShane argues that no expert has used a conditional approach in implementing the Equity Risk Premium Estimation Method. Specifically, quoting Ms. Mc Shane's response to Pollution Probe Interrogatory #30:[6]

> "The simple CAPM model used to estimate the cost of equity is a static model. Conditional models of the CAPM essentially hypothesize that betas and risk premiums are time varying. The empirical work that has been done using conditional models suggests that a conditional model may explain more of the cross-section of market returns. However, Ms. McShane is not aware of any practical applications of a conditional CAPM, and has never seen such a model proposed for, or used to, estimate the cost of equity for a regulated company."

[6] Ms. McShane's Evidence, EB-2007-0905, Exhibit C2, Tab 1, Schedule 30, page 1 of 1.

OPG INTERROGATORY #22 TO POLLUTION PROBE

Ref: Page 94

Preamble:

Drs. Kryzanowski and Roberts estimate "bare-bones" costs of equity of 6.35 percent and 6.75 percent for the 2008 and 2009 test years.

Interrogatory:

a) Can Drs. Kryzanowski and Roberts confirm that their bare-bones costs of equity are similar to the current yields on long-term (30-year) BBB rated utility debt? If not, please explain why not.

b) Please explain why a pension fund would invest in utility equity at returns of 6.35 percent and 6.75 percent if they can invest in those utilities' debt at the yields provided in response to a).

Response:

a) & b) Drs. Kryzanowski and Roberts confirm that these two percentages are in the same "ball-park" for some utilities at the present point in time. However, these two percentages (i.e., 6.35% and 6.75%) are not the recommended allowed rates of return of Drs. Kryzanowski and Roberts. Thus, it is not appropriate to compare an all-in yield on debt that is fixed for 30-years against a "bare-bones" or not all-in return on equity that is reset as frequently as yearly.

Furthermore, Drs. Kryzanowski and Roberts caution that it is not appropriate for an investor to make an investment decision by comparing the promised yield to maturity for the 30-year BBB-rated debt of a utility, which additionally may contain material default exposure due to its unregulated activities, against the allowed rate of return for only the next one or two years for the regulated utility activities with their immaterial expected rate of default. The actual total returns on the debt for holding periods of one and two years are likely to be quite different from the promised yield to maturity.

Furthermore, an informed investor would need to make many more adjustments before deciding which the better investment is. To illustrate, the divergence between the gross promised yield to maturity and the total return on the equity investment in the utility would widen when various frictions such as non-zero differential taxes and trade costs are considered. An informed investor would also have to form an expectation on how much the actual rate of return earned by the utility would exceed the allowed rate of return.

OPG INTERROGATORY #23 TO POLLUTION PROBE

Ref: Page 101

Preamble:

Drs. Kryzanowski and Roberts state that the automatic adjustment formulas are based on limited, old peer-reviewed scientific evidence on what are the determinants of changes in equity risk premiums.

Interrogatory:

a) Please identify the evidence to which the witnesses are referring.

b) Please provide support for the conclusion that the formulas are based on that evidence.

Response:

a) & b) As noted on page 114 in the Evidence of Drs. Kryzanowski and Roberts in the Alberta Generic Hearing (September 2003):

> There are some papers that find an empirical relationship between equity risk premia for utilities and long government bond yields. To illustrate, Dr. Brigham et al. find that the equity risk premia for utilities increased with the level of interest rates prior to 1980, and decreased with the level of interest rates thereafter.[7] In the absence of an underlying theory to explain the expected relationship between risk premia and interest rates, Dr. Brigham et al. had to rely on a number of ex post possible explanations for this turnaround. Of more concern here, however, is the fact that this relationship could be either positive or negative based on their evidence.

Drs. Kryzanowski and Roberts on pages 116 and 117 of the same Evidence state that:

> Drs. Harris and Marston find that much of the variation in the market risk premia in the U.S. can be explained by changes in interest rates or in changes in their forward-looking risk proxies. Since they also find that equity risk premia move inversely with interest rates in the U.S., they conclude that required returns on stocks are more stable than the interest rates themselves.[8] Of concern in this literature is the lack of theoretical justification for the choice of the tested determinants, such as the long

[7] E. Brigham, D. Shome and S. Vinson, 1985, The risk premium approach to measuring a utility's cost of equity, *Financial Management* (Spring), pp. 33-45.
[8] Robert S. Harris and Felicia C. Marston, 2001, The market risk premium: Expectational estimates using analyst's forecasts, *Journal of Applied Finance* 11:1 (2001), pp. 6-16.

> government rate, and our demonstration that the use of a risk-free proxy whose returns are independent of the returns on stocks results in an estimated beta of –1 between the ERP and that risk-free proxy.

In other words, if equity returns are independent of the risk-free rate (as is assumed in the risk premium method), then the estimated beta between the MERP and that risk-free proxy is -1 by construction. Thus, one only obtains an estimated beta between the MERP and that risk-free proxy that is different from -1 when the assumption of independence is violated.

Drs. Kryzanowski and Roberts went on to note on page 116 that:

> In the multifactor asset pricing and portfolio performance literature, lagged values or innovations in at least five variables have been found to be useful instruments for capturing the time-series variation in the returns and/or risk premia for the market and various multi-factor proxies of priced investment risks. The choice of these variables is based on evidence of their power in predicting stock returns. The variables include the dividend yield on a market index such as the S&P500 or S&P/TSX Composite, which has been used by Fama and French (1988), Ferson and Schadt (1996), Kryzanowski et al. (1997), Christopherson et al. (1998), Farnsworth et al. (2002) and Ayadi and Kryzanowski (2003); the one-month T-bill rate, which has been used by Ferson and Korajczyk (1995) and Ayadi and Kryzanowski (2003); the risk premium as measured by the yield spread between long corporates and long governments, which has been used by Chen, Roll, and Ross (1986), Kryzanowski and Zhang (1992), Koutoulas and Kryzanowski (1996) and Ayadi and Kryzanowski (2003); the slope of the term structure as measured by the yield spread between long governments and the one-month Treasury bill rate, which has been used by Ferson and Harvey (1991), Chen and Knez (1996) and Ayadi and Kryzanowski (2003); the variance of the returns on the market, which has been used by Kryzanowski et al. (1994), and a dummy variable for the month of January, which has been used by Ferson and Schadt (1996), Kryzanowski et al. (1997) and Farnsworth et al. (2002).[9]

---

[9] Ayadi, M. and L. Kryzanowski, 2003, Linear Performance Measurement Models and Fund Characteristics, paper to be presented at North Finance Association Meeting, September 2003; Chen, Z. and P. J. Knez, 1996, Portfolio Measurement: Theory and Applications, *Review of Financial Studies*, 9, 511-555; Chen, N. F., R. Roll and S. A. Ross, 1986, Economic Forces and the Stock Market, *Journal of Business*, 59, 383-403; Christopherson, J. A., W. E. Ferson, and D. A. Glassman, 1998, Conditioning Manager Alphas on Economic Information: Another Look at the Persistence of Performance, *Review of Financial Studies*, 11, 111-142; Fama, E. F., and K. R. French, 1988, Dividend Yields and Expected Stock Returns, *Journal of Financial Economics*, 22, 3-25; Farnsworth, H., W. E. Ferson, D. Jackson, and S. Todd, 2002, Performance Evaluation with Stochastic Discount Factors, *Journal of Business*, 75, 473-503; Ferson, W. E., and C. R. Harvey, 1999, Conditioning Variables and Cross-Section of Stock Returns, *Journal of Finance*, 54, 1325-1360; Ferson, W. E., and R. Schadt, 1996, Measuring Fund Strategy and Performance in Changing Economic Conditions, *Journal of Finance*, 51, 425-461; Kryzanowski, L., S. Lalancette, and M. C. To, 1997, Performance Attribution using an APT with Prespecified Macrofactors and Time-Varying Risk Premia and Betas, *Journal of Financial and Quantitative Analysis*, 32, 205-224; Kryzanowski, L., and H. Zhang, 1992, Economic Forces and Seasonality in Security

---

Returns, *Review of Quantitative Finance and Accounting*, 1, 227-244; Koutoulas G., and L. Kryzanowski, 1996, Macrofactor Conditional Volatilities, Time-Varying Risk Premia and Stock Return Behavior, *Financial Review*, 31, 169-195; L.. Kryzanowski, S. Lalancette and M.C. To, Performance attribution using a multivariate intertemporal asset pricing model with one state variable, 1994, *Canadian Journal of Administrative Sciences* 11:1, pp. 75-85.

OPG INTERROGATORY #24 TO POLLUTION PROBE

Ref: Page 101

Preamble:

Drs. Kryzanowski and Roberts state that the peer-reviewed scientific literature identifies other variables as being better predictors of risk premia.

Interrogatory:

a) When Drs. Kryzanowski and Roberts say "other variables", what is their understanding of the variable(s) that currently are being used to predict changes in risk premia?

b) Please discuss the potential weaknesses in only using changes in the long-term Government of Canada bond yield to predict the cost of equity.

c) If, for example, the NEB had initially relied on the "other variables" to which Drs. Kryzanowski and Roberts are referring when they implemented an automatic adjustment formula in 1995, what would the allowed ROE for Group 1 pipelines likely be today assuming the initial ROE were unchanged at 12.25 percent? Please explain in detail.

Response:

a) & b) Please see Pollution Probe's response to OPG Interrogatory #23.

c) Drs. Kryzanowski and Roberts have not conducted such an analysis. The rationale for not conducting such an analysis is apparent from their discussion on page 101 of their evidence to which this interrogatory is addressed.

OPG INTERROGATORY #25 TO POLLUTION PROBE

Ref: Page 107

Preamble:

Drs. Kryzanowski and Roberts state that their approach to estimating the spread is more consistent with regulatory practice.

Interrogatory:

Please provide support for that conclusion.

Response:

The approach of Drs. Kryzanowski and Roberts estimates the spread using historical data without introducing subjective judgment. As documented on page 100 of their Evidence, this is the approach taken by the National Energy Board and other regulators.

OPG INTERROGATORY #26 TO POLLUTION PROBE

Ref: Schedule 3.3

Preamble:

Drs. Kryzanowski and Roberts calculate the 2007 common equity ratio for ATCO Ltd at 31.75 percent.

Interrogatory:

a) Please explain the calculation, including how the non-recourse debt and the non-controlling interests were treated.

b) Please confirm that S&P estimated the 2006 debt ratio for ATCO at 51.3 percent compared to the witnesses' 66.97 percent.

Response:

a) In calculating the common equity ratio, Drs. Kryzanowski and Roberts included non-recourse debt in long-term debt and debentures. Non-controlling interests were not included in the calculation.

b) Drs. Kryzanowski and Roberts cannot so confirm because the latest S&P report on ATCO to which they have access is dated December 9, 2005 and does not contain 2006 ratios (EB-2007-0905, Exhibit A2, Tab 3, Schedule 1, Attachment B).

OPG INTERROGATORY #27 TO POLLUTION PROBE

Ref: Schedule 3.2

Preamble:

Drs. Kryzanowski and Roberts present debt ratings for a number of companies.

Interrogatory:

a) Please describe the criteria for the selection of the companies included in Schedule 3.2.

b) Which of the companies are holding companies and which are operating subsidiaries?

c) Please explain how S&P rates companies with holding company structures.

d) Do Drs. Kryzanowski and Roberts believe that the capital structures and credit metrics of leveraged holding companies are appropriate benchmarks for the stand-alone regulated operations of OPG, and if so, why?

e) Would Drs. Kryzanowski and Roberts confirm that DBRS' assessment of the credit metrics of holding companies like Enbridge Inc. include an evaluation on a non-consolidated basis? If not, please explain why not.

Response:

a) and d) Drs. Kryzanowski and Roberts stated the rationale for their sample selection on pages 42-43 of their Evidence as follows:

> Schedule 3.2 displays Dominion Bond Rating Service (DBRS) and Standard & Poor's (S&P) bond ratings in March 2008 for our eight Canadian utilities and their regulated subsidiaries spanning different parts of the industry: gas, electric and pipelines. These companies represent a current sample of utilities with publicly traded shares. In forming this sample we seek to measure ratings and financial ratios for the traded entity associated with the regulated utility. In focusing on traded companies, our goal is to maintain sample consistency throughout our evidence. We recognize, however, that many of the traded companies include nonregulated businesses in addition to the regulated utility. We control for any bias by commenting on the differences as well as comparing our conclusions to those drawn strictly for regulated entities.

b) The following companies in Schedule 3.2 are holding companies: Atco Ltd., Canadian Utilities, Enbridge Inc., Fortis Inc. and TransAlta. Operating subsidiaries in Schedule 3.2 are: Nova Scotia Power, Enbridge Gas Distribution, Fortis Alberta, Fortis BC, Newfoundland Power, Maritime Electric and TransCanada Pipelines.

c) and e) Drs. Kryzanowski and Roberts recognize that rating agencies conduct their analysis both at the holding company and the operating subsidiary levels. The inclusion of both types of ratings in Schedule 3.2 reflects this recognition.

OPG INTERROGATORY #28 TO POLLUTION PROBE

Interrogatory:

Please provide a table showing:

a) the recommended returns on equity and capital structure in each case in which Drs. Kryzanowski and Roberts have appeared since 2000

b) the date of the testimony

c) the client on whose behalf the testimony was prepared

d) the regulatory jurisdiction

e) the date of the decision

f) the awarded returns on equity and capital structures – if the case resulted in a settlement, please so indicate.

Please provide copies of all testimonies and accompanying schedules for each of the proceedings listed in the table.

Response:

Drs. Kryzanowski and Roberts have detailed records containing the information requested going back to 2002. A chronological list of the cases in which they appeared follows.

Nova Scotia Power (Attachment 1)

On behalf of the Province of Nova Scotia, they provided evidence and testified before the Nova Scotia Utility and Review Board in the matter of Nova Scotia Power Inc. in 2002. Their recommended return on equity was 8.03% and recommended allowed equity ratio was 35%. The Board awarded a 10.15% return on equity and an equity ratio of 37.5%.

Hydro Quebec (Attachment 2)

They filed evidence and testified before the Régie de l'Enérgie du Quebec for the Fédération canadienne de l'entreprise indépendante ("FCEI") / Union des municipalities du Québec ("UMQ") & Option consommateurs ("OC") in the 2003 application of Hydro Quebec Distribution. Their recommended return on equity was

8.45% and the recommended equity ratio was 34%. The Régie decision awarded a 9.40% return on equity and an equity ratio of 35%.

Alberta Generic Hearing (Attachment 3)

On behalf of Consumers Group, they prepared testimony and testified in Generic Hearing No. 1271597 before the Alberta Energy and Utilities Board in 2003-2004. Their recommended return on equity was 8.05%. The Board awarded 9.20%. The following lists the common equity recommendations of Drs. Kryzanowski and Roberts by company along with the Board decisions.

	2004 Board Approved Common Equity Ratios (%)	Ratio Recommended by Drs. Kryzanowski and Roberts
ATCO TFO	33.0	30.0
AltaLink	35.0	30.0
EPCOR TFO	35.0	30.0
NGTL	35.0	32.0
ATCO Electric DISCO	37.0	35.0
FortisAlberta (Aquila)	37.0	35.0
ATCO Gas	38.0	37.0
ENMAX DISCO	39.0	35.0
EPCOR DISCO	39.0	35.0
AltaGas	41.0	37.0
ATCO Pipelines	43.0	40.0

Northwest Territories Power Corporation (Attachment 4)

Most recently, Drs. Kryzanowski and Roberts submitted evidence and testified before the Public Utilities Board of the Northwest Territories in the General Rate Application of Northwest Territories Power Corporation in 2007. They recommended a return on equity of 6.75% for 2006-2007 and 7.20% for 2007-2008. The recommended equity ratio was 42%. The Board awarded NTPC deemed common equity ratios of 45.53% for 2006/7 and 48.59% for 2007/8. The allowed return on equity was 8.60% for 2006/7 and 9.25% for 2007/8.

Copies of their evidence in these hearings are attached as Attachments 1-4 to this Schedule.

Before the Nova Scotia Utility and Review Board

In the matter of:

NOVA SCOTIA POWER INC. (NSPI)

Prepared Testimony of

Dr. Lawrence Kryzanowski and Dr. Gordon S. Roberts

Ned Goodman Chair in Investment Finance, John Molson School of Business, Concordia University, Montreal, Canada; and CIBC Professor of Financial Services and Area Coordinator, Schulich School of Business, York University, Toronto, Canada.

March 2002

TABLE OF CONTENTS

*The four appendices are in a separate file.

**The 16 schedules are in a separate file.

I. INTRODUCTION AND SUMMARY

Q. Please state your names, employment and professions.

A. We are Dr. Lawrence Kryzanowski of Concordia University and Dr. Gordon S. Roberts of York University. Dr. Kryzanowski is currently Ned Goodman Chair of Investment Finance and Co-Director of the CCUIPP program in Financial Services at the John Molson School of Business, Concordia University. He earned his Ph.D. in Finance at the University of British Columbia. Dr. Gordon S. Roberts is currently CIBC Professor of Financial Services and Area Coordinator, Finance Area, at York University's Schulich School of Business. He earned his Ph.D. in Economics at Boston College.

Q. Please describe your experience relative to your current role of submitting evidence before the Nova Scotia Utility and Review Board.

A. Dr. Kryzanowski has experience in preparing evidence as an expert witness in utility rate of return applications, stock market insider trading court proceedings, and confidential final offer arbitration hearings for setting of fair rates for the movement of various products by rail. Together with Dr. Roberts in 1997, he prepared a report for the Calgary law firm, MacLeod Dixon, on rate of return considerations in the pipeline application by Maritimes and Northeast. For a group of organizations collectively referred to as the FIRM Customers, Drs. Kryzanowski and Roberts provided evidence on the fair return on equity and the recommended capital structure for ATCO Electric Limited ("ATCO Electric" or "ATCO") and UtiliCorp Networks Canada (Alberta) Ltd. ("UtiliCorp") in their Distribution Tariff Applications 2001/2002 before the Alberta Energy and Utilities Board.

Dr. Roberts is experienced in preparing evidence for utility rate of return hearings. From 1995 – 1997 he submitted prefiled testimony as a Board witness in rate hearings for Consumers Gas. In 1996, he served as an expert advisor to the Ontario Energy Board in its Diversification Workshop. As noted above, together with Dr. Kryzanowski, he has also prepared evidence on rate of return and capital structure considerations for a pipeline application by Maritimes and Northeast in 1997, and electricity applications by ATCO and by Utilicorp in 2000/2001.

More broadly, Drs. Kryzanowski and Roberts often provide technical expertise and advice on financial policy. Among their consulting clients in recent years are the Superintendent of Financial Institutions, the federal Department of Finance, Canada Investment and Savings, Canada Mortgage and Housing Corporation, and Canada Deposit Insurance Corporation. Our brief curricula vitae are attached as Appendix A.

Q. What is the purpose of the evidence that you are presenting here?

A. The Province of Nova Scotia has retained us to provide evidence on the fair return on equity and the recommended capital structure for Nova Scotia Power Inc. ("NSPI") in a Nova Scotia UARB Electricity Rate Hearing.

Q. Please describe the general approach that you have used in preparing your evidence.

In preparing our evidence we considered and used various techniques for determining an appropriate capital structure and for measuring the fair return on equity for a regulated utility. For determining an appropriate capital structure for NSPI, we conduct an analysis of the bond ratings, capital structures, interest coverage ratios, returns on equity and equity ratios (both actual and those allowed by regulators) for a comparable sample of utilities. We then determined an appropriate equity ratio for NSPI based on this analysis and NSPI's business risk relative to its peer group. For the determination of the recommended rate of return on equity, we considered and eliminated various approaches as being unreliable, and formulated our recommended rate of return based on the Equity Risk Premium Test.

Q. Please provide a summary of your evidence indicating the major conclusions of each section.

A. Section II examines current economic and financial market conditions in the U.S. and Canada and forecasts those economic variables that we use as inputs in the capital structure and fair rate of return tests.

Three long-term trends make up an important context to our forecast here as well as to our analysis of the fair rate of return on equity in Section IV of our evidence. The first trend is demographic: the aging of the population in developed countries is likely to lead to lower economic growth over the long run. The second relates to the development of derivatives markets and opportunities for corporations to hedge and better manage risks. Third, knowledgeable market participants expect equity risk premiums will be significantly lower in the future than suggested by extrapolation from realized equity returns in the boom years of the second half of the 1990s.

Economic indicators suggest that the U.S. economy is experiencing a decline in GDP growth, low inflation, and a drastic decrease in interest rates. The slowdown began before the September 11th terrorist attacks, although the tragic events exacerbated the slowdown, and are forecasted to delay the recovery. The slowdown has resulted in sovereign debt default, exemplified by Argentina, and a decline in the quality of corporate debt. Corporate default rates are at a 10-year high. The current Enron bankruptcy is the largest in U.S. history, and is causing major re-examinations of the quality of financial disclosures by corporations and the role of auditors.

Downward pressure on prices and rates may come from the weak labour market in the U.S. The weak labour market could translate into decreased inflation from limited demand for increased wages, as jobs are lost. Because of the limited maneuverability associated with the current low rates, and the expectations of a recovery, economic forecasters do not expect the Federal Reserve Board to stimulate the economy through lowering interest rates further in the near future. Instead, the Fed rate is expected to increase, with forecasted increases in 2002 ranging from 25 to 125 basis points.

Canada is currently experiencing a slowdown in economic growth for reasons similar to the U.S. Still, Canadian consumers continue to spend steadily, fuelled by a strong housing market. Further, forecasts of the current account balances suggest that the current account surplus will remain in the tens of billions of dollars range over the next few years. From a financial point of view, this means that Canada's reliance on foreign savings will continue to decrease. One reason for the lower dependence on foreign savings is found in the fiscal restraint shown by the Canadian government in reducing the deficit.

In short, notwithstanding the current slowdown, the forecast for Canada going forward is positive. The government maintains its commitment not to return to deficits. A recovery is underway in 2002, and the Bank of Canada continues to manage inflation successfully. As well, no new referendum on Quebec sovereignty is expected in the near future. We are predicting real economic growth in GDP for Canada of 0.2% to 1% in 2002. The Bank of

Canada continues to target core inflation successfully within the 1% to 3% CPI level and we believe that inflation expectations have moderated over the long-term. For 30-year Government of Canada bonds our forecast is a range from 5.85% up to 5.95% (midpoint of 5.90%) at the end of 2002.

Section III contains our views on the appropriate capital structure for NSPI. We begin by examining the relevant financial data for a sample of nine Canadian utilities. We analyze their bond ratings, capital structures, interest coverage ratios and returns on equity. Next, we briefly review the practical implications of finance theory on capital structure for electric utilities and particularly for NSPI. We then turn to examining the equity ratios of comparable companies – both the actual ratios and the ratios allowed by regulators. Based on these examinations and tests, we conclude that an appropriate equity ratio for NSPI is 35%.

In Section IV, we estimate the fair rate of return for NSPI using the Equity Risk Premium Test. We assess the expected market risk premium for the average Canadian stock at 3.70% to 4.10% and determine that NSPI is 52% as risky as the TSE300 index. We add an adjustment of 10 basis points for flotation costs. Given our point forecast of a long-term Government of Canada bond rate of 5.90%, we are recommending a return on equity of 8.03%, which lies approximately midway within our estimated range of 7.92% and 8.13%. Our return on equity recommendation allows NSPI a risk premium of 213 basis points over our forecast for long Canada yields.

Section V of our evidence contains our comments and critique of certain aspects of the evidence of Ms. McShane and Mr. Falconer. Among the topics covered are our demonstrations why the Comparable Earnings Test is without merit and is unsuitable for use in determining a fair rate of return on equity for a utility. This includes evidence that the sample of comparable firms selected by Ms. McShane had an extraordinary investment performance over her ten-year window in that they had a lower standard deviation of return and a higher mean return than the TSE 300 index over the period, substantially less investment risk (beta of 0.41) than the TSE 300 index over the period, and a large abnormal return or free lunch for those fortunate enough to hold that portfolio of over 5% per annum. We also show that Ms. McShane's application of the comparable earnings method is not internally consistent since it generates estimated risk-free rates that are substantially larger than the rates she initially uses in the application of the method. We also demonstrate that using a weighted average of the risk premium for two different markets with the Canadian beta for a stock makes little sense because it implies that a utility cross-listed in Canada and the United States has a materially different cost of equity for each of the two markets. Thus, in this section, we indicate how corrections to the analyses conducted by Ms. McShane and Mr. Falconer consistently lead to a lower common equity ratio and a lower return on equity for NSPI.

In Section VI, we estimate the cost of new debt for NSPI for 2002 as being 6.9%. This is obtained by adding up our estimates of the three components of debt cost; namely, a long-Canada yield of 5.90%, a yield spread of 95 basis points, and issue costs of 5 basis points. We also demonstrate that the dire consequences from a bond rating downgrade predicted by both Ms. McShane and Mr. Falconer for NSPI did not materialize after the downgrade of NSPI by S&P in December 2001.

Q. Please summarize your recommendations for the rate of return portion of your evidence using a format that is suitable for comparing your recommendation with those of Ms. McShane.

A. The following table contains the summary.

	Component		Flotation Allowance	Total	Weight
	1	2			
Comparable Earnings Test	N/A	N/A	N/A	N/A	0%
Equity Risk Premium Test	Risk-free Rate of 5.90%	Risk Premium (52% of) of 3.70% to 4.10%	0.10%	7.92% to 8.13%	100%
Recommendation	5.90%	2.03%	0.10%	8.03%	100%

II. ECONOMIC AND FINANCIAL MARKET CONDITIONS

Q. How is this portion of your evidence organized?

A. We begin by discussing three long-term trends in capital markets that form an important backdrop to our forecast here and to our analysis of the fair rate of return on equity in Section IV. These include demographics; the development of derivatives markets offering opportunities for corporations to hedge risks; and shifts in expected market risk premiums. Next we present our view of the U.S. economy. We then turn to our economic outlook for Canada and Nova Scotia. We conclude with our forecasts of the Canada/US exchange rate and North American interest rates, focusing on the long Canada rate to be used in our rate of return analysis.

Q. Are there any long-term trends that influence your forecasts?

A. Yes, there are. The first is demographic, the second relates to the development of derivatives markets and opportunities for corporations to hedge risks. The third trend addresses shifts in expected market risk premiums.

Q. Please explain the first trend.

A. Over the longer term, demographic analysis conducted by the Center for Strategic and International Studies and Watson Wyatt Worldwide has several relevant implications for our evidence.[1] It suggests that the costs of public services will increase, while economic growth rates will decrease. Due to the aging of the baby boom generation and increases in longevity,

[1] Center for Strategic and International Studies and Watson Wyatt Worldwide, *Global Aging; The Challenge of the New Millenium*, December 1999.

the population is aging in the developed world. While in 2000 an estimated 14.7% of people in the developed world were aged 65 or over, in 2030 this number will increase to 23.8%. This trend towards a larger percentage of retired persons is reinforced by the growing popularity of early retirement. Population aging has a number of important economic implications.

First, governments face huge pension liabilities. Pension liabilities are currently between 100 to 250 % of GDP in developed countries. Second, the pension liability, as well as the higher costs associated with services geared toward the elderly, will lead to large budget deficits, higher taxes, or elimination of other spending. Third, as the population ages, the consumer market will shrink, resulting in decreased economic growth rates. Fourth, should the government choose to fund the expenses associated with an aging population through higher taxes, this could cause further decreases in consumer spending. Fifth, labour markets will tighten, as the pool of qualified personnel decreases. Sixth, we will observe overcapacity in those sectors most sensitive to changes in population levels and composition, such as real estate and construction. Note that the lower growth implications of the demographic analysis are independent of the business cycle.

Q. Please state your views on how corporate hedging opportunities are evolving.

A. The market for derivative securities continues to grow on an annual basis. Internationally, the outstanding notional principal of futures contracts traded on organized exchanges has increased from slightly over $8 trillion U.S. in December 1999 to close to $10 trillion U.S. in September 2001.[2] The amounts outstanding for option contracts over the same time period rose from close to $5 trillion U.S. to close to $12 trillion U.S. North

[2] http://www.bis.org/publ/r_qa0112.pdf#page=94 page 94.

American markets account for most contracts, followed by Europe and Asian-Pacific markets. In North American markets, the vast majority of either option or futures contracts are interest rate related, with the rest being currency or equity related. For example, in September 2001, approximately 96.5% of the outstanding principal associated with futures contracts and 86.4% associated with options contracts were interest rate contracts.

The above values do not include Over-The-Counter (OTC) contracts, which include interest rate, currency, equity, commodity and credit risk related contracts. Notional amounts of all OTC contracts rose from around $88 trillion U.S. in December 1999 to approximately $99 trillion in June 2001. Approximately 67% of this amount represents interest-rate contracts.

For Canada, the *Bank of Canada Review* reports that the average daily turnover more than doubled between 1995 and 2001.[3] For currency swaps and OTC foreign exchange options, average daily turnover rose from $0.8 billion U.S. to $2.6 billion. For forward rate agreements, interest rate swaps, and OTC interest rate options, average daily turnover rose from $4.3 billion U.S. to $9.9 billion.

Clearly, the derivative securities market continues to grow quickly, and the reasons for this growth warrant exploration. Ignoring transaction costs, derivatives securities are “zero sum games,” insofar as the money received by one side of the contract directly corresponds to the money paid by the other. However, while individual contracts are zero sum games, there are important economic benefits associated with the existence of such contracts, in terms of increasing market efficiency and

[3] http://proquest.umi.com/pqdweb?TS=1015190609&Did=000000090066226&Fmt=6&Deli=1&Mtd=1&Idx=5&Sid=1&RQT=309&Q=1&IE=x.pdf.

market completeness. Derivative securities are used to hedge, speculate, arbitrage, and leverage. Related to each of the above, derivative securities ensure market completeness, through providing opportunities that are otherwise unavailable.

Focusing on hedging, a seminal 1993 publication by the Group of Thirty, a private international body composed of very senior representatives of the private and public sectors and academia, surveyed how firms use derivative contracts to hedge risk.[4] They found that 82% of respondents use OTC derivatives to hedge risks associated with new financing, 33% to hedge risk associated with currency exposure, 69% to hedge exposure related to foreign exchange transactions, and 78% to manage and modify the characteristics of existing asset and liability positions held by firms.

Hedging improves the efficiency of markets by transferring risk from those who do not wish to bear it to those who do. There are a number of hypotheses as to why firms wish to transfer risk. Some argue that hedging reduces taxes, thereby increasing firm value. Others argue that hedging increases firm value through decreasing the costs associated with financial distress. “Financial distress” refers to a situation where the firm faces bankruptcy, which may result in high costs, such as legal fees and asset redeployment costs. Hedging can reduce such costs by lowering the probability of bankruptcy occurring.

Some argue that hedging increases firm value through decreasing the costs associated with agency problems. “Agency problems” refer to conflicts of interest between stockholders and managers. Hedging can be used to align the objectives of both parties. Other theories relate hedging policy to managerial compensation plans.

---

[4] Still, K., The Economic Benefits and Risks of Derivative Securities, January/February 1997, *Business Review* (available through ABI).

Canadian evidence suggests that firms that use derivatives to hedge tend to have higher leverage and lower credit ratings than firms that do not hedge.[5] This supports the contention that hedging plays a role in reducing the likelihood of financial distress. As well, firms that use derivatives have longer maturity debt. These results are generally similar to those for the U.S.

The discussion above suggests that there are both OTC and exchange-traded markets through which Canadian companies may hedge. Further, there are a number of strong reasons why a Canadian company may wish to do so.

There are important distinctions between derivatives traded in OTC markets and exchange traded derivatives. Exchanges typically trade only a few "plain vanilla" securities, rigorously defined and standardized in terms of maturity and other characteristics. OTC markets, on the other hand, permit the trading of a wide variety of derivative securities. The Office of the Superintendent of Financial Institutions (OSFI) regulates both exchange and OTC derivatives markets in Canada. However, the ability of the market makers in the OTC market to create complex instruments often results in limited OSFI supervision on a day-to-day basis.

An important issue related to the OTC derivatives markets is counterparty risk. Counterparty risk is the risk that the other party in a derivative agreement may default. Some firms may be excluded from OTC markets because their credit rating suggests they face an unacceptable probability of defaulting. One way to avoid restrictions due to a poor credit rating is through setting up a Special Purpose Vehicle (SPV) through which the

[5] Jalilvand, A., Why Firms Use Derivatives: Evidence from Canada, *Canadian Journal of Administrative Sciences*, 16, September 1999, pp. 213-228.

derivative transactions can be structured. Counterparty risk is not an important issue on exchanges, due to marking to market requirements.

Q. How do these growing hedging opportunities relate to a Canadian electric utility that relies importantly on coal burning?

A. Such utilities generally purchase over 50% of projected coal needs using forward contracts prior to the budget year, while the balance is purchased either using shorter-term forward contracts or on the spot market in the budget year. Because these contracts are U.S. dollar denominated, a Canadian electric utility faces the risk that the Canadian dollar will decline relative to the U.S. dollar, resulting in a higher-than-expected forward price, in Canadian dollar terms. There are a number of ways that the utility can reduce or eliminate this risk.

For example, the utility can purchase U.S.$/CDN$ forward contracts, whereby it has the obligation to purchase a specific amount of U.S. dollars for a specific Canadian dollar price, at a specific time in the future. Through specifying the amount of U.S. dollars to be purchased as equivalent to the U.S. dollar denominated price associated with the coal forwards, and through specifying the maturity dates of the foreign exchange forwards as identical to the maturity date associated with the coal forwards, the utility can fix the future cost of the coal bought forward, in Canadian dollars, today.

The utility can also hedge the foreign exchange cost of its forecasted spot coal purchases using currency futures options. Options are more appropriate here as they give the utility the right but not the obligation to purchase U.S. dollars. For example, if the heating season is warmer than expected, coal needs will be less than forecasted and the utility will elect not to exercise some of its currency options. Alternatively, the utility could hedge the foreign exchange risk of all of its expected coal purchases using currency futures and offset uncertain needs with weather derivatives traded on the Chicago Mercantile Exchange.

Note that since "plain vanilla" contracts are used to perform the above foreign exchange hedge, firms unable or unwilling to trade on OTC markets, such as due to credit risk issues, can perform the above-described hedge using futures contracts that trade on an exchange.

Besides hedging currency risk using exchange traded futures, exchange traded coal futures are also available. For example, the New York Mercantile Exchange has traded Central Appalachian Coal Futures since July 2001.[6] While the number of contracts settled was high when the coal futures initially traded, daily volume has fallen below 40 contracts per day.[7] Hence while not highly liquid, there is a developed exchange-traded futures market for coal. This is likely due to the relative stability of coal prices in comparison with oil and natural gas prices.

For a wider variety of hedging tools, the hedger can turn to the OTC Coal markets as well. Standardized OTC-traded coal instruments include Powder River Basin Contracts.[8] The "Powder River Basin" is the largest coal-producing region in the Western U.S. Two Powder River Basin contracts require the delivery of 12,500 tons, and are one of two types, PRB 8400 and PRB 8800. The numbers 8400 and 8800 refer to the number of BTUs per pound of coal. A BTU is a measure of the energy that raises the temperature of one pound of water by one degree Fahrenheit.[9] For each contract, rejection of the coal can occur if the actual BTUs are

[6] See http://www.nymex.com/markets/cont_all.cfm?cid=26&cont_name=info for a description and discussion of the contract. See http://www.eia.doe.gov/cneaf/coal/page/f_p_coal/isspaper_p7.html for the July 2001 date source.
[7] See http://www.eia.doe.gov/cneaf/coal/page/f_p_coal/isspaper_p7.html.
[8] Following discussion from http://www.evomarkets.com/mk_otc.html and http://www.evomarkets.com/mk_otc-cspecs.html#8400.

200 below the specified level. Each contract also specifies levels of moisture, ash, SO2, sodium, as well as the delivery point.

We conclude that there is a growing number of hedging opportunities open to Canadian electric utilities seeking to control exposure to the risk of unexpected shifts in energy prices and the U.S. dollar.

Q. In addition to demographic effects and the growth of hedging opportunities, what is the third trend related to market risk premiums?

A. After the recession of the early 1990s, the rest of the decade was an ideal period in capital markets due to a long economic expansion and falling interest rates. As evidence of the economic expansion, note that between January 1990 and December 1999 real GDP in Canada grew from $171.7 billion to $228.5 billion (in 1992 dollars).[10] This represents a 37.33% growth over the period. Average real GDP growth in Canada was 2% annually between 1990 and 1998, and was 5.1% in 1999 and 4.4% in 2000. Annual average real GDP growth in the U.S. was 2.9% between 1990 and 1998, and averaged 4.1% in 1999 and 2000. As evidence of falling interest rates, 91-day Canadian T-Bills decreased from 12.13% in January 1990 to 4.82% in December 1999, while U.S. T-Bills decreased from 7.75% to 5.37%. In brief, most of the 1990s was an ideal period for capital markets characterized by strong and sustained growth for much of the period and falling interest rates.

Because the boom years of the 1990s were such a unique period, knowledgeable market participants do not expect that the excess of equity returns over long Canadian bond yields will be as high in the future. In the William M. Mercer Limited *2002 Fearless Forecast*, a survey of 81

[9] See British Thermal Unit in http://www.consolenergy.com/glossary.htm.
[10] See CANSIM II SERIES V498943, V122484 and V121817.

Canadian and international investment managers, the average manager expects an equity risk premium (TSE 300 return minus long Canada yield) of 3% over the next five years, which is below the historical average.[11] As well, the Mercer report states that their own research suggests an expected equity risk premium of 2% to 2.5%, well below the historical average.

Further evidence of falling equity premiums comes from the Watson Wyatt *21st Annual Canadian Survey of Economic Expectations 2002*, a survey of Canadian economists and portfolio managers. For the long run, the survey reports a median forecasted total return on the TSE 300 stock index of 8% between 2007-2016, and a median forecasted yield on Canadian ten-year bonds of 5.8% between 2007-2016. This suggests a market risk premium over 10-year Canada bonds of 2.2%. Although the Watson Wyatt survey does not report forecasts for 30-year bonds, we deduce that, given a positively sloping yield curve, the risk premium over 30-year bonds will be even smaller.

Q. What is your outlook for the U.S. economy in 2002?

A. Economic indicators suggest that the U.S. economy experienced a decline in GDP growth, low inflation, and a drastic decrease in interest rates in 2001. The slowdown began before the September 11th terrorist attacks, though the tragic events exacerbated the slowdown, and are forecasted to delay the recovery. Factors that influenced the slowdown in the U.S. economy include the fragility of the economy, in terms of consumer confidence. For example, in January 2001, consumer confidence fell to its lowest level in four years, 9 months before the terrorist attacks. Decreases in consumer confidence lead to consumer caution in spending, which has a direct impact on GDP. Other factors influencing the slowdown include

[11] *2002 Fearless Forecast,* William Mercer Limited, January 2002.

high unemployment rates, a global slowdown, and vanishing budget surpluses.

The slowdown has resulted in sovereign debt default, exemplified by Argentina, and a decline in the quality of corporate debt. Corporate default rates are at a 10-year high. The current Enron bankruptcy is the largest in U.S. history. According to Moody's, one out of 10 companies with a junk rating did not repay debt to creditors in 2001. This compares unfavorably to an average 2% rate during the 1990s.[12] Further exacerbating the current slowdown is the fact that since rates are currently at historical lows, monetary policymakers are limited in their ability to cut rates further to stimulate a turnaround.

After the GDP expansion discussed earlier, real GDP contracted at an annualized rate of 1.1% in the third quarter of 2001. Forecasts of real GDP generally predict modest positive growth in 2002. The *Watson Wyatt 21st Annual Canadian Survey of Economic Expectations 2002* reports a median U.S. real GDP growth forecast of 1.2%. More generally, forecasters generally agree that GDP will be approximately 1% in 2001, though forecasts for 2002 range from 0.4% through to 3.5%. The variability in 2002 forecasts is a function of the general uncertainty facing the markets.

Short- and long-term U.S. Treasury securities behaved differently over the past year. As of March 2002, 30-year Treasury bonds currently yield 5.82% and 3-month Treasury bills currently yield 1.82%. During 2001, the short yield decreased dramatically from a high of 5.29% in January to a low of 1.91% in December, while the long yield ranged from 5.78% to 5.12% over the same period.

---

[12] See http://www.forbes.com/newswire/2001/12/24/rtr464132.html.

Forecasts of the U.S. consumer price index (CPI) inflation range from 0.5% to 2.8% for 2002.[13] Because of the limited maneuverability associated with the current low rates, and the expectations of a recovery, economic forecasters do not expect the Federal Reserve Board to stimulate the economy through lowering interest rates further in the near future. Instead, the Fed rate is expected to increase, with forecasted increases in 2002 ranging from 25 to 125 basis points. The general expectation is that short and long-term interest rates will increase steadily from the current rates over the next 24 months. *Scotiabank Group* predicts U.S. 30-year bond rates at 5.65% in the fourth quarter of 2002.

Downward pressure on prices and rates may come from the weak labour market in the U.S. The weak labour market could translate into decreased inflation from limited demand for increased wages, as jobs are lost. Soft oil prices will also limit inflation. Note, however, that the decrease of 124,000 in payroll employment in December 2001 was an improvement over the decreases of 448,000 and 371,000 in payroll employment in October and November of 2001, respectively. This suggests that the weakness in the US labour market may be easing somewhat.

The economic indicators suggest that the U.S. economy will continue to struggle in 2002. Therefore, we forecast that the U.S. core CPI inflation rate will decrease to just under 2% in 2002, and remain steady or lower afterwards. We expect very little growth in GDP in 2002, with GDP ranging from 0.8% to 1.2%, followed by a recovery, and GDP growth under 4% in the years following.

Q: What is your forecast for Canadian real economic growth over the next two years?

[13] See the *Watson Wyatt 21st Annual Canadian Survey of Economic Expectations 2002*.

A. Canada is currently experiencing a slowdown in economic growth for reasons similar to those explaining the U.S. economic slowdown. As discussed earlier, besides the obvious impact of the September 11, 2001 terrorist attacks, other factors explaining the slowdown include: decreases in consumer confidence in the U.S., high unemployment, vanishing budget surpluses, the global slowdown, sovereign debt defaults, the decline in the quality of corporate debt, and the limited flexibility associated with monetary policy.

Notwithstanding the current economic slowdown, Canadian consumers continue to spend steadily, fuelled by a strong housing market. The strength in the housing market is primarily due to low borrowing costs. With the growth of exports to the U.S., Canada's current account surplus grew to $26.9 billion in 2000, much higher than the $1.7 billion surplus in 1999, and the annual average deficit of $16.1 billion between 1990 through 1998. Further, forecasts of the current account balances suggest that the current account surplus will remain in the double-digit range over the next few years. For example, *Scotiabank Group* forecasts $31 billion, $11 billion, and $22 billion surpluses in 2001, 2002, and 2003, respectively. From a financial point of view, this means that Canada's reliance on foreign savings will continue to decrease.

One reason for the lower dependence on foreign savings is found in the fiscal restraint shown by the Canadian government in reducing the deficit. While the deficit was $24.2 billion between 1990-98, there were $12.3 billion and $17.1 billion budgetary surpluses in 1999 and 2000, respectively. However, the economic downturn makes it difficult for the government to maintain the federal budget surpluses. The forecasted surplus is zero for 2001. There are conflicting forecasts regarding the deficit in 2002. The *Watson Wyatt 21st Annual Canadian Survey of Economic Expectations 2002* reports a median forecasted surplus of $2 billion, with forecasts ranging from $0.6 billion to $15 billion. Note as well that in the budget speech of December 10, 2001, Finance Minister Paul Martin reiterated that the federal government intends to balance the budget over the next two years by using the government's contingency reserve as a buffer against the economic slowdown.

The finance minister's reaffirmation of his intention to maintain conservative fiscal policies provides evidence that the Canadian government is working to reduce its reliance on the debt markets, reducing demand for capital and easing upward pressures on yields. The budget speech did not contain new major tax cuts, but reaffirmed the intention to follow through with the tax cuts announced in 2000. New spending initiatives proposed in the 2001 budget include health care and security spending increases, among other spending increases. The estimated cost of these new initiatives is $2.664 billion, $2.551 billion, and $2.703 billion in 2001-2002, 2002-2003, and 2003-2004, respectively. As well, spending initiatives announced before the 2001 budget will cost $894 million, $866 million, and $672 million in 2001-2002, 2002-2003, and 2003-2004, respectively. The government's confidence in its ability to balance the budget, the economic slowdown notwithstanding, suggests that the economic future for Canada and its financial markets looks brighter than it currently is, but not as bright as it has been during much of the 1990s.

The Governor of the Bank of Canada, David Dodge, recently reiterated the bank's commitment to the preservation of an environment of low and stable inflation.[14] The core inflation rate is measured using the CPI, adjusted so as to exclude fluctuations in energy and food prices, and changes in indirect taxes. The core measure has met the Bank of Canada's target band for inflation of between 1% and 3%. Between

[14] See http://www.bankofcanada.ca/en/speeches/sp02-1.htm

January 2000 and December 2001, the Bank of Canada's Overnight Rate Target fell from 5.5% to 2.25%. These decreases followed similar actions by the Federal Reserve. The Governor notes that the decision to decrease interest rates is due to reduced exports to the United States. Due to this spillover, the factor that caused the U.S. interest rate decreases – supply outstripping demand – affects Canada as well.

The Bank of Canada stresses that economic recovery in Canada "does not hinge" on the Canadian dollar remaining low relative to the US dollar (currently \$0.62 - \$0.63 US/CDN). This statement should be perceived in the context of recent statements made by Finance Minister Paul Martin which are intended to provide verbal support for the Canadian dollar. The Bank of Canada focuses its policies on inflation management, not currency management; hence the role of the Bank of Canada in bolstering the dollar is limited. However, high inflation countries tend to have weak currencies. Hence, keeping inflation low does play an indirect role in strengthening the Canadian dollar.

In short, notwithstanding the current slowdown, the forecast for Canada going forward is positive. The government maintains its commitment not to return to deficits. A recovery is expected in 2002, and the Bank of Canada continues to manage inflation successfully. As well, no new referendum on Quebec sovereignty is expected in the near future. All these factors suggest that it is possible for Canada to outperform most of the G-7 countries. The *Watson Wyatt 21st Annual Canadian Survey of Economic Expectations 2002* reports a median forecasted real Canadian GDP growth of 1.5% with forecasts ranging from 0.2% to 3%. We are predicting real economic growth in GDP for Canada of 0.2-1% in 2002.

Q. What are your views on the Canadian inflation outlook for 2002 and 2003?

A. Due to the current slowdown, the economy has slack, particularly with respect to unemployment rates and industrial capacity. The unemployment rate as of December 2001 was 8%. This compares unfavourably with the past few years. The unemployment rate in Canada was 6.8% in 2000, lower than the 6.9% rate in 1999 and 9.8% annual average rate between 1990 through 1998. From a policy perspective, since the Bank of Canada continues to target core inflation successfully within the 1 to 3% CPI level, we believe that inflation expectations have moderated over the long term, and the credibility of the Bank of Canada's strategy has been established with financial markets. Further, forecasted unemployment rates suggest that unemployment rates will remain in the 8% - 8.5% range over the next couple of years. For example, the *Watson Wyatt 21st Annual Canadian Survey of Economic Expectations 2002* reports a median forecasted unemployment rate of 7.8% for 2002 and 7% between 2003 - 2006. The Bank of Canada's *Monetary Policy Report* estimates that, using conventional measurement techniques, the Canadian economy was operating below its production capacity in the third quarter of 2001, suggesting that the economy has excess capacity.

As a result of the issues discussed above, we expect inflation levels to be in the lower end of the Bank of Canada's target band. The Watson Wyatt forecast is for a median CPI rate for 2002 of 1.8% with a range of 1.5% to 1.9%. We expect the CPI inflation rate to be between 1.5-2% in 2002.

Q. Please explain your forecast for the Nova Scotia economy in 2002.

A. Nova Scotia's economy is small, representing approximately 2% of Canada's GDP.[15] Like all Canadian provinces, Nova Scotia's economy depends on the U.S. economy. Non-energy exports are highly sensitive to

[15] http://www.gov.ns.ca/finance/statisti/gdp/gdp7.htm.

changes in the U.S. economy. Approximately 75% of all of Nova Scotia's exports are destined for the U.S. Important non-energy exports include food and beverages; inedible fabricated materials such as lumber and paper; and machinery.

An issue of importance to Nova Scotia's non-energy exports is the U.S.'s threat to impose duties on softwood lumber. Negotiations are currently in progress, and news reports suggest that Canada may choose to impose an export tax to avoid the duties. While the conclusion of the negotiations is uncertain, it is reasonable to argue that the imposition of any tax, as well as the U.S. government's insistence that Ottawa accept other conditions such as a minimum floor price, will harm Nova Scotia's softwood lumber industry.

Energy exports, such as the natural gas and gas liquid exports from the Sable Offshore Energy Project (SOEP), are generally absorbable into the U.S. economy, even during a U.S. economic slowdown. However, according to Nova Scotia's Department of Finance, there is limited scope for increased production in 2002. Further, a disadvantage associated with the SOEP is that increased output directly results in only a limited number of new jobs.

Nova Scotia's Department of Finance forecasts unemployment rising above 10% in 2002[16]. Increased unemployment will reduce consumer spending, limiting economic growth. Over the longer term, the growth of the service industry, particularly call centers, is expected to lower unemployment, and boost consumer spending. Further, energy projects, such as the Deep Panuke project and the SOEP Tier II, should help lower unemployment as well. As recently as March 1, 2002, PanCanadian Energy Corp. announced that it is has filed applications to proceed with

[16] http://www.gov.ns.ca/finance/statisti/gdp/gdp7.htm

the Deep Panuke project, providing evidence that the Deep Panuke project is progressing.[17] The SOEP Tier II is expected to begin production in 2004, maintaining production levels that would otherwise decrease over time as production from Tier I wells begins to fall off.

Economic forecasts are mixed. According to Nova Scotia's Department of Finance, the province's economic recovery in 2002 will be slower than the recovery for the rest of Canada. Conversely, Toronto Dominion Bank forecasts that Nova Scotia's real GDP growth will be higher than the Canadian average in 2002, primarily due to the SOEP.[18] The Bank of Nova Scotia also predicts real GDP growth higher than the Canadian average.[19]

In our opinion, the limited job growth associated with the SOEP and reduced consumer spending suggest that Nova Scotia's GDP will grow at a slower rate than Canada's. Further support for this argument is that Nova Scotia's GDP growth rate has historically been lower than Canada's. We therefore forecast real economic growth in GDP in 2002 at 75% of Canada's.

Q. What are the implications of your views on the Canadian economy for the likely level of Canadian corporate profits and equity returns during 2002 and 2003, particularly as they apply to low-risk industrials?

A. Corporate profits will remain weak in the near future. The *TD Quarterly Economic Forecast* of December 18, 2001 notes that in the third quarter of 2001, corporate profits were down 24% from the year earlier levels. The resulting job cuts will dampen consumer spending and demand for housing in the near future. Further, the *Watson Wyatt 21st Annual*

[17] See http://biz.yahoo.com/rf/020301/n01179555_1.html.
[18] http://www.td.com/economics/finances/ns01.pdf.

Canadian Survey of Economic Expectations 2002 reports a median forecasted decline in corporate profits after taxes of 2% in 2002 with a wide range from a decline of 17.7% to an increase of 5.0%. We are forecasting corporate profit growth to range from –5% to zero in 2002.

Q. What are your views on the Canadian dollar?

A. A number of factors are considered when forecasting changes in the US$/CDN$ exchange rate. At the most general level, exchange rates are influenced by relative supply and demand for each currency. Hence, higher Canadian interest rates increase demand for the Canadian dollar, and should therefore boost the exchange rate. Another factor that may influence exchange rates is the trade balance. If exports rise in value more than imports, there will be greater relative demand for the Canadian dollar. Further, confidence in the Canadian economy will motivate investment in Canadian assets, leading to greater demand for Canadian dollars.

Finally, the currency of countries experiencing relatively high inflation will depreciate relative to countries with relatively low inflation, as inflation erodes expected value. Note, however, that the inflation factor is inappropriate for forecasting exchange rates for countries with similar inflation rates, as is currently the case for Canada and the U.S.

Based on the above discussion, and given the similarity in relative inflation, it is apparent that the Canadian exchange rate is influenced by relative interest rates, the trade balance, and confidence in the Canadian economy.

Recently, as mentioned earlier, the Bank of Canada and Finance Minister Paul Martin provided verbal support for the Canadian dollar, reflecting

[19] http://www.scotiacapital.com/English/bns_econ/pupdate.pdf.

worries concerning the historic lows associated with the CDN$/US$ exchange rate. This verbal support, combined with robust economic data, suggests that the exchange rate is not likely to fall below $0.62.

BMO Nesbitt Burns forecasts an exchange rate of approximately $0.64 towards the end of 2002, and $0.645 in 2003. Toronto Dominion bank forecasts an exchange rate of approximately $0.66 towards the end of 2002, and $0.68 in 2003.[20] The *Watson Wyatt 21st Annual Canadian Survey of Economic Expectations 2002* suggests that most forecasters expect the Canadian dollar to appreciate to between $0.63 and $0.66 in 2002. Based on the above, we forecast that the CDN$/US$ exchange rate will rise to between $0.64 and $0.66 towards the end of 2002.

Q. Please state your forecasts for U.S. interest rates between now and year-end 2002?

A. We base our recommendation on our forecasts of macroeconomic variables, such as interest rates, GDP, and inflation. We also take into consideration external forecasts, as reviewed earlier and displayed in Schedule 1. Our forecast for 30-year U.S. Treasury yields is 5.5%, with a range from 4.90% up to 6.0%, by the end of 2002.

Q. What rate do you recommend as the long-Canada rate for use in market risk premium analysis?

A. In its November 2001 *Monetary Policy Report* available on its web site (http://www.bankofcanada.ca/), the Bank of Canada notes that due to the pessimistic economic outlook, the yield curve in Canada had steepened and shifted downward since mid 2001. The lower long-term rates may be

[20] http://www.td.com/economics/qef/qefde01.pdf.

due to a reduction of the inflation component of the yield on long-term bonds.

Due to the elimination of Canada's budget deficits, there is less reliance on foreign debt. This suggests that higher differentials are not required to keep investors' funds in Canada. Accordingly, we have seen the yield spread of long Canada's over 30-year U.S. Treasuries widen after the U.S. Treasury announcement. This suggests that while the Treasury announcement had an impact on the U.S. market, the yields on long Canada's were not significantly affected.

In this context, we base our forecast on the consensus view. As seen in Schedule 1, the Mercer survey reports that the median forecast for 30-year Canadas was 5.9% at December 31, 2002. *Scotiabank Group* forecasts that the 30-year Canada rate will be 5.85% in the fourth quarter 2002. From *TD Economics* comes a forecast for 5.95% for the fourth quarter of 2002. For 30-year Canada bonds, our forecast is a range of long Canada yields from 5.85% to 5.95% with a mid-point of 5.9%.

III. CAPITAL STRUCTURE

Q. Please explain how you have organized this section of your evidence on capital structure.

A. We begin by examining relevant financial data for a sample of nine Canadian utilities drawn from Stock Guide. This sample consists of gas and electric utilities and pipelines that are covered in Stock Guide and have publicly traded common shares. We require the included companies to be publicly traded to ensure consistency between our samples here and in later sections where we present our evidence on the fair rate of return. We analyze bond ratings, capital structures, interest coverage ratios and return on equity. Next, we briefly review the practical implications of finance theory on capital structure for electric utilities. We review the business risks faced by NSPI and relate them to these implications. We then turn to examining the equity ratios of comparable companies – both the actual ratios and the ratios allowed by regulators. We conclude this section of our evidence with our recommendation on the appropriate equity ratio for NSPI.

Q. What evidence can you present on bond ratings and capital structures for Canadian utilities?

A. Schedule 2 displays Dominion Bond Rating Service (DBRS) and Standard & Poor's (S&P) bond ratings in March 2002 for our nine Canadian utilities: three gas utilities, four electric utilities and two oil pipelines. These companies represent a current sample of utilities with publicly traded shares for which data are available in Stock Guide. In forming this sample we seek to measure ratings and financial ratios for the traded entity associated with the regulated utility. In focusing on traded companies, our goal is to maintain sample consistency throughout our evidence. We recognize, however, that many of the traded companies include nonregulated businesses in addition to the regulated utility. We control for any bias by commenting on the differences as well as comparing our conclusions to those drawn strictly for regulated entities.

The bond ratings are from the websites of DBRS and S&P. Starting with the DBRS ratings, the Schedule shows that these ranged from A for Canadian Utilities, Enbridge and TransCanada Pipelines down to BB (high) for Pacific Northern Gas. The Schedule shows that the typical Canadian energy utility is rated A (low) by DBRS. To avoid circularity, Emera and NSPI are not in our sample and Schedule 2 shows their ratings separately.

We next turn to the S&P ratings and make a similar comparison. The S&P ratings for the utilities in our sample similarly ranged from A+ for Canadian Utilities down to BB- for Pacific Northern Gas. The Schedule shows that the typical Canadian energy utility is rated A- by S&P. Again, to avoid circularity, Emera and NSPI are not in our sample and Schedule 2 shows their ratings separately.

From Schedule 2 we see that both rating agencies rate Emera just below the average of our sample. In the case of NSPI the rating agencies disagree with S&P rating it identically to Emera and DBRS assigning a higher rating. Overall, our examination of bond ratings leads us to conclude that NSPI is rated at or slightly below the middle of our sample of nine Canadian utilities.

The next step is to examine the actual capital structures of the companies in our sample for 1999 and 2000, the latest years for which data are available in Stock Guide. Focusing on the 2000 ratios, Schedule 3 reveals that there is considerable variation in common equity ratios for these companies ranging from a high of 46.85% for Trans Alta down to 22.96% for Atco Ltd. The average percentage of common equity for these companies was 33.26% in 2000. Schedule 3 also presents common equity ratios for 1999. With one exception (BC Gas), the ratios were quite stable over these two years.

In addition, Schedule 3 shows the percentages of long-term debt and preferred shares in the capital structures of these companies. Again, there was considerable variation in the proportionate use of financing across companies. On average, the companies employed 63.47% long-term debt and 3.27% preferred shares in 2000.

The presentation of ratios for the same group of companies continues in Schedule 4. The first column shows the coverage ratio, EBIT/ Interest expense.[21] The average coverage ratio was 2.39 in 2000.

Q. What conclusions about an appropriate capital structure for an electric utility can you draw from Schedules 2 - 4?

The schedules show that, from the vantage point of DBRS, Canadian Utilities, Enbridge and TransCanada Pipelines are the only companies which enjoy an A credit rating. The other companies are all rated A (low) (or lower). For S&P, only one company in our sample (Canadian Utilities) was rated A or above. As stated earlier, the typical company is rated A(low) by DBRS and given a comparable A- rating by S&P. Of the nine utilities in our sample, four received a rating below A- (A (low)) from at least one of the rating agencies. Yet, despite their lower ratings, these companies have experienced no difficulties in accessing capital markets to raise long-term financing. Further, there is evidence that the market is developing an appetite for lower rated debt.

[21] EBIT are earnings before interest and taxes.

We conclude that the experience of the other companies in Schedules 2-4 suggests that a bond rating of BBB (high) (BBB+) or higher is sufficient to maintain good access to capital markets.

Q. Do you have any further evidence to support this view?

A. Yes, we do. We will show that bond rating is far from an exact science suggesting that it is overly simplistic to argue that only companies with ratings of A (low) or higher can function successfully in financial markets.[22]

To illustrate the role that judgement plays in bond ratings, we have only to examine Schedule 2 where we see that the two agencies rating Canadian utility bonds often disagree. This situation, termed split ratings, is quite common. To illustrate, we begin by excluding Atco Ltd. which has only one rating and then compare ratings to determine the extent of agreement or disagreement between rating agencies. In this remaining sample of eight utilities (without Atco Inc.) only one company, Westcoast Energy, was assigned a comparable rating by DBRS and S&P. In five of the remaining seven cases, the DBRS rating was higher than the S&P rating. In the other two cases, S&P rated the companies more highly.

A well-known Canadian investments textbook documents that disagreements between bond raters are common:

> "A study of 55 Canadian issues that were rated by at least one US and one Canadian rating agency showed that the latter assigned a higher rating in 45 cases, lower in 4 and the same in 6. On average the ratings by the Canadian raters were one quality level higher. This has led some analysts to conclude that the Canadian bond raters are systematically biased. Other analysts, however, point out

[22] As argued in Ms. McShane, page 12, in evidence, and in Mr. Falconer, page 14, of evidence.

> that the Canadian firms are more familiar with the domestic market and may uncover aspects of the debt issuer's financial condition overlooked by S&P's and Moody's".[23]

Bond rating agencies often disagree and ratings of the same company often differ by one "notch" between rating agencies. For this reason, it is highly unlikely that a downgrade of one notch would have a material impact on a utility as long as it remained BBB or better (investment grade).

Kryzanowski and Ménard conducted a comprehensive study of bond rating migrations (movements) for senior, unsecured, long-term bonds rated by the Canadian Bond Rating Service (CBRS) for 395 corporate issuers over the 25-year period 1973-1998, and by Moody's for 195 corporate issuers over the 16-year period 1982-1998.[24] The sample consists of all bond issues found in CBRS's proprietary database, Moody's Credit Opinions and Bloomberg. Their major findings of relevance here are:

- The rating drift ratios (a measure of whether bond rating movements have predominantly improved or deteriorated) differ appreciably for CBRS- and Moody's-rated bonds, especially during the 1985-1989 period.
- The rating drift ratios show that the bond ratings of Canadian issuers improved during each of the years in the 1975-1980 period, and they deteriorated substantially during each of the years in the 1982-1983 and 1990-1993 period.
- The highest annual rating activity ratios (i.e., the number of rating changes during a year divided by the number of issuers rated

[23] W.F. Sharpe, G.J. Alexander, J.V. Bailey, D.J. Fowler and D.L. Domian, *Investments*, Third Canadian Edition, Prentice Hall Canada, Scarborough, 2000, p. 371.
[24] Lawrence Kryzanowski and Jocelyne Ménard, 2001, Migration behavior of long-term bond ratings of Canadian corporate issuers, *Canadian Investment Review* (Fall).

during the year) of about 65% in 1982 and 76% in 1991 occurred during the last two economic recessions.

- The highest sub-groups of B-rated debtors exhibited an increasing tendency to be upgraded as the tracking horizon lengthened.

Q. Do you have further evidence to support your view of bond ratings and their impact?

A. Yes, we do. Just as bond rating agencies often disagree, institutional investors, bond traders and other sophisticated bond market participants often challenge bond raters' assessments. A number of academic papers document the lag between information becoming publicly available about a company and the upgrading or downgrading of its debt by rating agencies. A current example of rating lag features Enron's debt which continued to enjoy an investment grade rating until shortly before the company declared bankruptcy. More generally, a number of academic papers have estimated the rating lag as being up to 1 ½ years in length.[25]

This suggests that bond investors form their own views of the risk of individual bonds which are often more finely tuned than those of the rating agencies and may not be dissuaded from holding bonds that have been downgraded. A passage from the textbook cited earlier verifies this:

> "Some institutional investors attempt to take advantage of the uncertainty surrounding a bond's rating…Thus an investor who purchases underrated bonds and avoids overrated bonds can

[25] Two examples are: M.I. Weinstein, The Effect of Rating Change Announcement on Bond Price, *Journal of Financial Economics* 6, 1978, pp. 329-350; and G. Pinches and J.C. Singleton, The Adjustment of Common Stock Prices to Bond Rating Changes, *Journal of Finance* 33, 1978, pp. 29-94.

construct a portfolio that will outperform a passively managed portfolio of similar risk".[26]

Analysts at Scotia Capital are currently applying this textbook bond trading strategy to NSPI and Emera bonds. On February 15, 2002, Stephen Dafoe, Scotia Capital fixed income analyst, put out a buy recommendation on the bonds of these two companies. We quote the conclusion of his recommendation:

"We think that NSPI, despite the BBB+ rating from Standard & Poor's, is still a very solid Canadian utility credit, and the NSPI bonds rightly trade more like many single-A (low) category utility bonds. Compared to traditional peers such as Gaz Met and Union Gas, NSPI represents good value, with very little difference in credit risk."[27]

Our point here is that, once again, there is little reason to believe that the downgrade to BBB+ by S&P will cause difficulties for NSPI.

Q. Would you comment on any public announcements made by either Emera or NSPI on the effect of the downgrade?

A. In a press release of February 15, 2002 by Emera, the impact of the downgrade was described as follows:[28]

"Late in 2001, Standard & Poor's (S&P) lowered its long-term corporate credit rating on NSPI to BBB+ from A; its senior unsecured debt rating to BBB+ from A-; and its preferred stock rating to P-2 (Low) from P-2. S&P noted the outlook is stable. S&P

[26] W.F. Sharpe, G.J. Alexander, J.V. Bailey, D.J. Fowler and D.L.Domian, *Investments*, Third Canadian Edition, Prentice Hall Canada, Scarborough, 2000, p. 372.
[27] S. Dafoe, Credit Analysis, Nova Scotia Power Inc./ Emera Inc., Scotia Capital, February 15, 2002.

> cited the Province of Nova Scotia's announcement that it intends to gradually introduce competition within the electricity sector as the reason for the change.

Based on our available credit and credit ratings, and past experience in public financing since privatization, NSPI expects to have access to capital when needed."

Q. Schedule 4 also contains data on ROEs for the companies in your sample. Do these data support your argument that a bond rating of BBB (high) or above is sufficient for a regulated electric utility?

A. Yes, they do. The ROE figures for 1999 and 2000 show that all but one of the companies earned positive ROEs in both years. The one company that did not, TransCanada, suffered losses due to a one-time event, a failed diversification program. Further, a current study on the Canadian electric utility industry by DBRS, concludes that actual earned ROEs typically exceed ROE targets set by regulators.[29] This strongly suggests that having a bond rating of BBB (high) did not impede these companies from profitably conducting their businesses.

Q. Turning from examining data to the realm of finance theory, what can we learn from finance theory about the appropriate level of the equity ratio for a regulated electric utility?

A. The first thing we can learn is to be suspicious of attempts to determine an appropriate equity ratio using a formula. Unlike other areas in finance, research on capital structure can offer only qualitative policy advice. To quote a leading, current corporate finance textbook:

[28] Emera Inc., Press release, Acquisitions boost Emera 2001 earnings, Friday February 15, 2002, 12:09 pm Eastern Time, p. 57. Available at: http://biz.yahoo.com/cnw/020215/emera_2001_earnings_1.html.

> "We clearly have no unique formula that can establish a debt-equity ratio for all companies."[30]

Q. In the absence of a formula, can you explain the key considerations in determining capital structure?

A. In the same textbook we find the following:

> "From a theoretical perspective and from empirical research, we present three important factors in the final determination of a target debt-equity ratio:[31]
>
> 1. Taxes. If a company has (and will continue to have) taxable income, an increased reliance on debt will reduce taxes paid by the company and increase taxes paid by some bondholders…
> 2. Types of assets. Financial distress is costly, with or without formal bankruptcy proceedings. The costs of financial distress depend on the types of assets that the firm has. For example, if a firm has a large investment in land, buildings, and other tangible assets, it will have smaller costs of financial distress than a firm with a large investment in research and development. Research and development typically has less resale value than land; thus, most of its value disappears in financial distress.
> 3. Uncertainty of operating income. Firms with uncertain operating income have a high probability of experiencing financial

[29] G. Lavalee, M. Kolodzie and W. Schroeder, The Canadian Electric Utility Industry, Dominion Bond Rating Service, November 2001, p. 49.
[30] S.A. Ross, R.W. Westerfield, J. F. Jaffe and G.S. Roberts, *Corporate Finance*, Second Canadian Edition, Toronto, McGraw-Hill Ryerson, 1999, p. 463.
[31] S.A. Ross, R.W. Westerfield, J. F. Jaffe and G.S. Roberts, *Corporate Finance*, Second Canadian Edition, Toronto, McGraw-Hill Ryerson, 1999, p. 463.

> distress, even without debt. Thus, these firms must finance mostly with equity. For example, pharmaceutical firms have uncertain operating income because no one can predict whether today's research will generate new drugs, and the product development process generally is long and costly. Consequently, these firms issue little debt. By contrast, the operating income of utilities generally has little uncertainty. Relative to other industries, utilities use a great deal of debt [emphasis added].

Q. What does consideration of these three factors tell us about the appropriate amount of debt for an integrated utility?

A. For any company, if we set aside factors 2 and 3 for a moment, factor 1 tells us that a company should use a large proportion of debt financing to reduce its cost of capital. Simply stated, factors 2 and 3 restrain the company's use of debt in order to reduce the cost of financial distress and the probability that it will occur due to low operating income. Turning from speaking in general about any company to focusing on a regulated electric utility, we believe that factors 2 and 3 are largely mitigated by the special features of this industry.

For an electric utility, the costs of financial distress (factor 2) are reduced because its assets make excellent collateral. Further, the regulation process allows the company to go back to the Board to apply for relief in the unlikely event that it does not earn its fair rate of return in a given year. We term this unlikely based on the DBRS study cited above which states that Canadian electric utilities typically earn more than their allowed ROEs. Additionally, in the extreme event that an electric utility became insolvent, it is highly likely that the regulator (and other governmental bodies) would work with the company to find new investors or a merger partner so that service (and thus, asset usage) would not be interrupted. This is what occurred with the bankruptcy of Pacific Gas and Electric Company in California.[32] As a result, the cost of financial distress is far lower than for a nonregulated firm.

A further example of such regulatory flexibility and understanding is the UARB ruling on amortization expense for NSPI for its permanently shut down Glace Bay generating station, which was taken out of service in 1995. An Emera press release describes this regulatory flexibility as follows:[33]

> In circumstances where the carrying value of an asset to be written off is significant, NSPI's regulated accounting policy provides for amortization of the net book value of the asset on a straight-line basis over five years. Instead of straight-line amortization, the UARB has allowed NSPI flexibility in determining the annual write-off of the Glace Bay station in order to support rate stability. For 2001, $3.0 million (2000 - $10.0 million) has been written off, and is included in amortization expense. The amount remaining to be written off over the next three years is $25.7 million, including allowance for funds used during construction recorded to December 31, 2001.

The third factor is the probability of financial distress. As stated in the quotation, this probability is low for utilities because operating income has low variability. In conclusion, we come back to the beginning of our answer to this question. If we set aside factors 2 and 3 (the costs of financial distress and the probability of financial distress), the theory

[32] K. Gaudette, Bankrupt Pacific Gas and Electric hopes to avoid state laws, Associated Press, *The Nando Times*, January 25, 2002, www.nando.net/business/story/228567p-2199342c.html.

suggests that a company should use a high proportion of debt. Our comments on factors 2 and 3 explain why it makes sense to downplay them in practice for this industry. With the focus then on the first factor, taxes, we would expect regulated electric utilities to be among the most highly leveraged industries.

Q. Your answer to the previous question addressed integrated electric utilities as a whole. How do you assess the business risk of NSPI?

A. Our answer focuses on uncertainty of operating income introduced earlier in our overview of important factors in the determination of capital structure. Factors that increase costs to a utility such as higher coal prices or a lower Canadian dollar do not necessarily increase business risk. Management can prevent these factors from increasing the uncertainty of operating income in several ways. First, it can forecast their impacts and build them into proposed pricing. In a fair regulatory environment, such costs will be allowed and passed on to customers. Second, management can engage in hedging to control the impact of such factors on operating income. Business risk is only increased if these two approaches to controlling risk fail. We now apply this framework for assessing business risk to NSPI.

NSPI is a monopoly in a stable, mature, market with limited competition. The company's asset base of around $3 billion makes it a mid-sized electric utility in the Canadian context. The customer base is spread relatively evenly among industrial, residential and commercial customers. The company has produced stable earnings without a rate increase since 1996. It has achieved this by cutting costs and financing all expenditures from cash flows. In its mature market, generation capacity is comfortably

[33] Emera Inc., Press release, Acquisitions boost Emera 2001 earnings, Friday February 15, 2002, 12:09 pm Eastern Time, pp. 55 and 56. Available at:

above projected demand and there is little need for capital expenditures. The current economic slowdown will slow growth in demand but growth should resume with economic recovery in 2003 and beyond. Additionally, offshore gas development is expected to feed economic growth in Nova Scotia longer term.

Electricity rates in Nova Scotia are "among the highest in Canada" due to reliance on coal generation and limited scale economies in a small market according to a DBRS report.[34] This could make it attractive for outside competitors to enter the market but limited interconnection capacity means that technical factors protect NSPI from competition from outside suppliers. The main potential outside supplier is Hydro-Quebec, however, U.S. markets with their higher rates make a more attractive target for Hydro-Quebec than does Nova Scotia.

High costs also open a threat that load could be lost to natural gas as the Sable gas becomes available between 2004 and 2007. This load loss could occur due to development of competing in-province suppliers building gas-fired plants or from conversion to gas by industrial and retail customers. The threat from gas is not a substantial one during the test period for several reasons. First, gas infrastructure is still in the initial planning stage. Second, NSPI is prepared to offer more attractive "time of use" and "load retention" rates to retain industrial customers. Third, the only threat over the next 3-5 years on the residential side comes from replacement of electric water heaters with gas as well as heating in new construction and conversions in older homes. Replacements will be gradual because building infrastructure (transmission and distribution) takes many years and customer uptake takes time.

---

http://biz.yahoo.com/cnw/020215/emera_2001_earnings_1.html.

[34] Dominion Bond Rating Service Limited, Nova Scotia Power Inc., May 25, 2001, p. 2.

After 2001, NSPI will need to purchase most of its coal on the world market due to the closure of its contract supplier, Cape Breton Development Corporation. Global coal prices rose starting in the second half of 2000 and peaked in the first half of 2001. By late 2001, coal prices had declined and are expected to bottom out in 2002. Given the commitment for 2002 deliveries was made in 2001, 2002 coal costs will reflect the higher 2001 coal prices which combined with the low Canadian dollar, will increase NSPI's 2002 fuel bill. The decline in coal prices in 2002, however, should yield lower prices for 2003. This forecast notwithstanding, under cost of service regulation, expected increases in costs do not pose a threat to the regulated company as long as the regulatory mechanism works properly and promptly. The only threat comes from unanticipated cost increases.

These can be addressed by hedging. The company is presently forecasting coal needs and hedging the price on an annual basis by employing one-year forward fixed price contracts with suppliers. With the termination of the Cape Breton Development Corporation agreement, NSPI is not using any multi-year hedging options in its strategy. In addition, alternative sources for hedging coal price risk are developing as discussed in Section II of our evidence. Foreign exchange risk can also be hedged, which NSPI does, as there is a deep and liquid market for FX derivatives. As a result, NSPI's business risk associated with volatile coal prices and changing exchange rates can be managed.

The company will become fully taxable in 2004. However, as with any predictable cost increase, taxability should not impact business risk. A related issue concerns a dispute with Canada Customs and Revenue

Agency over capital cost allowances. Emera has described this issue in a press release as follows:[35]

> "NSPI has filed income tax returns for previous years that increase the tax depreciation (capital cost allowance) available to be deducted against the Company's future taxable income. Those returns were reassessed by the Canada Customs and Revenue Agency (CCRA), which disallowed the deductions claimed. A notice of objection has been filed with respect to the reassessments, and the issue is being litigated. In January 2002 NSPI received a favourable decision from the Tax Court of Canada with respect to CCRA's reassessment of its corporate income tax returns. The decision is subject to appeal and a determination of the amount of allowable deductions is still at issue. Without the benefit of this additional deduction, it is estimated that the Company's tax liability at December 31, 2001 would have been approximately $110 million (2000 - $79 million). If the Company is unsuccessful in this matter, it will apply to the UARB to recover these costs through the regulatory process."

The Tax Court decision is currently under appeal.

Environmental concerns are a potential risk to NSPI arising from its current dependence on coal. If greenhouse gas emission standards are raised to meet the Kyoto Accord, NSPI could face costs of upgrading its plants or potentially see some of its assets stranded. The regulator can mitigate this potential risk.

Risks arising from S02 and other pollutant emissions are also not a major issue due to several mitigating factors. The switch from high sulfur Cape Breton coal to cleaner imported supplies will cut down emissions.

[35] Emera Inc., Press release, Acquisitions boost Emera 2001 earnings, Friday February 15, 2002, 12:09 pm Eastern Time, pp. 26 and 27. Also, see pages 3 and 67. Available at:

Conversion of the Tufts Cove station to dual firing (heavy fuel oil and natural gas) and reliance on natural gas for new generation will further improve emissions. Further, although the Province's new energy strategy targets such emissions for reduction in 2005, this is not an issue for the test year.[36]

In 2001, the Nova Scotia government introduced a new energy strategy moving toward reregulation of the electricity industry. The strategy is documented in *Seizing the Opportunity: Nova Scotia's Energy Strategy*, Volumes 1 and 2.[37] In the context of the North American scene, the plan represents only a modest step and will not raise business risk to NSPI during the test period. The goal is to "adopt a very gradual and controlled transition in any restructuring of the Nova Scotia electricity market".[38] As a result, NSPI will operate in a more stable environment than utilities in Alberta, Ontario and many U.S. states where large-scale deregulation is underway.

The plan will be implemented by an electricity marketplace governance committee (EMGC) to be created by the government. It has four key elements targeted for implementation before 2005: (1) opening the wholesale market to competition, (2) allowing open access to the transmission system, (3) encouraging independent green power producers using wind generation and (4) introducing competition for future electricity generation. Examining each element in turn supports our conclusion of no significant increase in business risk.

---

http://biz.yahoo.com/cnw/020215/emera_2001_earnings_1.html.

[36] *Seizing the Opportunity: Nova Scotia's Energy Strategy*, Volume 1, p. 33 and Volume 2, Section 6.

[37] The key sections pertaining to electricity policy are Volume 1, pp. 25-31 and Volume II, Parts III and IV.

[38] *Seizing the Opportunity: Nova Scotia's Energy Strategy*, Volume 2, Part III, p. 11.

First, the plan will allow competition to NSPI at the wholesale level. This market segment includes just six municipal utilities and represents only 1.6% of the market in Nova Scotia.[39] Second, the plan will allow potential competitors to access NSPI's transmission grid. This will pose no real threat during the test period as there are no other significant suppliers or large users with cogeneration capacity in place.

Third, the plan encourages independent production of green power. The size of such supply is limited as producers are capped at 2.5% of current generation capacity (50 MW). Furthermore, green power is not competitive with NSPI's coal generated power. It is expected to require a surcharge premium.

Fourth, under the plan, competition in electricity generation is not proposed for the test period or the near future.

Our conclusions are consistent with the government policy document:

> "The proposed phased restructuring maintains most features of the present system. NSPI remains a utility that is regulated, based on its cost of service. It retains its obligation to serve Nova Scotian customers, while the market is gradually opened up to increased competition. The EMGC will recommend the long-term structure and timing of any future changes in Nova Scotia's electricity market".[40]

Overall, examination of the four key elements of the deregulation plan reveals no threats that will increase NSPI's business risk during the test period. More dramatic restructuring such as separating transmission,

[39] Exhibit 9A, Column 1, Nova Scotia Power Inc., Direct Evidence. December 18, 2001.
[40] *Seizing the Opportunity: Nova Scotia's Energy Strategy*, Volume 1, p. 27.

distribution and generation functions and replacing cost of service regulation with market prices will not be contemplated for implementation before 2005.

Emera's statements during the development of the Province's energy policy and on its release are consistent with our view. In its submission to the Nova Scotia Energy Strategy Task Force, Emera stated:

> "Emera believes the wise energy strategy for Nova Scotia begins with:
>
> - Nurturing local involvement in an expanding Nova Scotia natural gas industry
> - A staged but resolute approach to restructuring the electricity industry beginning with greater competition in power generation, and opening of access to the transmission grid…"[41]

When the new strategy was unveiled Emera's press release stated that the company "applauds the Nova Scotia Government's New Energy Strategy".[42]

Q. Please summarize the conclusions of your analysis of NSPI's business risk.

A. Our analysis shows that NSPI is in a favourable position with regard to the major factors causing business risk for a regulated electric utility in Canada. We conclude that, compared to its position at the last rate hearing in 1996, the business risk facing NSPI is substantially unchanged. We base this assessment on our view that the regulatory process and prudent management practices will combine to mitigate the potential risks we discuss. Further, given the relative lack of competition, mature market,

[41] Emera, Response to Nova Scotia Energy Strategy Discussion Paper, September 2001, Stora IR-140.

and slow progress toward deregulation, our view is that the business risk faced by NSPI is no higher than that faced by the average integrated electric utility in Canada. A similar comparison could be made to gas companies.

Q. Given your assessment of the business risk of NSPI as no higher than average for an integrated electric utility and little changed over the last five years what capital structure do you recommend?

A. In response to an earlier question, we briefly explained why we believe the determination of capital structure represents a qualitative judgement. Following that approach and dovetailing with the qualitative approach taken by Boards in past decisions, we arrive at our recommendation by developing a number of benchmarks for NSPI's common equity ratio.

First, we turn to Schedule 3 where we observe that the average actual equity ratio for utilities in our sample is 33.26% for 2000, the most recent year for which we have data. This represents one useful benchmark for the equity ratio for an integrated utility. Other benchmarks are useful for two reasons. First, like any sample average, our average equity ratio depends on the sample drawn and can vary somewhat for this reason. Second, as we indicated earlier, the average is based on equity ratios for traded companies which include nonregulated activities as well as regulated utilities.

As a check on our calculations we examine the equity ratios allowed by various Canadian regulatory bodies for the companies in our sample for which we obtained data from past Board decisions. The sample includes Atco Electric, Atco Gas North, Atco Gas South, B.C. Gas, Enbridge,

---

[42] Emera Inc., Press Release, Emera Applauds the Nova Scotia Government's New Energy Strategy, Wednesday December 12, 2001, 4:08 pm Eastern Time. Available at:

Pacific Northern Gas, TransAlta Transmission, TransAlta Distribution, TransCanada Pipelines and Westcoast Energy and is displayed in Schedule 5. In Schedule 5, we calculate the average allowed equity ratio for these 10 companies as 37.24%. In this sample, there is one clear outlier, TransAlta Distribution, which skews the distribution. In such cases, it is more appropriate to measure the typical outcome using the median ratio. Applying this approach, we calculate the median allowed equity ratio as 35.00%. This is around 2% above our average of 33.26% for the sample of integrated utilities in Schedule 3. The analysis in Schedule 5 reinforces our conclusion that the average "generous" equity ratio for an integrated electric utility is around 35% to 37%.

Q. Why do you call this average equity ratio "generous"?

A. We call it "generous" because it represents the result of a regulatory process in which Board decisions take as input the views of opposing parties each representing its own interest. We already showed how the regulatory process may be regarded as generous as it almost always results in the regulated companies earning an ROE in excess of the allowed return.

Focusing the discussion of generosity on the common equity ratio leads to a similar conclusion. Regulated utilities have little incentive to optimize the use of debt in their capital structures. Having a capital structure with insufficient debt increases the weighted cost of capital because equity is the most expensive form of financing. In the case of regulated utilities, this "extra" cost associated with insufficient debt may be recovered through the process of regulation. If the company can persuade its regulator to approve this unwarranted extra equity, there is no cost to the company from a higher cost of capital. If this occurs, then the regulated

---

http://biz.yahoo.com/cnw/011212/emera_ns_energy_plan_1.html.

company has unused debt capacity which can be a benefit to the parent holding company. The assets of the regulated utility can then serve as collateral to increase the borrowing power of the unregulated part of the holding company adding value for the shareholders. If this occurs, the shareholders gain unfairly at the expense of the customers of the regulated utility who have to pay higher rates to "compensate" the regulated utility for the cost of carrying unwarranted extra equity.

Q. Can you develop another benchmark common equity ratio from what was recommended and allowed by this Board in 1996 for NSPI?

A. Yes, we can. In 1996, this Board awarded NSPI a common equity ratio of a range of 33% - 35%. Our analysis of the environment facing NSPI shows that it is not today materially more risky than in 1996. Nor do we expect that this will change during the current test period. This suggests that a common equity ratio of 35% will continue to serve NSPI well in the test period.

Q. You have explained how your recommended common equity ratio of 35% is reasonable compared to actual and allowed common equity ratios for other integrated electric utilities and reasonable in light of past decisions of this Board. Do you have any other benchmarks?

A. Yes, another useful benchmark is the common equity ratio for gas utilities. Earlier in our evidence, we characterize the business risk faced by an integrated utility as equivalent to that of a gas utility. In Schedule 5, we can identify a subsample of five gas utilities for which we have data on allowed equity ratios: Atco Gas North, Atco Gas South, B.C. Gas, Enbridge and Pacific Northern Gas. The average allowed equity ratio for this subsample is 36.44%. This suggests that regulatory boards in Canada regard 36% - 37% as an appropriate allowed equity ratio for a gas company.

To test the reasonableness of this conclusion, we also examine the allowed equity ratios for the two gas companies identified by Scotia Capital as similar risks to NSPI: Gaz Metropolitain and Union Gas. The allowed equity ratios for these companies are 38.50% and 35.00%, respectively, averaging 36.75%. Once again, we find 36-37% as the range representing what Boards have allowed gas utilities.

Q. Please summarize the six benchmarks that are relevant in determining an appropriate common equity ratio for NSPI.

A. Schedule 6 contains a summary and shows that the six benchmarks range from 33% to 37% when rounded.

Q. Please summarize your recommendation for the common equity ratio for NSPI.

A. We form six estimates of the appropriate equity ratio for NSPI. The first is based on the average of actual equity ratios for nine utility companies. The second estimate is the average equity ratio allowed these companies by their regulatory boards. Our third estimate is the median allowed equity ratio for the same sample. The fourth benchmark is the equity ratio allowed NSPI in 1996 when its business risk was similar to what it is today. The fifth estimate is the average allowed equity ratio for 5 gas utilities chosen for their comparable risk. The sixth and last benchmark is the average allowed equity ratio for 2 comparable gas companies chosen by Scotia Capital. These benchmark equity ratios all fall in a narrow range of 33% - 37%.

The midpoint of this range is 35% and we believe that this remains a fair common equity ratio for NSPI for the test period. Our analysis uncovered no arguments favouring increasing NSPI's common equity ratio beyond 35%.

IV. RATE OF RETURN ON COMMON EQUITY

Q. How is this part of your evidence organized?

A. We begin with a discussion of the general regulatory principles that are appropriate in conducting our fair rate of return analysis. We then present our implementation of the Equity Risk Premium Test. For this estimation method, the recommended rate of return on equity is equal to the estimate of the risk-free rate plus the premium (or additional return) that investors require to bear the risk associated with an equity investment in NSPI. For the estimate of the risk-free rate, we use the estimate for the yield on long Canada's for 2002 determined earlier in Section II.

We then estimate the premium (or additional return) that equity investors require to bear NSPI's investment risk (commonly referred to as the own equity market risk premium or own equity premium for NSPI). Since NSPI's own equity premium is obtained by multiplying the equity market risk premium (i.e., the premium for investing in a well diversified equity portfolio such as the TSE300 index) by the relative investment riskiness of NSPI, we provide estimates of each of these two components in turn.

We first estimate the required market risk premium for Canadian equities based on historical and forward-looking estimates for Canada and the U.S., and recent evidence that suggests that previously estimated equity risk premia using realized returns have produced an upwardly biased estimate of required equity risk premia. The expected risk premia estimates of various academic and practitioner scholars, and of surveys of Canadian investment professionals are that equity risk premia in the future will be much lower than those historically, and may even be nil or negative. We argue using finance theory that most of the fundamental changes in the Canadian market imply that the equity risk premium is decreasing, and will decrease further in the future. We explain why the equity risk premium can be low, nil or negative given that the risk (standard deviation of returns) of equities is higher than the risk of bonds and cash only over short holding periods of one year but is lower than the risk of bonds or cash over longer holding periods of ten to twenty years depending on the evidence examined. We estimate an equity market risk premium of 3.90%.

We then estimate the relative investment riskiness or beta of NSPI as being 0.52, and show that the beta of utilities has been decreasing over time, although we make only a minimal adjustment for this latter observation. We then demonstrate that the two primary rationales that have been given for using the adjusted beta method when calculating the required rate of return on equity are not valid. We then multiply the estimate of the equity market risk premium by the estimate of the relative investment riskiness or beta of NSPI to obtain our estimate of the own equity premium for NSPI of 2.03%.

This is followed by the presentation of our “bare bones” cost of equity estimate, and the adjustment to the “bare bones” cost to compensate NSPI for potential equity flotation or issuance costs. We end this section with our return on equity recommendation for NSPI of 8.03%. Our return on equity recommendation allows NSPI a risk premium of 213 basis points over our forecast for long Canada yields of 5.9%.

Discussion of General Principles

Q. What regulatory principles have you found appropriate in conducting your analysis of the fair rate of return on equity capital for NSPI?

A. We believe that the regulatory process should ensure that NSPI earns a return on common equity that compensates investors for the risk level of its shares and enables NSPI to maintain its financial integrity and to meet its financial obligations. The shareholders' interests must be balanced with the interests of the customers of NSPI who are entitled to efficient and reliable service at fair rates.

Q. What rate of return test have you used to determine the fair rate of return on common equity for NSPI?

A. We identified various techniques that are commonly used for measuring the fair rate of return on equity both before this Board and in other jurisdictions. We have based our conclusions regarding the fair rate of return on common equity exclusively on the Equity Risk Premium Test. We do not employ the Comparable Earnings Approach because we believe that it is without merit and unsuitable for use in determining a fair rate of return on equity for a utility. Section V of our evidence includes a detailed discussion of this point.

<u>The Equity Risk Premium Test</u>

Q. What is the Equity Risk Premium Test?

A. The Equity Risk Premium (ERP) Test estimates the cost of equity capital for utility companies with respect to other publicly traded investment opportunities that are available to investors. It is an attempt to find the risk-adjusted "opportunity cost" for investing in the shares of utility companies. This cost is based on the gross rate of return required by equity investors; i.e., the rate of return required by equity investors before trade costs and taxes.

Q. What approach have you used to implement the Equity Risk Premium or ERP Test.

A. There are several ways to implement the Equity Risk Premium Test. The ERP Test which we conducted uses the following inputs:

1. the yield forecasted for 2002 for long Canada's (input #1);
2. the adjusted historical risk premium for the TSE300 over the period 1957-2001 (the adjustments are detailed below) (input #2);
3. the investment riskiness (market beta) of NSPI relative to the market portfolio as proxied by the TSE300 Index (input #3); and
4. an adjustment (if any) to preserve the financing flexibility of NSPI and to cover fees involved with potential equity offerings or issues (input #4).

The input estimates are combined as follows:

(Input #1) + [(Input #2) *x* (Input #3)] + (Input #4) = recommended rate of return on equity for NSPI

We now need to detail how we obtained the final estimates of each of the four inputs, and to present the recommended rate of return on equity for NSPI that results from a combination of the final estimates of the four inputs.

Long Canada yield estimate (input #1)

Q. What is your estimate of the long-term risk-free rate that will prevail during 2002?

A. As discussed earlier in Section II, we have forecasted the long-term Government of Canada bond rate to range from 5.85% to 5.95% with a midpoint of 5.9%.

Equity market risk premium estimate (input #2): Some measurement considerations

Q. What considerations go into the measurement of the market risk premium?

A. The market risk premium reflects equity investors' assessment of the expected (or required) return differential from investing in a diversified portfolio as compared to investing in the risk-free benchmark security. It indicates the total incremental return that equity investors require for bearing the non-diversifiable risk of the diversified portfolio relative to investing in the risk-free benchmark security. In Canada, the diversified portfolio is usually chosen to be a well-diversified equity market portfolio or index such as the TSE 300 Index. The reason is that this portfolio is well diversified when viewed from a domestic-only investment perspective. The equity risk premium occurs because risk-averse investors require a positive reward for bearing each unit of risk, and equities exhibit risk. The reward required for bearing each unit of risk increases, as investors become less risk tolerant, and decreases as investors become more risk tolerant. The equity risk premium is the total compensation that investors require to bear the total risk (in this case, non-diversifiable risk only) of the diversified portfolio. We use the equity risk premium here in a forward-looking sense to project the required return on a diversified portfolio.

Since the market only rewards investors for bearing non-diversifiable risk and individual investments are not well-diversified portfolios, this requires an estimation of the relative non-diversifiable risk or beta of each candidate utility relative to the diversified market portfolio. The equity risk premium is then adjusted upwards or downwards to reflect the relative **non-**diversifiable risk of the candidate utility relative to the diversified market portfolio. The lower non-diversifiable risk of NSPI relative to that for the diversified market portfolio necessitates a downward adjustment in the risk premium added to the forecasted long-term risk-free rate to calculate the cost of equity for NSPI.

Because the forward-looking or ex ante risk premium is difficult to observe, cost of equity studies typically rely on measurement of historical or ex post risk premiums. This approach involves thorny measurement issues because historical measures may be biased or noisy proxies for forward-looking variables.

One important difference between expected and realized risk premia relates to the occurrence of a negative risk premium. The expected risk premium measures the expected return differential of a well-diversified but risky portfolio of equities over risk-free government securities. Since investors are risk averse, they would not invest in equities unless they expected the risk premium to be non-negative. However, since realizations can differ from rational expectations, the historical or realized market risk premium can be negative for any given period of time.

To illustrate, the total return (i.e., dividend yield plus investment value change) for the TSE300 for 1990 was –14.80%. This resulted in a negative risk premium for 1990 when the risk premium is calculated using the average 3-month Treasury (T-) bill rate of 13.28%. This negative risk premium was not a good proxy of the risk premium expectation of equity investors at the beginning of 1990. As of January 2, 1990, those investors holding equities must have expected that equities would outperform T-bills over the year. Similarly, investors holding equities must not have expected the negative total returns achieved by the TSE300 in 1992, 1994, 1998 and 2001.

To address this potential difficulty with historical data, return on equity studies generally employ periods of at least ten years so that the realized market risk premium is positive. Also, the difference between the average realized and the average expected risk premia should diminish, as the measurement period gets longer. However, due to fundamental shifts in economies and/or markets (technically, referred to as regime shifts), the use of too distant time periods may result in the inclusion of time periods that are no longer representative of currently possible market returns and/or market risk premia. For example, fundamental changes have occurred over time in the level of market integration across international markets, the level of market frictions (particularly, trade costs), and so forth.

A second difficulty arises because the market risk premium is time-varying. Ceteris paribus (everything else held equal), the market risk premium will change over time, and can change drastically, with changes in the risk-free rate, risk tolerance of the representative investor, and the set of available investment opportunities.

A third difficulty arises because a period with a declining required equity market risk premium is likely to coincide with a temporarily increased realized equity market risk premium. Peter A. Diamond, Institute Professor at M.I.T., states this as follows for the U.S. market:[43]

> "It is important to recognize that a period with a declining required equity premium is likely to have a temporary increase in the realized equity premium. This divergence occurs because a greater willingness to hold stocks, relative to bonds, tends to increase the price of stocks. Such a price rise may yield a higher return than the required return. For example, the high realized equity premium since World War II may be in part a result of the decline in the required equity premium. Therefore, it would be a

[43] Peter A. Diamond, What stock market returns to expect for the future?, *An Issue in Brief*, Centre for Retirement Research at Boston College, No. 2, September 1999, p. 2.

> mistake during the transition period to extrapolate what may be a temporarily high realized return."

Similarly, Glassman and Hassett argue that the equity premium will be dramatically less than it has been in the U.S. in the past. They raise the possibility that the realized rate of return in the intermediate period will be higher than in the long run if the required equity premium declines.[44]

Q. What criteria need to be satisfied when deciding on what time period yields relevant data for calculating historical equity market risk premia in Canada?

A. The primary criteria for making this decision is that the time period should have data that are reliable and are for a comparable proxy of the market portfolio.

Q. What period of time satisfies these criteria for the Canadian market?

A. In Canada, such data are available on the TSE300 Index from 1956. The available Canadian equity market data prior to 1956 are usually obtained by splicing together series for equity portfolios with inconsistent formation characteristics. Because of the existence of interest rate controls and the absence of a Canadian money market to price fixed income securities, the data on fixed income securities are also of poor quality prior to 1956. For these reasons, we use post-1956 data for our primary tests. As a check on our results, we also examine returns prior to and after 1956.

Q. How should the historical market risk premium be calculated?

[44] James Glassman and Kevin Hasset, Are stocks overvalued? Not a chance*, Wall Street Journal*, March 30, 1998; and Stock prices are far too low, *Wall Street Journal*, March 17, 1999.

A. The historical market risk premium generally is calculated using holding period returns for a market proxy and for a risk-free proxy. In academic research on Canadian markets, the TSE300 index and the T-bill rate generally are used as the proxies for the market and the risk-free rate, respectively. In contrast, in the rate setting process, the risk-free rate is proxied by the more risky long Canada. Furthermore, in the rate setting process, the estimated market risk premium, after being properly adjusted for non-diversifiable risk differences between the candidate utility and the market, is added to the yield (not expected holding period return) on long-term Canada's to get the cost of equity estimate for the candidate utility. The implications of these inconsistencies need to be addressed in any determination of the cost of equity for a specific utility. Consequently, we return to these issues as we describe the steps we follow in our equity risk premium tests.

Equity market risk premium estimate: The appropriate average of historical annual data

Q. When is it preferable to use the arithmetic and the geometric average historical market risk premium?

A. It is preferable to use the geometric average (mean) historical risk premium when measuring historical holding period performance. The reason is that the geometric mean exactly represents the constant rate of return that is needed in each year to exactly match actual performance over that past investment period.[45] This is the reason why Canadian

[45] The superiority of the geometric mean over the arithmetic mean is easily shown using an example drawn from L. Kryzanowski, *Investment and Portfolio Management* (Montreal: Institute of Canadian Bankers, 1996), p. 82. The example concerns the investment portfolio of Mr. John Velco whose investment portfolio increases from $200,000 to $400,000 during the first year for an annual return of 100%, and then returns to its original $200,000 value during the second year for an annual return of –50%. The arithmetic and geometric mean annual returns are 25% and 0%. Of course, the correct constant annual return has to be 0% since the beginning and ending portfolio values are identical.

mutual funds are required to disclose compound rates of return, which is just a different name for a geometric mean return. Similarly, the annual yield-to-maturity quoted on a long-term bond is an annual geometric return.

It is preferable to use the arithmetic mean historical market risk premium when making investment decisions for a one-period investment horizon where investment horizon is identical to the interval of time over which the historical returns are measured. To illustrate, if historical market risk premia are measured using annual returns, the future investment horizon should be one year. The reason is two-fold. First, the arithmetic mean is an unbiased estimate of an investment's expected future risk premium for a single period investment horizon. Second, investment decisions require a measure of the mean risk premium that does not depend on risk because investment decisions use separate expected return and risk inputs to build a portfolio that has an optimal return-to-risk trade-off. In contrast, risk premium determination requires a measure of the mean risk premium that reflects both risk and the time value of money.

It is preferable to use the geometric mean historical market risk premium when determining the cost of equity for rate setting if the only criterion is to ensure that equity investors are adequately compensated for the investment risk that they are bearing. If we introduce an additional criterion that the firm is allowed a higher return to ensure financial integrity, this is easily achieved by using some weighted average of the geometric and arithmetic mean historical market risk premia. The two means are identical when there is no risk. Thus, for the case of no market risk, the use of the annual arithmetic mean market risk premium over the annual geometric market risk premium provides no extra risk premium for ensuring financial integrity, as none is needed. When risk is present, the positive numerical difference between the arithmetic mean market risk premium and the geometric mean market risk premium grows with higher levels of risk. Thus, the use of the annual arithmetic mean market risk premium over the annual geometric mean market risk premium provides more risk premium coverage for ensuring financial integrity for greater levels of market risk.

This is best illustrated by referring to the example in Schedule 7. In this example, we show what happens to the final wealth position of two typical investors who each invest $6,592.58 in two different utilities at the end of 1989. For ease of presentation, we assume that each utility is well diversified and has the same investment risk and return as the market. The first investor invests in the first utility whose value compounds at the annual geometric mean return for the TSE300 over the ten-year period 1990-1999. As expected, the terminal value of the investment in the first utility by the first investor is equal to the ending value of $17,960.99 for the TSE300 index for 1999. Thus, the first investor receives the same return as given by the market on his utility investment. In contrast, the second investor invests in the second utility whose value compounds at the annual arithmetic mean return for the TSE300 over the ten-year period 1990-1999. As expected, the terminal value of the investment in the second utility by the second investor of $19,759.06 is now greater than the terminal value of $17,960.99 for the TSE300 index at year-end 1999. Thus, this second investor has achieved what finance professionals refer to as an abnormal return or “free lunch”, and investment professionals refer to as a positive alpha. In fact, the second investor has achieved an above market return per dollar of initial investment without incurring any additional risk when performance is benchmarked against the performance of the market.

From the perspective of the second utility, the difference between the annual geometric and arithmetic mean returns of approximately 106 basis points represents the amount of return that it can forego before it begins to disappoint its equity investors. In a rating setting forum, the full 106 basis points would represent a very expensive insurance premium to pay annually to ensure that a utility is guaranteed financial integrity.

Q. What do you conclude from your assessment of whether the geometric or arithmetic mean market risk premium should be used in the Equity Risk Premium (ERP) Test?

A. We conclude that the use of the geometric mean market risk premium is preferable if an additional adjustment is to be made to ensure the financial integrity of a utility. We conclude that, since the use of the arithmetic mean market risk premium already includes an adjustment (generally sizeable in terms of the geometric mean), no additional adjustment should be made to ensure financial integrity if the arithmetic mean market risk premium or some weighted-average of the geometric and arithmetic mean market risk premia are used in the Equity Risk Premium (ERP) Test.

Equity market risk premium estimate: Impact of market frictions

Q. Are there any market frictions that should be kept in mind when examining historical market risk premia?

A. Historical market risk premia studies are based on gross and not net returns, although investors make decisions between investments of different risk based on net and not gross returns. There are at least two frictions that cause a divergence between gross and net returns from investment.

The first major market friction is taxes. As tax rates increase, investors require higher gross returns from investment to get the same net (after-tax) return, and vice versa when tax rates decrease. Similarly, if the tax rate reduction differs by type of asset, then their gross returns will change by different amounts to maintain their same net returns. To illustrate, if the effective tax rate on the return of a non-dividend-paying growth stock declines by more than that on the return of a long-term government bond, then the drop in the gross return of the stock to maintain its after-tax return will exceed the drop in the gross return of the bond. In turn, this will decrease the required equity market risk premium, all else held equal.

The second major market friction is trade costs, which include liquidity costs (as measured, for example, by the effective bid-ask spread), broker commissions, and so forth. In general, the gap between gross and net returns increases as trade costs increase, and decreases as trade costs decrease.

Equity market risk premium estimate (input #2): Initial Canadian estimate based on historical data

Q. What is your interpretation of the relevant data on historical market risk premia in Canada?

A. We begin with the longest period for which we have reliable data for a market proxy that has reasonably similar rules in how it is constructed over time. These are the data for the TSE300 index over the time period 1957-2001. The historical estimates of the mean annual risk premia of stocks over the risk-free rate and over long Canada's are reported in Schedule 8. The mean market risk premia range from 2.29% to 2.86% with a point estimate of 2.575% when measured against long Canada's, and from 3.83% to 3.95 % with a point estimate of 3.89% when measured against T-bills. It is important to note that the corresponding geometric mean market risk premia are considerably lower. The geometric mean market risk premia range from 1.61% to 1.69% when measured against long

Canada's, and from 2.69% to 2.80% when measured against T-bills. The higher risk premium for T-bills reflects the historical positive slope of the yield curve.

In the interest of being very conservative in ensuring that the market risk premium is not understated, we arrive at a starting estimate of the market risk premium by using the rounded-up equally weighted average of the above two point estimates of the arithmetic means: 2.575% measured against long Canada's and 3.89% measured against T-bills. This yields a starting point estimate of the equity market risk premium of 3.25%. Thus, this contains an extremely generous premium for maintaining the financial flexibility of NSPI.

Equity market risk premium estimate: Possible rationales for adjusting the initial Canadian estimate

Q. Do you have any reason to expect that there have been some fundamental changes over the 1957-2001 period that have had an impact on the equity market risk premium?

A. Yes, there are at least 7 fundamental changes over this period that have had an impact on the equity market risk premium.

A first fundamental change is the introduction of a capital gains tax in Canada in 1972. All else held equal, the introduction of a capital gains tax results in Canadian taxable investors increasing their required market risk premium on a before-tax or gross basis.

A second fundamental change is the more recent successive reductions in the capital gains inclusion rate. All else held equal, the successive reductions in the capital gains inclusion rate reduce the tax bite on an important component of investor returns from equity investment, and change the relative tax bite between equity returns and fixed income returns in favor of equity returns. Thus, all else held equal, the successive reductions in the capital gains inclusion rate result in Canadian taxable investors decreasing their required equity market risk premia on a before-tax or gross return basis.

A third fundamental change is the increased willingness or tolerance of Canadian investors to bear risk. All else held equal, an increase in investor tolerance to bear risk lowers the required equity market risk premium. This is easily seen in the world of the CAPM where the intercept and slope of the capital market line (CML) are the “price of time” and the “price of risk or market risk premium”, respectively. If all else is held constant, then the slope of the CML increases (decreases) as the market becomes less (more) risk tolerant.

A fourth fundamental change is the large inflow of funds into the market without a corresponding increase in viable investment opportunities. Based on data from the U.S. Federal Reserve Board, the number of shareholders increased by 32 million between 1989 and 1998, and stood at 84 million in the late 1990s. Based on a study conducted in 2000 for the Toronto Stock Exchange and World Investor Link, the proportion of Canadians that are shareowners is 23% in 1989, 37% in 1996 and 49% at the time of the study.[46] This large influx of capital chasing a set of viable investment opportunities that is growing at a slower rate has led to a rapid increase in equity prices and a concurrent decline in the market risk premium. According to Diamond (1999, p. 2), widening the pool of investors in the stock market through greater investor participation rates should lower the required risk premium.

[46] As reported in William Hanley, Bear market shakes our faith in stocks, *National Post*, February 2002, p. SM11.

David Rosenberg, Chief Canadian Economist & Strategist at Merrill Lynch, acknowledges this over-investment as follows:[47]

> "In our view, what triggered this bear market, in contrast to prior bear markets, was a recession induced by years of over-investment in technology, triggering massive excessive capacity, …"

A fifth fundamental change is the more recent use of very aggressive accounting practices by firms to maintain or enhance their earnings growth. To illustrate public concern with this issue, Mr. Paul Volcker, a former Federal Reserve chairman, stated in recent testimony before the U.S. senate that Enron's collapse exposed just one symptom of the accounting industry's problems. He went on to state that: "We have had too many restatements of earnings, too many doubts about 'pro-forma' earnings, too many sudden charges of billions of dollars to 'good will,' too many perceived auditing failures accompanying bankruptcies to make us at all comfortable." He went on to urge the adoption of international accounting standards "that reasonably reflect underlying economic reality".[48] Mr. Donald Coxe, Chairman and Chief Strategist of Harris Investment Management, describes aggressive accounting as follows:[49]

> "What does "aggressive accounting" mean? Well, the Nasdaq 100 companies reported $82.3 billion in combined losses to the SEC for the first three quarters of last year, but told shareholders they'd had profits of $19.1 billion, (according to SmartStockInvestor.com). The Big Five on Nasdaq (Microsoft, Intel, Cisco, Oracle, and Dell), reported $4.4 billion in net earnings to the SEC, while pleasing stockholders with reported earnings of $13.4 billion."

Coxe (p. 12) goes on to note:

[47] As reported in David Rosenberg, Analysis: Not your average bear, *National Post*, February 2002, p. SM4.
[48] Kellman, Laurie, Associated Press, Volcker says Enron only one symptom of problems in accounting industry, 2/14/2002.

> "Estimates for earnings on the S&P500 this year range from $37 to $57, depending on which accounting numbers are used. The stock market is, therefore, either wildly overpriced, or a bargain, depending on whether one uses pro forma, reported, adjusted, or GAAP earnings."

Other examples of aggressive accounting are reported in Schedule 9.

A sixth fundamental change is the rapid growth in mutual funds, index products, derivative products and exchange-traded funds. Since this allows small investors to acquire and manage diversified portfolios at lower cost, the required risk premium will be lowered since greater diversification means that these investors face less risk. Also, since the reduction in cost has been higher for equity versus fixed income investment vehicles, the equity risk premium relative to historical levels can be expected to decline. [50]

A seventh fundamental change is the continual evolution of the industrial composition of our economy and markets. This is neither unique nor confined to our more recent past. These changes are captured, albeit not perfectly, by market indexes such as the TSE300 where the relative index weightings of industrial sectors with above-average and below-average economic prospects increase and decline over time. Since stock prices are based on the perceptions of the future economic prospects of firms, these prospects are reflected in the current prices, and thus, index weightings of firms in indexes such as the TSE300 index. This is why the stock market is used as a leading indicator to forecast the economy in both Canada and the U.S.

[49] BMO Nesbitt Burns, *Basic Points*, February 8, 2002, p. 5.
[50] Similar points are made about mutual funds by Diamond (1999), p. 2.

Current stock prices also can reflect investor exuberance or false or misleading corporate information. This leads to what many investment professionals refer to as bubbles or mania. Bubbles can be firm-specific or market-wide. Since the list is long, three more recent firm-specific bubbles are Bre-X, Enron and Nortel (a $350-billion drop in market cap). Market-wide bubbles include the U.S. (and other) market in 1928-29, the Japanese market in the early 1990s, and the recent high-tech (or dot.com) bubble in 1998-2000. Some quotes from professional commentaries describing the latest up and down movements in high-tech prices as a bubble or mania are summarized in Schedule 9.

Q. What lesson should one learn from this high-tech bubble when determining the equity market risk premium?

A. The major lesson that one can learn from this latest high-tech bubble is that one should not determine that markets or the economy have changed fundamentally based on only three or four years of data. Thus, removing the bubble years suggests that the representation of the high-tech sector in the TSE300 has been gradually increasing over time to reflect the changing economic importance of the various industrial sectors in the Canadian economy. This commonly happens in the same market over time as some industries become more important economically and others become less important.

Equity market risk premium estimate: Canadian estimates for other time periods

Q. How do these equity market risk premium estimates change when you examine Canadian market data for other time periods?

A. We first examine two longer time periods, and then we examine one shorter time period. The first longer time period is the post war period 1948-2001. As seen in Schedule 8, the arithmetic average equity market risk premia over the yields of bonds and T-bills over the 1948-2001 period are 5.47% and 6.73%, respectively. Since the first three or four years are likely to be enhanced by the cessation of World War II and pent-up consumer demand, we recalculate the equity market risk premium with the removal of the three years in the period 1948-1950. The removal of the first three years post-war from this longer time period reduces the arithmetic average equity market risk premium over bonds by 123 basis points to 4.24%.

The second longer time period is for the longest available time series of annual returns for equities and “long Canada's” that is available from the Canadian Institute of Actuaries (CIA). It covers the 1924-2000 period and yields a geometric mean annual market risk premium estimate over the return on long Canada's of 4.43%.[51] Over various 25-year periods, the CIA reports geometric mean annual market risk premium estimates of 4.30% for 1926-1950, 6.22% for 1951-1975, and 1.98% for 1976-2000. As expected, given our previous discussion of the merits of arithmetic and geometric means, only geometric mean annual returns are reported in this publication. However, the time series used by CIA essentially requires the splicing of time-series from various time periods together to form one long-time series for stocks and bonds (essentially combining apples with oranges). In turn, this makes the market risk premium estimates for this longer data series of somewhat dubious reliability.

The shorter time period is the more recent period 1980-2001, where the arithmetic mean annual market risk premium of Canadian equities over the

[51] Canadian Institute of Actuaries, *Report on Canadian Economic Statistics, 1924-2000*, September 2001, p. 8.

yield on T-bills is only 2.53% and over the yield on long Canada's is 1.57%.

Equity market risk premium estimate: Canadian forward-looking estimates

Q. Are there any expectations data on Canadian stock and bond returns and the equity market risk premium that you considered in determining your estimate of the equity market risk premium?

A. Yes, we considered the forecasts by 81 Canadian and international investment managers contained in the *2002 Fearless Forecast* authored by W.M. Mercer. The study notes on page 3 that perhaps its most interesting result is the relationship between managers' expectations for bond returns versus stock returns. A risk premium estimate of 3.0% over long Canada bonds is obtained based on the expectations of the managers that the TSE300 Total Return Index (TRI) will beat the Scotia Capital Universe TRI by 3.5% over the next five years, and the assumption that the yield curve will continue to be positively sloped. The study notes that this number is lower than the historical average and lower than expectations in recent *Fearless Forecasts*, but is higher than the 0% that some analysts believe is reasonable to expect and is higher than the 2.0% to 2.5% that is indicated by Mercer's own research. Douglas Porter and David Watt, from the Economist Research Unit at BMO Nesbitt Burns, state that a reasonable range for the future equity premium is between 1.25% and 1.75%. They note that this leads to "real equities returns over the medium term [that] will closely resemble their historical norm" [our insertion].[52]

[52] Douglas Porter and David Watt, Returning to equity returns, *Focus*, Economic Research, BMO Nesbitt Burns, February 22, 2002, pp. 4&5.

Equity market risk premium estimate: Historical and forward-looking estimates for non-Canadian markets

Q. Is there any value in examining the U.S. experience?

A. Yes, there is. First, as markets become more integrated, foreign-exchange and risk-adjusted returns become approximately equal across various world markets. This is referred to as the "law of one price". Second, examining other markets provides a test of how reasonable the Canadian estimates of the equity market risk premium are. However, one must be careful not to introduce an ex post selection bias when selecting which other market(s) to examine. Choosing the market that has grown to be the largest market or has had the best ex post performance introduces an ex post selection bias because its historical equity market risk premium will be among the highest among world markets. This is what happens when the U.S. equity market is chosen for this purpose. This is much like assessing the performance of the Montreal Expos by using the performance of the New York Yankees in baseball. This also is why the Japanese market for the last thirteen years is not chosen. The Japanese market is at a level that is about 70% of its peak in 1989.[53]

In their book, Campbell, Lo and MacKinlay (1997)[54] report that the mean excess return of stocks over commercial paper is about 6% in the U.S. when asset returns are measured annually over the period 1889 to 1994.

We calculate the arithmetic mean annual excess of the return on the S&P500 index over long U.S. treasuries for the period 1957-2001. As expected given our prior knowledge that the U.S. market is known to have

[53] As reported in: William Hanley, Bear market shakes our faith in stocks, *National Post*, February 2002, p. SM11.
[54] J.Y. Campbell, A.W. Lo and A. Craig MacKinlay, *The econometrics of financial markets* (Princeton, New Jersey: Princeton University Press, 1997).

significantly outperformed the Canadian market historically, we find that the arithmetic mean annual excess is a high 5.63% when measured against the yield for long U.S. treasuries.

Q. What estimates of the equity market risk premium have been reported in the more recent literature for the U.S. and other developed countries?

A. A review of this literature is presented in Appendix B. Two recent studies estimate realized and expected equity risk premia for 15 countries over a 101-year period. They find that the expected equity risk premium, when measured **against short-term** government bonds over the 101-year period, is 4.0% and 3.5% for the U.S. and a sample of 15 developed countries including the U.S., respectively. All of the studies reviewed in Appendix B conclude that the U.S. equity risk premium has narrowed substantially, and is expected to be lower in the future. The U.S. forward-looking equity risk premium estimates vary from zero or slightly negative to about 6%. Interestingly, a working paper by Ibbotson and Chen (2001) contains the highest estimate. According to the legendary Warren Buffett in December 2001:[55]

> "I would expect now to see long-run returns (in stocks) in the neighbourhood of 7% after costs. Not bad at all – that is, unless you're still deriving your expectations from the 1990s."

In his 2001 letter to shareholders, he reiterates his expectations as follows:[56]

> "Our restrained enthusiasm for these securities is matched by decidedly lukewarm feelings about the prospects for stocks in general over the next decade or so…. Charlie and I believe that American business will do fine over time but think that today's

[55] As reported in Douglas Porter and David Watt, Returning to equity returns, *Focus*, Economic Research, BMO Nesbitt Burns, February 22, 2002, p. 4.

[56] Warren E. Buffett, Warren Buffett's Letters to Berkshire Shareholders 2001, February 28, 2002, p. 15. Available at: http://www.berkshirehathaway.com/letters/2001pdf.pdf.

equity prices presage only moderate returns for investors. The market outperformed business for a very long period, and that phenomenon had to end. A market that no more than parallels business progress, however, is likely to leave many investors disappointed, particularly those relatively new to the game."

Equity market risk premium estimate: Relative risk of equity versus bonds

Q. How can the required equity risk premium be zero or negative given the belief that equities are more risky than bonds?

A. In terms of investment risk, equities may not be more risky than bonds. Many studies find that the ratio of the standard deviations of return of equities to bonds is above one, approaches one, and goes below one as the measurement period over which returns are measured gets longer.

In a recent study, W.M. Mercer evaluated the investment riskiness of Canadian stocks, bonds and cash over varying time horizons.[57] These results confirm existing U.S. results that:[58]

- Stocks are riskier than both bonds and cash over shorter time horizons, such as one year.
- Stock returns exhibit decreasing variability (measured by the standard deviation of returns) over time.
- For 20-year rolling time periods, stocks outperform bonds in terms of returns, and both asset classes have about the same risk.

[57] William M. Mercer Limited, Are stocks riskier than bonds? New Mercer research indicates that stocks become less risky in the long run, news release, February 15, 2001. Available at www.wmmercer.com/Canada/english/resource/resource_news02152001.html.

[58] The historical results reported by the CIA suggest that the standard deviation results are obtainable for periods as short as 5 years. Over 5-year periods, they report standard deviations of returns of 6.75%, 5.69% and 3.53% for stocks, long Canada's and 91-day T-bills, respectively. Over 10-year periods, the corresponding standard deviations are 2.98%, 4.59% and 3.26%. Canadian Institute of Actuaries, *Report on Canadian Economic Statistics*, 1924-2000, September 2001, Table 2A, p. 8.

- For 30-year rolling time periods, stocks outperform both bonds and cash, and stocks are less risky than both bonds and cash.

Thus, based on the long-run perspective underlying rate of return rate setting, equities may in fact not be more risky than traditional debt instruments from an investment risk perspective. Since the equity risk premium is predicted on the notion that stocks are riskier than bonds, these results attack the validity of a fundamental notion behind the existence of an equity risk premium.

Equity market risk premium estimate: Use of non-Canadian estimates

Q. Do you use any explicit or implicit weighting scheme when you consider the equity market risk premia in Canada and in foreign countries, such as the United States?

A. We use no explicit or implicit weighting scheme. Our approach is to use this additional information on foreign equity risk premia to subjectively adjust the initial point estimate of the Canadian equity risk premium in its range (or distribution) of possible equity risk premia.

As we have noted in Appendix D, the use of an explicit or implicit weighting scheme ignores the fact that, if the subject utility traded in the foreign market, its beta is likely to be different than it is in the Canadian market. For example, in Appendix D, we argue that if the equity market risk premium is higher in the foreign than Canadian market, the subject utility is likely to have a lower beta in that foreign market than in the Canadian market.

Fortunately, we can test this argument. Four of the utilities in our sample of nine utilities are cross-listed on the Toronto Stock Exchange and the New York Stock Exchange. They are (with their NYSE ticker symbol in parentheses): Enbridge Inc. (ENB), TransCanada Pipelines Ltd. (TRP), Westcoast Energy Inc. (WE) and Transalta Corp. (TAC). We eliminate TAC because it does not have at least five years of monthly data on the NYSE, and we note that the trading in ENB is quite thin. Thus, we examine the average results for the sample of TRP and WE with/without ENB.

This is a particularly “clean” test because we can examine the beta estimates and own utility risk premia in both markets for exactly the same companies in terms of business and financial risk. Shares in both markets for the same company need to provide the required risk-adjusted return for investors in both markets to hold the shares. Furthermore, any contemporaneous price differences in both markets will be small because of arbitrageurs.

Our beta estimates for the three cross-listed utilities are reported in Schedule 10 for eight rolling five-year periods over the period 1990-2001 for the TSE and the NYSE, and over the full period 1990-2001. As expected, the beta estimates are lower for the same firm using NYSE data compared to using TSE data. To illustrate, the mean NYSE beta for the three utilities is 0.220 compared to its mean TSE beta of 0.374 based on the eight rolling five-year periods. The corresponding values are 0.183 and 0.073 based on the full period 1990-2001. The betas based on the rolling five-year periods are higher because they overweight the periods over which the beta estimates are higher.

To show the implications of these different betas, let us assume for argument purposes that the appropriate equity risk premia for the Canadian and U.S. markets are 3.5% and 6%, respectively. If we then use the higher mean beta estimates for the sample of three utilities of 0.374 and 0.220 for Canada and the U.S., respectively, we obtain the same rounded-off mean own utility sample risk premia of 1.3% for the Canadian and U.S. markets. If we repeat this calculation without the utility with the thin trading problem (namely, Enbridge), we still obtain quite similar own utility sample risk premia of 1.4% and 1.8%, respectively. These results are what one would expect given the high level of integration between the Canadian and U.S. markets.[59]

Equity market risk premium estimate: Biases and their impact

Q. Are there any biases in the various estimates of the equity risk premium that you refer to above?

A. Yes, there are a number of biases. All of them suggest that the various estimates are likely to be upwardly biased. We discuss four such biases.

The first bias is caused by survivorship bias. Some examples follow. First, when a new index is introduced, the index sponsor generally provides historic data on that index. For example, when the TSE300 index was introduced in January 1977, historic ("back-fill") data was provided dating back to January 1956. The historic data was for firms in existence as of the date of the index introduction. Thus, when the TSE introduces its replacement index for the TSE300, its replacement index and the back-fill data are unlikely to include companies that have disappeared from the TSE300 such as Bre-X. Second, as proposed by Brown, Goetzmann and Ross (1995),[60] financial economists concentrate on the performance of surviving markets and so-called "winner" markets like the US stock market. Financial economists ignore other markets that have done poorly or even disappeared. Examples given by Brown et al. include the

[59] For a study dealing with integration of the Canadian and U.S. markets, see Lawrence Kryzanowski and Hao Zhang, Intraday market price integration for shares cross-listed internationally. Forthcoming in the *Journal of Financial and Quantitative Analysis*.

Argentine market that is considered a comparatively less important emerging market because of long history of poor performance, and the Russian market where investors at one point had all their wealth expropriated during the last 100 years.

The second bias is caused by selection bias. Various studies argue that the historic returns for index additions or deletions (and indexes) are not representative of returns in general since S&P500 and TSE300 replacement selection decisions use historical price information to select stocks for replacement. For example, Chung and Kryzanowski (1998)[61] find that deletions are drawn from stocks (so-called losers) that have performed abnormally poorly relative to the market prior to their removal from the index, and additions are drawn from stocks (so-called winners) that have performed abnormally well relative to the market prior to their addition to the index. This is not surprising because the major criterion for index deletion and addition for the TSE300 is relative capitalization (i.e., market price per share times the number of shares of float). Thus, relative losers are replaced with relative winners in terms of market price.

The third bias is caused by differences in index construction. For example, while the TSE300 and S&P500 indexes are both value-weighted indexes, they differ in how the weights are calculated. Unlike the S&P500 index, the TSE300 only uses the public float when calculating a firm's weight for index construction purposes. This makes the TSE300 more representative than the S&P500 of the actual investment opportunities that are available to public investors.

[60] S. Brown, W. Goetzmann and S. Ross, Survival, *Journal of Finance* 50 (1995), pp. 853-873. The following examples are drawn from Brown et al (1995).
[61] R. Chung and L. Kryzanowski, Are the market effects associated with revisions to the TSE300 Index robust, *Multinational Finance Journal* 2 (March 1998), pp. 1-36.

The fourth bias is caused by data recording problems. The price of the last trade is used to value firms in financial difficulty that have their trading suspended. If these firms later fail and are delisted, they are removed from the index using the last traded price and not their current price.

Q. Have you made any adjustments for these biases?

A. No, we have not made any adjustments for these biases. However, by not accounting for these biases, the equity risk premium estimates reported earlier are upwardly biased.

Q. Have you made any adjustments for globalization, increasing wealth of Canadians and a perceived desire of Canadians to be more heavily involved in equities?

A. No, we have not although all of the factors suggest that the risk premium will decrease in the future. As we discussed more fully in this and the next major section of our evidence, all of these factors suggest that the market's tolerance for bearing risk can be expected to increase in the future. In turn, this leads to a decrease (not increase) in the risk premium, everything else held constant.

The final Canadian equity market risk premium estimate (final input #2)

Q. Does your initial estimate of the market risk premium change based on your examination of other time periods in Canada, and the international evidence on realized and expected equity risk premia?

A. Yes. We believe that an examination of other time periods in Canada and the international evidence on realized and expected equity risk premia suggests that the initial point estimate of the equity market risk premium of

3.25% based on the realized equity market risk premium for the 1957-2001 period is somewhat low. Market commentators have complained for many years until recently about what they perceived as an under-performing Canadian market. Of course, their assessments were benchmarked against one of the better performing markets, namely, the U.S. market. Furthermore, the deficit problems at the federal and provincial levels are becoming non-issues, inflation is under control and the economy is expected to grow at a much slower rate in the near future.

Q. What equity market risk premium are you forecasting to be used to calculate the risk premium for NSPI for 2002?

A. We determine that our direct point estimate of the Canadian equity market risk premium of 3.25% discussed above is to be raised by a range of 45 to 85 basis points. This reflects our examination of other time periods in Canada as well as the international experience, which suggest an upward adjustment balanced against factors arguing for a downward adjustment. These latter include the recent evidence that the use of realized equity market risk premia results in an over-estimate of the risk premia required historically, and the consensus conclusion in recent studies that the required risk premium going forward will be low, if not nil or negative. On balance, weighing all these factors leads to our Canadian market risk premium forecast of 3.70% to 4.10%, with a point estimate of 3.90%. Our point estimate is substantially higher than the forecasted range of 2.0% to 2.5% calculated for internal use by W.M. Mercer for Canada, the consensus forecast of 3.5% reported for Canada in the *2002 Fearless Forecast*, and the “consensus” forecast of academic and professional scholars of a low, nil or negative equity risk premium for the U.S. going forward. It is also substantially higher than the BMO Nesbitt Burns’ forecast of a maximum of less than 2% presented earlier.

Relative investment risk of NSPI (input #3)

Q. How does the overall riskiness of NSPI compare with the typical firm contained in the TSE300 index?

A. The overall (investment) riskiness of a firm is typically determined by measuring its contribution to the risk of a well-diversified portfolio. In a CAPM world where the only factor affecting returns is the market, this contribution is measured by the firm's market beta.

Since market betas vary over time, investment professionals prefer to use only the most recent data in order to capture the firm's current risk even for firms with long trading histories. However, to ensure reasonable statistical precision, beta estimations typically are based on approximately 5 years of monthly observations. The betas used herein are based on 60 months of data, and are only calculated if almost all months have returns based on actual market transactions.

It is not possible to estimate a reliable beta for NSPI directly. NSPI does not trade publicly, although its parent Emera is a listed public company, and its major asset in terms of investments and revenues is NSPI. However, it is possible to make an approximation. We use the same sample of nine utilities that we used in our capital structure discussion in Section III. We present the rationale for the sample selection there. We also examine what happens to the average beta when we add Emera, the parent of NSPI, to the sample. As shown in Schedule 11, the average beta for the group of nine utilities is 0.183 for 1997-2001, a sizeable decrease from 0.583 for 1990-1994. The average for the most recent five-year period, 1997-2001, increases marginally to 0.194 if we add Emera to the sample. The means of the mean cross-sectional beta for each of the eight rolling five-year periods for the sample is 0.439 and 0.437 with and without

Emera in the sample. The mean of the mean cross-sectional betas for the first four and the last four rolling five-year periods are 0.542 and 0.331, respectively, with Emera out of the sample, and are 0.541 and 0.337, respectively, with Emera in the sample. Thus, the inclusion of Emera in the sample marginally increases the various sample averages. Although we believe that the downward trend in the betas will not change direction in the future due to the changing nature of the Canadian equity market, we estimate the beta for NSPI at 0.52, slightly above the grand average of the average rolling-betas for the eight periods. [62] We believe that this estimate is upwardly biased, and provides sufficient coverage for any estimation errors.

Q. What other risk-related factors did you consider that could affect the cost of equity capital for NSPI?

A. We also examined whether an average utility was becoming a more desirable investment because of an increase in its potential to diversify investor portfolios. In modern portfolio theory, an asset becomes more desirable for portfolio diversification purposes if its correlations with all the other assets decreases, everything else held constant. This important contribution led to the awarding of a Nobel prize in economics to Dr. Harry Markowitz.

Thus, we calculate moving average correlations for our sample of utilities with the TSE300 index. These results are summarized in Schedule 12. We find that the average correlation between a utility in our sample of nine utilities and the TSE300 index is substantially lower for the most recent five-year periods relative to the more distant five-year periods (0.158 versus 0.495), and is quite low at 0.389 across all eight rolling five-year

[62] Betas of 0 and 1 correspond to no market risk and a market risk equal to a well diversified portfolio such as the TSE300 index, respectively. Thus, a beta of 0.52 for NSPI indicates that

periods. These numbers increase marginally when Emera is added to the sample of nine utilities. The corresponding correlation values are 0.495 for the 1990-1995 period, 0.177 for the 1997-2001 period, and 0.395 for the mean of the means for the eight rolling five-year periods. This suggests that an average utility is now more desirable as an investment because of its enhanced potential for portfolio risk reduction. A greater potential for risk reduction leads to a reduction in an asset's risk premium. Furthermore, during the most recent five-year period, 1997-2001, four of the nine utilities have a correlation with the market of less than 0.1. In other words, four of these utilities behave almost as if they were market neutral.

This reduction in the correlations between the returns of the utilities and the market also contributes to the reduction in the betas of the sample of utilities since the beta coefficient is given by:

$$\beta_i = \frac{\sigma_i \rho_{im}}{\sigma_m}$$

where σ_i and σ_m are the standard deviation of returns for utility *i* and the market *m*, respectively; and

ρ_{im} is the correlation between the returns for utility *i* and the market *m*, respectively.

Thus, if the relative risks of the utility and market remain constant, the beta decreases as the correlation between their returns moves from 1 to 0.

As a check of whether or not everything else is held equal, we also calculate and report the average overall risk of the sample of utilities relative to the TSE300 index. We find that the average overall risk of the sample of utilities relative to the TSE300 index has been above one for most of the eight rolling five-year periods as seen in Schedule 12. This

NSPI has 52% of the investment risk of the TSE300.

suggests that the relative total riskiness (i.e., diversifiable plus nondiversifiable risk) of utilities exceeds that of the market, which only has nondiversifiable risk from a domestic-only perspective. However, it is important to remember that the market does not reward investors for holding diversifiable risk in their portfolios.

For the measures of total risk, adding Emera to our sample of nine utilities actually decreases the mean relative total risk. To illustrate, adding Emera to our sample decreases the relative total risk measure from 1.282 to 1.256 for the mean of the means for the eight rolling five-year periods, decreases the relative total risk measure from 1.169 to 1.164 for the most distant four rolling five-year periods, and decreases the relative total risk measure from 1.396 to 1.348 for the most recent four rolling five-year periods.

Our results in Schedule 12 vividly illustrate what happens to the relative risk of a sample of utilities when it includes a utility (in this case, TransCanada Pipelines) that has gone through a diversification program that has failed and the subsequent restructuring from downsizing. Specifically, the average overall risk of the sample of utilities without TransCanada but with Emera relative to the TSE300 index for the last two rolling periods of 1996-2000 and 1997-2001 (i.e., the ones that include 2000) are 1.097 and 1.108, respectively. In contrast, this relative measure of total risk with TransCanada and Emera included in the sample is dramatically higher at 1.719 and 1.672 for the 1996-2000 and 1997-2001 periods, respectively. While this relative measure of total risk for TransCanada itself ranged between 1.017 and 1.291 for the first six rolling five-year periods, it jumped to 7.325 and went down to 6.747 for the 1996-2000 and 1997-2001 time periods, respectively.

Q. What conclusion do you derive from this analysis?

A. We conclude that the required equity risk premium for NSPI should be reduced to reflect the trend that indicates the greater desirability of holding utilities for investor portfolio diversification over time. This is due to the downward trend in the average correlation of utilities with the market over time, although we make no such reduction.

Relative investment risk of NSPI: The use of the adjusted beta method

Q. What is your opinion on the practice by other witnesses of adjusting the betas used in calculating the required rate of return on equity?

A. There are two primary rationales that have been given for using the adjusted beta method when calculating the required rate of return on equity. Both rationales are flawed.

Q. Would you please explain what the first rationale for using the adjusted beta method for utilities is and why it is flawed?

A. The first rationale is based on the empirical finding by Blume (1975) that the betas of individual U.S. equities, for a large sample that is representative of the overall market, tend to regress over the long run towards the mean beta for the sample.[63]

Blume regresses the beta estimates obtained over the period 1955-1961 against the beta estimates obtained over the period 1948-1954 for common shares traded on the NYSE. Blume finds that the betas of firms with betas less than one subsequently tend to increase towards the sample beta of one, and firms with betas of more than one tend to

[63] M.E. Blume, Betas and their regression tendencies, *Journal of Finance* 30 (June 1975), pp. 785-796.

subsequently decrease towards the market beta of one. The relationship estimated by Blume suggests that the quality of beta forecasts can be improved, and that a higher quality predictor of an individual firm's beta may be a weighted average of the sample beta and the firm's current beta where the weights are approximately one-third and two-thirds, respectively.[64]

There are at least five substantive reasons for not adjusting betas for utilities based on this rationale.

First, Harrington (1983)[65] shows that the betas that are supplied by commercial vendors that use this adjustment have little predictive accuracy. Her conclusion is based on a comparison of the actual beta forecasts supplied by a number of commercial investment vendors (such as Value Line) with their corresponding benchmark estimates for four forecast horizons.

Second, there appears to be no evidence that the relationship estimated by Blume applies to other markets, such as the Canadian market, or more recent time periods. In other words, there appears to be no empirical evidence that the betas of Canadian stocks revert to the sample mean.

Third, if the sample average is consistently lower than the market beta, as is the case for the samples of utilities studied herein, the use of the market beta of one will result in an over-prediction of the mean beta in the next period for the sample. This is easily shown by taking a portfolio that is invested 40% in risk-free assets and 60% in the market, and thus, has a constant beta of 0.60. It adjusted beta would consistently be 0.73 (i.e.,

[64] Also, see O.A. Vasicek, A note on using cross-sectional information vs. Bayesian estimation of security betas, *Journal of Finance* 28 (September 1973), pp. 1233-1239.
[65] D.R. Harrington, Whose beta is best?, *Financial Analysts Journal* (July-August 1983), pp. 67-73.

two-thirds of 0.6 + one-third of 1), although its actual or "true" beta is substantially lower at 0.6.

Fourth, the previous point has already been documented in the published literature. Kryzanowski and Jalilvand (1986)[66] test the relative accuracy of six beta predictors for a sample of fifty U.S. utilities from 1969-1979. They find that the best predictors differ only in that they use different weighted combinations of the average beta of their <u>sample of utilities</u>, and that, not unexpectedly, the worst predictor is to use a beta of one or the so-called "long-term tendency of betas towards 1.00".

Fifth, adjusting the beta towards one assumes that the "true" beta for the utility is one. In other words, this adjustment method is based on the implicit assumption that the "true" beta for the utility is the same as that of the market index.

Q. Would you please explain what the second rationale for using the adjusted beta method is and why it is flawed?

A. The second rationale for using the adjusted beta method for utilities is the need to adjust raw utility betas upward to be more consistent with the interest rate sensitivity of the common equity shares of utilities.[67]

We provide a detailed criticism of this rationale in Appendix C. This detailed criticism will now be summarized.

As is the case for the TSE300 index, the returns of utilities are sensitive to changes in both market and bond returns. This suggests that utility returns may be better modeled using these two potential return determinants or

[66] L. Kryzanowski and A. Jalilvand, Statistical tests of the accuracy of alternative forecasts: Some results for U.S. utility betas, *The Financial Review* (1986), pp. 319-335.

factors. However, one should not confuse the sensitivity of utility returns to the returns of each of these factors with the premium required by investors to bear market and interest rate risk when investing in utility equities.

When there is only one determinant of utility returns (namely, the market), the theoretically justified approach is to use the traditional one-factor CAPM to implement the Market Risk Premium Method. The method is implemented by first estimating the utility's beta by running a regression of the returns on the utility against the returns on the market proxy (TSE300 index). The utility's required equity risk premium is obtained by multiplying the equity risk premium estimate for the market by the utility's beta estimate. The cost of equity for the utility is obtained by adding the equity risk premium estimate for the utility to the estimate of the risk-free rate (as proxied by the yield on long Canada's).

When there are two possible determinants of utility returns (in this case, equity market risk and interest rate risk), the theoretically justified approach is to use a two-factor CAPM to implement the Market Risk Premium Method. The Equity Risk Premium Method now is implemented by first estimating the utility's two betas by running a regression of the returns on the utility against the returns on the equity market proxy (TSE300 index) and on the bond market proxy (long Canada's). The first component of the utility's required equity risk premium is obtained by multiplying the equity risk premium estimate for the market by the utility's market beta estimate, and the second component of the utility's required equity risk premium is obtained by multiplying the bond risk premium estimate by the utility's bond beta estimate. The utility's required equity risk premium is the sum of these two components. The cost of equity for the utility then is obtained by adding the equity risk premium estimate

[67] Ms. McShane, page 55, of evidence.

appropriate for the level of relative risk for the utility to the estimate of the risk-free rate (as proxied by the yield on long Canada's).

While one would expect the estimates of the return on the TSE300 index, of the return on long Canada's, and of the return on the TSE300 index over the yield on long Canada's to be positive and significant, such is not the case for the return on long Canada's over the yield on long Canada's. Over the long run, we would expect the average return on long Canada's to be equal to the yield on long Canada's (the proxy for the risk-free rate in rate of return settings). This is because our expectation is that rates would fluctuate randomly so that returns would be above yields to maturity in some periods and below them in others. Thus, while it is true that utility returns are sensitive to interest rates, it is not true that interest rate risk will have a positive risk premium over the long run.

To examine the nature of bond market risk premia, we calculate the bond market risk premia over various time periods that correspond to those used previously to calculate the equity market risk premia. These results are reported in Schedule C-2 in Appendix C. As expected, over long periods, such as 1948-2001 or 1957-2001, the bond market risk premium is less than 60 basis points. While it is much larger over the 1980-2001 period at 3.676%, this is offset by the low equity market risk premium of 1.570%. Furthermore, if we use the median equity and bond betas of 0.350 and 0.438, respectively, for the utilities reported in Schedule C-1 in Appendix C, we find that the combined equity and bond market risk premium for the average utility ranges from 1.245% for the 1957-2001 period to 2.191% for the 1980-2001 period.

Looking forward we expect equity market risk premia to be low, and we do not expect the bond market risk premium to be material (on the positive side) since interest rates are now at historic lows.

The initial cost of equity capital recommendation

Q. What cost of equity capital are you recommending for NSPI based on this ERP test?

A. Based on a market risk premium estimate of 3.70% to 4.10% and at a relative risk factor of 52% of the TSE300 index, the equity risk premium required for NSPI (i.e., our final estimate of input #2 multiplied by our final estimate of input #3) is calculated to be 1.92% to 2.13% with a rounded up point estimate of 2.03%. Given our point forecast of a long-term Government of Canada bond rate of 5.90% (our final estimate of input #1), the cost of equity capital will lie between 7.82% and 8.03%, for a rounded up point estimate of 7.93%.

Adjustment to the Initial Cost of Equity Capital Recommendation for NSPI

Q. What adjustment is required to this “bare bones” figure to make it suitable for a cost of equity estimate for purposes of regulation?

A. Past practice in this and other regulatory jurisdictions considers the need to adjust from a market-value based rate of return to an accounting-based rate of return in order to preserve the financial integrity and financing flexibility of NSPI. The idea is that NSPI should be allowed to maintain its market-to-book value ratio sufficiently above unity (the value of one) in order to attract investment and to recoup flotation costs associated with issuing new equity financing instruments.[68] The notion that each company should maintain market value above book value is somewhat contradictory

[68] For example, see G.R. Schink and R.S. Bower, Application of the Fama-French model to utility stocks, in *Financial Markets, Institutions and Instruments; Estimating the Cost of Capital: Methods and Practice* 3:3 (1994), pp. 74-95.

as it suggests that each company should plan to earn a return on new investments above the allowed rate of return.

Also, as was discussed earlier, the use of the arithmetic instead of the geometric mean in determining the market risk premium already provides for financial integrity and financing flexibility.

For these reasons, we only consider flotation costs as a justification for making an adjustment to the “bares bones” cost. However, given the high dividend payout ratios paid by utility firms, no compelling justification exists for making an adjustment for equity flotation costs. Since all ongoing equity needs should be able to be totally funded internally, no flotation costs should be incurred for public equity offerings.

Q. What adjustment to the “bare bones” cost do you make to compensate NSPI for potential equity flotation costs?

A. When firms issue or sell new equity to the market, they incur underwriting fees paid for marketing the issue, and other underwriting and issue expenses for legal and accounting services, printing of issuing documents, and applicable registration fees. Research on the flotation or issuance costs for new equity issues for utilities in Canada over the past five years finds that the median fee is 4% of gross proceeds for equity offerings (see Schedule 13). When the equity offering fees are amortized over a 50-year period, the annual adjustment needed to compensate NSPI for potential equity flotation costs is about 8 basis points annually, which we round up to 10 basis points to cover other issue costs.

<u>The Final Recommended Cost of Equity Capital for NSPI</u>

Q. What cost of equity capital are you recommending for NSPI based on this ERP Test?

A. As noted earlier, our Equity Risk Premium or ERP Test used the following inputs:

1. the yield forecasted for 2002 for long Canada's (input #1);
2. the adjusted historical risk premium for the TSE300 over the period 1957-2001 (the adjustments are detailed below) (input #2);
3. the investment riskiness (market beta) of NSPI relative to the market portfolio as proxied by the TSE300 Index (input #3); and
4. an adjustment (if any) to preserve the financing flexibility of NSPI and to cover fees involved with potential equity offerings or issues (input #4).

We also stated that the recommended rate of return on equity for NSPI is obtained by combining our final estimates of these four inputs as follows:

(Input #1) + [(Input #2) *x* (Input #3)] + (Input #4)

Based on a market risk premium estimate of 3.70% to 4.10% and at a relative risk factor of 52% of the TSE300 index, the equity risk premium required for NSPI (i.e., our final estimate of input #2 multiplied by our final estimate of input #3) is calculated to be 1.92% to 2.13 % with a rounded up point estimate of 2.03%. Given our point forecast of a long-term Government of Canada bond rate of 5.90% (our final estimate of input #1), the cost of equity capital, before an adjustment for equity flotation costs, will lie between 7.82% and 8.03%, for a rounded up point estimate of 7.93%. To this we add the allowance for equity flotation costs of 0.10% (our final estimate of input #4). This gives a range for the cost of equity, after the adjustment for equity flotation costs, of 7.92% to 8.13%, with a rounded up point estimate of 8.03%.

Thus, we are recommending a return of equity of 8.03%. Our return on equity recommendation allows NSPI a risk premium of 213 basis points over our forecast for long Canada yields.

V. ADDITIONAL EVIDENCE

Economic and Capital Market Trends

Q. What comments do you have on Ms. McShane's 2002 forecast of the 30-year Canada yield?

A. Ms. McShane creates her forecast in two steps (McShane, Page 34, Lines 18-19). First, she uses the November 2001 consensus forecast and yields prevailing in December 2001 to forecast 10-year Canada's at the end of 2002 in a range of 5.25% - 5.75%. Second, she adds approximately 30 basis points to account for the spread between 10- and 30-year Canada's to obtain a range of 5.5% – 6.0% with a midpoint of 5.75%.

We do not disagree with Ms. McShane's methodology. However, since our evidence is filed after hers, we take advantage of consensus figures from Canadian investment managers released in January 2002 to reach a consensus forecast for 30-year Canada's of 5.9%.

Capital Structure

Q. Please explain how setting the allowed equity ratio too high leads to unnecessary cost to the ratepayers?

A. On page 2 of her evidence, Ms. McShane states her support for NSPI's request to increase its allowed common equity ratio to a range of 40% to 45%. In Section II of our evidence, we argue that the currently allowed level of 35% set by the Board in 1996 remains a sufficient common equity ratio for NSPI to address the risks faced by the company. Based on our earlier arguments, the requested common equity ratio of 40% - 45%

represents an unwarranted substitution of equity for cheaper debt in the range of 5% - 10% of capital.

To assess the cost of this unwarranted substitution of equity for debt we calculate the increase in NSPI's weighted cost of capital. For a common equity ratio of 40%, i.e., 5% unwarranted increase in equity, the increased cost is 11 basis points in the weighted average cost of capital. We obtain this estimate using our recommended return on equity of 8.03% and our recommended cost of debt as 6.9%. We obtain NSPI's tax rate of 15.38% from the company's forecast for the 2002 test year in table 3-1 in NSPI's direct evidence. Our calculations follow:

+0.05 x 8.03%	= +0.40%
-0.05 x 6.90% x (1-0.1538)	= -0.29%
net increase	= 0.11%

For a common equity ratio of 45%, the unwarranted increase in equity of 10% has a price tag of 22 basis points added on to the cost of capital. This is determined as follows:

+0.1 x 8.03%	= +0.80%
-0.1 x 6.90% x (1-0.1538)	= -0.58%
net increase	= 0.22%

In practice, the cost is likely to be higher. First, we do not believe that a higher equity ratio is needed to retain NSPI's viability so we do not reduce the yield on debt with the higher ratios. Second, we employ the tax rate for the 2002 test year of 15.38%. In later years, the tax rate is likely to increase reducing the cost of debt and increasing the cost of substituting equity for debt. We note as well that we employ our recommended allowed return on equity of 8.03%. If any higher rate is allowed, the cost will increase further.

Comparison of Witnesses' Rate of Return Evidence Against Adjustment Formula

Q. Did you conduct any further analysis of the equity rate of return evidence submitted by Ms. McShane?

A. Yes, we compared her recommendations for the equity risk premium for NSPI against the formulas used by the National Energy Board, the British Columbia Utilities Commission, the Ontario Energy Board and the Manitoba Public Utilities Board. For comparison purposes, we also include our own recommendations.

Q. Please explain the rationale for making these comparisons.

A. In its RH-2-94 Multi-Pipeline Cost of Capital Decision issued in March 1995, the National Energy Board adopted a formula to compute an equity risk premium over the consensus forecast of the long-Canada rate. While this formula was adopted as an administrative convenience, it has stood the test of time for the NEB and has been adopted, in modified form by three provincial regulatory boards. Thus, these formulas provide useful benchmarks of the levels of equity risk premiums that regulators regard as reasonable. With these benchmarks, we can assess the extent to which recommendations offered by particular witnesses lie within or beyond a reasonable range.

We begin with the NEB formula. This procedure takes the average 3-month out and 12-month out forecasts of 10-year Government of Canada bond yields as reported in the November issue of *Consensus Forecasts*

(Consensus Economics, Inc., London, England.) To this is added the average daily spread between 10-year and 30-year Government of Canada bonds as reported in the *National Post* for October. An equity risk premium of 300 basis points was determined to be appropriate for the particular group of pipeline companies in 1995. This equity risk premium is added to the determined 30-year Canada rate to give a final allowed return on equity.

In order to acknowledge the NEB's belief that equity risk premiums decrease when rates are rising and increase when rates are falling, an adjustment mechanism allows for the cost of capital to be adjusted upwards or downwards by 75% of the increase in the long Canada rate occurring after 1995. The NEB decision also notes that the adjustment mechanism is not restricted to the range of rates in its table.

We can illustrate the workings of the NEB formula using our forecast of 5.90%. The forecasted long-Canada rate for 1995 was 9.25%, resulting in an allowed return on equity of 12.25%. For our forecast of 5.90%, the new rate is 9.74%.[69] Put into words, the NEB formula states that as rates fall from 9.25% to 5.90% (a drop of 335 basis points), 75% of that drop is reflected by lowering the new rate, and the remaining 25% of the drop is added to the risk premium. In this case, the risk premium increases by 84 basis points (.25 (9.25 – 5.90)). These figures appear in Schedule 14.

Following similar logic, we calculate the recommended equity returns and risk premiums for the other regulatory bodies. The Ontario Energy Board formula for Consumers Gas provided for a risk premium of 340 basis points when the long Canada rate was at 7.25%. The OEB formula follows the NEB in employing a 75% adjustment for changes in interest rates. Using a similar formula, the Public Utility Board of Manitoba set a risk

[69] 9.74%. = 5.90 + 3.00 + .25 (9.25 – 5.90)).

premium of 300 basis points at a long Canada yield of 9.12% with an 80% adjustment factor. Finally, the most recent position of the BC Utilities Commission calls for an equity risk premium of 350 basis points to accompany a forecasted long Canada rate of 6.0%. The Commission applies an 80% adjustment factor when rates rise and no adjustment for falling rates. For our forecast of 5.90%, the risk premium remains at 350 basis points.

In summary, Schedule 14 shows that applying the four adjustment formulas using our forecasted rate of 5.90% produces an average equity risk premium of 368 basis points with a relatively narrow range of 350 – 384 basis points.

Q. What does your summary of regulatory formulas tell us about the reasonableness of the recommendations of Ms. McShane for NSPI?

A. In order to draw on the results of the regulatory formulas, we must first establish that the risk of the utilities for which the formulas were designed is comparable to the risk of NSPI. We believe that this is the case for reasons discussed at length in other parts of our evidence.

Turning to the numbers in Schedule 14, it is apparent that the risk premium numbers recommended by the various witnesses vary according to the perspectives of the various parties. That said, Schedule 14 reveals that the numbers fall into three distinct sets. At the high end are the recommendations of Ms. McShane, which are clearly substantially higher than the results of regulatory formulas. In the middle lie the regulatory formulas. Below them are our own recommendations.

Q. What do you conclude from this comparison?

A. The regulatory formulas are drawn from the era of higher risk premiums. Our earlier evidence presented a large body of argument showing that the equity risk premium is expected to be considerably lower in the future. Because they do not take this important trend into account, recommended returns drawn from regulatory formulas should be regarded as a generous upper bound. Our own recommendation reflects the current trend towards a lower equity risk premium. For this reason, it represents a reasonable choice should the Board wish to adjust to the new market regime. If, however, the Board should wish to recognize the trend while taking account of decisions of other regulatory agencies, it could choose to set the allowed equity return for NSPI in the range between our recommendation and the average of the regulatory formulas. Either way, our examination of the regulatory formulas suggests that the rate of return recommendation of Ms. McShane is inconsistent with the results of other regulatory formulas as well as with the rate indicated by the new market regime.

Q. Do you have any further evidence to support your contention that the results of regulatory formulas should be regarded as an upper bound?

A. Yes, we do. In the response to NSUARB IR-30, we find an equity analyst's report on NSPI from CIBC World Markets. The report comments on the requested return on equity:

> "The 11% ROE compares to the 9.53% 2002 benchmark ROE for the National Energy Board and the 9.05% ROE that will be in effect in Newfoundland next year. As a result, this will be another test case challenging Canadian regulators' traditional approach to setting authorized returns."

This report reflects the view of the CIBC World Markets analysts of the likely range of outcomes. Ms. McShane's recommendation is identified as above the traditional range.

<u>Definition of Risk</u>

Q. What is your opinion about the total (investment) risk of a common stock investment as being comprised of both the business and financial risks to which the stockholder is exposed?[70]

A. The definition is fine but it does not go far enough. It should be expanded to point out that the investment risk of a common stock is only the non-diversifiable portion of business and financial risks to which the stockholder is exposed. This is the essence of modern portfolio theory.

<u>Use of the Arithmetic Mean Historical Risk Premium For Estimating Expected Risk Premium</u>

Q. Ms. McShane states "in principle, when historic risk premiums are used as a basis for estimating the expected risk premium, arithmetic averages should be used". Do you agree with this statement.[71]

A. No, we do not agree with this statement because it is incorrect. Furthermore, the quote from the publication by Ibbotson Associates does not conform to finance theory or practical applications of finance.[72]

First, when companies develop a discount rate for internal use, such as the evaluation of long-lived capital investment projects, these companies use geometric not arithmetic average returns to calculate the equity and

[70] Ms. McShane, page 3, of evidence.
[71] Ms. McShane, page 44, of evidence.

Kryzanowski and Roberts, NSPI, 2002.

debt components of the cost of capital. Furthermore, when they evaluate the returns from such projects, they calculate the annual internal rate of return or IRR (the so-called compound annual return) and not the arithmetic mean of the annual simple returns for the projects. The annual IRR so calculated is equal to the geometric mean when each year is given an equal weighting, and this occurs when the investment level remains constant over the life of the project. In other words, they compare the annual geometric mean return from investment against the annual geometric mean cost of the investment.

Second, the use of the geometric mean for equity is consistent with the calculation used to calculate the cost of debt. The yield-to-maturity, which is used to calculate the cost of debt, is a geometric mean. If only debt and equity are considered, it seems quite inconsistent to use the geometric mean in calculating the cost of the debt component, and the arithmetic mean in calculating the cost of the equity component.

Third, the expected one-period simple return (i.e., the arithmetic mean of the one-period simple return) is only an appropriate return concept for the cost of equity capital for a short future time horizon of one period (usually a year).[73] For multiple-period horizons, expected return estimates enter the present value expressions in a nonlinear manner. Thus, numerous articles have documented the biases in using arithmetic or geometric means of one-period returns or risk premia to assess long-run expected rates of return or risk premia.

Blume (1974), Cooper (1994) and Indro and Lee (1997) show mathematically that for long-run expected returns and risk premia, the arithmetic average produces an estimate that is upwardly biased, and that

[72] Ms. McShane, page 44, of evidence.
[73] Eugene F. Fama, 1996, Discounting under uncertainty, *Journal of Business* 69, pp. 415-428.

the geometric average produces an estimate that is downwardly biased.[74] The simulation results of Indro and Lee (1997) support the use of a horizon-weighted average of the arithmetic and geometric averages proposed by Blume (1974). In the Blume average, the arithmetic average receives all the weight when the time horizon or project life (denoted by N) is one period, and the geometric average receives all the weight when the time horizon is equal to the number of time periods (denoted by T) used to obtain a historical estimate of average returns or risk premia. To illustrate, if we deem that 30 years constitutes the long-run as is assumed for the cost of debt (i.e., 30-year Canada's) and we use the longest available time period without serious measurement errors to estimate the market risk premium in Canada (namely, the 39-year period, 1957-1999), then the weight placed on the geometric average, w_G, is:

$$w_G = (N - 1) / (T - 1) = (30 - 1) / (39 - 1) = 29 / 38 = .76 \text{ or } 76\%.$$

Of course, the long run is longer than 30 years, and we would use it for bonds if such maturities were available. For practical purposes, we can assume that the yield on 30-year Canada's is a good proxy for the yield over a 39 year period since the yield curve will be approximately flat on average for terms-to-maturity beyond 30 years. In that case, we would place all of the weight on the geometric average, and none on the arithmetic mean when calculating the estimated equity market risk premium.

Fourth, the use of the geometric mean is supported empirically. Fama and French estimate the nominal cost of capital for U.S. nonfinancial

[74] M.E. Blume, 1974, Unbiased estimators of long-run expected rates of return, *Journal of the American Statistical Association* 69:347 (September 1974), pp. 634-638; Ian Cooper, 1994, Arithmetic versus geometric mean estimators. Setting discount rates for capital budgeting, working paper, London Business School; and D.C. Indro and W.Y. Lee, 1997, Biases in arithmetic and geometric averages as estimates of long-run expected returns and risk premia, *Financial Management* 26:4 (Winter), pp. 81-90.

corporations for 1950-1996 as 10.72%. Since this is smaller than the nominal return on investment of 12.11%, average corporate investment has been profitable.[75] If the arithmetic mean of the simple annual returns is used instead to obtain an estimate of the nominal cost of capital, the resulting value of 12.12% is about the same as the return of investment of 12.11%. This implies that average investment by corporate U.S. has added no value over the 1950-1996 period, which seems unreasonable given stock market performance over this period of time.

Q. Would you please comment on the statement by Ms. McShane that, while the arithmetic average recognizes uncertainty in the stock market, the geometric average removes the uncertainty by smoothing over the differences.[76]

A. The arithmetic average does not recognize uncertainty but ignores it. This is why the arithmetic mean remains unchanged as a series has more variability, while the geometric mean becomes progressively smaller as a series has more variability.

This can be shown by a simple example, where the simple annual returns for each year are 10%. In this case (which we refer to as the base case), both the arithmetic and geometric mean are the same at 10%. Let us now introduce some uncertainty but change the return series as follows: 5% in both years one and two, 10% in year three, and 15% in both years four and five. In this case, the arithmetic mean remains unchanged from the base case at 10%, while the geometric mean drops to 9.09%. More

[75] These two values are the IRRs on value and on cost, respectively. The geometric mean of simple annual returns on cost is almost identical. Eugene F. Fama and Kenneth R. French, 1999, The corporate cost of capital and the return on corporate investment, *The Journal of Finance* December, pp. 1939-1967. As in Copeland et al. (1990), the return on value is an estimate of the cost of capital when the cost of capital is taken to be an expected compound return. Tom Copeland, Tim Koller and Jack Murrin, 1990, *Valuation in measuring and managing the value of companies* (John Wiley and Sons, New York).

[76] Ms. McShane, page 45, of evidence.

importantly, compounding an initial dollar of investment at the beginning of the five-year period at the annual arithmetic mean results in too high of an ending value, while compounding at the annual geometric mean results in the actual total value of the investment at the end of the five year period.

Impact of Fundamental Changes Including Globalization

Q. Ms. McShane implicitly argues that the appropriate risk premium for Canadian utilities increases with the globalization of the Canadian economy and markets. Would you please explain by providing examples of how the risk premium is affected by various changes, such as changes in the average degree of risk aversion, the market becoming more risky due to a greater proportion in high-tech stocks, and the market becoming more globally integrated?

A. Yes, in Appendix D, we show, all else held constant, that:

a. The market risk premium decreases (not increases) as average investor risk tolerance increases;
b. The own risk premium for a utility decreases (not increases) as average investor risk tolerance increases;
c. The total market risk premium increases as the market portfolio becomes more risky as its composition changes to a more risky mix of assets but the market risk premium per unit of risk remains constant;
d. The own risk premium for a utility is likely to decrease as the market portfolio becomes more risky as its composition changes because both the correlation and beta of the utility will decrease in value; and
e. The market risk premium and the own risk premium for a utility will decrease with greater market globalization due to the theoretical and empirical evidence about the impact on the cost of capital of the diversification benefits obtained by investors from international diversification.

Q. Ms. McShane discusses the need to consider globalization in setting the cost of capital for NSPI.[77] Would you please discuss some of the evidence that globalization decreases the cost of capital?

A. To illustrate this evidence, we refer to a forthcoming article by Drs. Errunza and Miller that examines the impact on the cost of capital of market reforms and liberalization that began in the developing countries in the 1970s and in the emerging economies during the second half of the 1980s.[78] Due to the decline in expected returns from enhanced investor diversification opportunities predicted by finance theory, they hypothesize that returns should follow the following patterns:

- High equilibrium expected returns pre liberalization indicating a high cost of capital;
- Large positive returns during the liberalization period, reflecting price increases as the cost of capital falls (the revaluation effect); and
- Normal equilibrium expected returns post liberalization, with the difference in the pre- versus the post-period returns (i.e., the change in the cost of capital) related to diversification potential.

As expected, they find that market liberalization decreases the cost of capital as the sample firms experience significant declines in realized abnormal returns. After controlling for a number of effects, the cost of capital is reduced by 42.2%. They also document evidence that equity valuations increase as the cost of capital falls.

Use of U.S. Market Risk Premium Method

[77] Ms. McShane's evidence, p. 20, lines 8-23.
[78] Vihang R. Errunza and Darius P. Miller, Market segmentation and the cost of capital in international markets, forthcoming in *The Journal of Financial and Quantitative Analysis*.

Q. Please explain your criticism of the evidence of Ms. McShane based on the use of the U.S. market risk premium method.

A. Ms. McShane uses the Ibbotson study for the historical rates of return on U.S. shares and historical rates of return on long-term U. S. treasury bonds. We have a number of major criticisms of this evidence.

First, Ms. McShane fails to take into account all of the evidence that we presented earlier in Section IV that the U.S. equity risk premium has narrowed substantially, and is expected to be lower in the future. The U.S. forward-looking equity risk premium estimates vary from zero or slightly negative to about 6 %. This year's keynote speaker at the Risk Management Conference, Burton Malkiel from Princeton University, agrees with the consensus view "that the equity risk premium investors will realize in the future is likely to be very small".[79]

Second, Ms. McShane fails to make the adjustments that have to be made when conducting a Market Risk Premium Test when one moves from a Canada-only perspective to an international perspective. When viewed from a Canada-only perspective, the market risk premium can be measured using a domestic market proxy such as the TSE300, which is assumed to be a reasonably well-diversified domestic portfolio. However, when viewed from an international perspective, domestic markets (and their market proxies) are no longer well diversified. This is especially true for very small markets like the Canadian equity market that represents less than 3% of the world market. When viewed from an international perspective, a significant portion of domestic equity market risk becomes diversifiable and is not rewarded.

[79] Risk Management 2001: Managing risk in a future of single-digit returns, *Canadian Investment Review*, Winter 2001.

Thus, we cannot just combine or average equity risk premia from different markets because they may represent different non-diversifiable risks. We can demonstrate this by calculating the investment risk or beta of each of the TSE300 and S&P500 indexes in a global context using the following relationship:

$$Beta_D = Corr_{D,W} * (Sig_D / Sig_W)$$

where $Beta_D$ is the estimated beta for the domestic market,

$Corr_{D,W}$ is the correlation between the returns for the domestic and world markets, and

Sig_D and Sig_W are the standard deviations of returns for the domestic and world markets, respectively.

Using the data provided by Auger and Parisien, for illustrative purposes only, yields:

$$Beta_{TSE300} = 0.5 * (0.22 / 0.193) = 0.570$$

$$Beta_{S\&P500} = 0.8 * (0.185 / 0.193) = 0.767$$

If we scale up the betas so that the S&P500 beta is represented by 1, we obtain a TSE300 beta of 0.743 or approximately 0.74.

This shows the fallacy of assuming that the risk premium should be the same for the TSE300 and the S&P500 because their standard deviations are the same. This is much like assuming that the market risk premium for a utility should be the same as that for the TSE300 because they have the same standard deviations.

Q. How does failing to account for differences in the systematic risks of the various market indexes affect the evidence presented by Ms. McShane?

A. It tends to inflate the market risk premium. To illustrate, we use the arithmetic mean market risk premium for the TSE 300 and the

S&P500 over their respective long bond yields of 2.85% and 5.63%, respectively.

We then adjust for the lower beta for the TSE300 versus the S&P500 and we adjust for the Canadian/US bond differential. This risk-adjusted market risk premium (RMRP) difference between the S&P500 and the TSE300 that accounts for bond return differences is given by:

RMRP = Risk-adjusted U.S. market risk premium - Canadian market risk premium – Bond return difference

RMRP = (0.74 x 5.627%) – 2.854% - 1.275% = 4.164% – 2.854% – 1.275% = 0.035% or 3.5 basis points

Properly accounting for systematic risk differences now leads to the conclusion that the Canadian and U.S. markets had similar performances over the 1957-2001 period.

<u>Validity of Using a Weighting Formula of the Risk Premia from Various Country Markets</u>

Q. Would you please comment on the validity of giving an approximate 70% weight to Canadian risk premia and 30% to U.S. risk premia in order to estimate the required market equity risk premium?[80]

A. There are at least two serious problems with this approach.

First, this approach ignores the benefits from international diversification, which reduce the required equity risk premium, as we discussed in Section IV.

[80] Ms. McShane, page 45, of evidence.

Second, this approach makes no adjustment for the differences in the non-diversifiable risks of the two market proxies used in this process. In other words, the non-diversifiable risks of the TSE300 and S&P500 differ. Studies find that the correlation of annual total equity returns with world total equities for Canada is a little more than 70% of that for the U.S. [81] Thus, the reduction in total risk from international diversification is substantially higher for the Canadian market proxy than for the U.S. market proxy, as discussed in our previous answer.

<u>CAPM Understates Expected Returns for Less Risky Firms</u>

Q. Do the empirical studies cited show that the CAPM understates the return requirements of companies with betas less than one?[82]

A. The simple answer is no. When the T-bill rate is used as the proxy for the risk-free rate, studies show that the estimated intercept of the Capital Market Line or CML is above the risk-free rate, and the estimated slope of the CML is smaller than the difference between the mean return on the market and the mean return on T-bills. More recent studies find evidence against the standard form of the CAPM, and find strong support for the zero-beta version of the CAPM where the estimated intercept is the return on the zero-beta portfolio. The expectation of the CAPM is that the return on the zero-beta portfolio should exceed the return on T-bills.[83] The use of the higher long Canada rate as the proxy for the risk-free rate is consistent with these empirical findings.

[81] William F. Sharpe, Gordon J. Alexander and David J. Fowler,1993, *Investments* (Prentice Hall Canada Inc.), p. 772. Adapted from Roger G. Ibbotson, Richard C. Carr and Anthony W. Robinson, 1982, International equity and bond returns, *Financial Analyst Journal*, July/August, p. 71.
[82] Ms. McShane, page 47, of evidence.
[83] Robert F. Stambaugh, 1982, On the exclusion of assets from tests of the two-parameter model: A sensitivity analysis, *Journal of Financial Economics*, November, pp. 237-268.

Regression of Gas/Electric Returns Against TSE 300 Returns

Q. Would you please comment on the interpretation of the regressions run by Ms. McShane between the returns on the TSE Gas/Electric Index and the TSE 300?

A. When Ms. McShane runs a regression of the raw returns of the TSE Gas/Electric against those of the TSE300, she obtains a significant and positive intercept.[84] The intercept should be positive and significant because it is an estimate of the risk-free rate.

When Ms. McShane runs a regression of the raw returns of the TSE Gas/Electric against those of the TSE 300 and long Canada's, she obtains an insignificant intercept. She interprets this incorrectly as "the fact that the constant is significantly closer to zero … and no longer statistically different from zero in the second equation confirms that the addition of bond returns (i.e., interest sensitivity) to the analysis explains a larger proportion…."[85] Unfortunately, all this shows is that the estimate of the risk-free rate obtained from the second equation is no longer significant, although it should be. We only expect the estimated intercept to be zero when we use returns in excess of the risk-free rate in the regressions (so-called "excess returns"). This is the underlying logic behind the so-called Jensen or alpha measure of portfolio performance.

Q. Have the investors in Canadian gas and electric firms earned a return that is commensurate with the investment risk borne by such an investment?

A. Yes, and in fact, they have earned a premium return from such investments, or what investment people refer to as a positive alpha or "free lunch".

[84] Ms. McShane, pages 53 and 54, of evidence.

Q. What is the basis for your conclusion?

A. We used a standard portfolio performance metric, a portfolio's alpha, to evaluate the performance of holding the Gas/Electric sub-group index of the TSE300 over the periods, 1980-2000 and 1991-2000. This performance measure is the estimated intercept from a regression of the returns in excess of the risk-free rate for both the sub-index and the market index. In other words, we ran a regression of the excess returns on the Gas/Electric sub-group total return index against those for the TSE 300 total return index.

The results are summarized in Schedule 15. Based on these results, we find that the Gas/Electric sub-group outperformed the TSE 300 by 2.7% annually over the 1980-2000 period, and by 6.16% annually over the ten-year period 1991-2000. Thus, investors that invested in a portfolio that mimicked this sub-group achieved an excess return or "free lunch" of over 6% on an annual basis over the 1991-2000 period. These results suggest that regulators have been somewhat "generous" when setting the rates for this group of utilities.

<u>Use of DCF Estimates of Fair Return</u>

Q. Ms. McShane also generates DCF estimates of a fair return on equity for NSPI. Please provide a brief discussion of why you do not provide DCF estimates of a fair return on equity for NSPI?

A. Discounted cash flow (DCF) tests have a number of disadvantages that make them unreliable. First, the DCF test depends critically on estimating the expected growth rate. Error in capturing the growth rate impacts

[85] Ms. McShane, page 54, of evidence.

directly on DCF estimates. Because estimates of the growth rate depend on past growth and/or analyst opinion, it is difficult to achieve any measure of precision.

Second, circularity also causes a problem in applying the DCF approach. Investors base their analysis of the future growth in earnings and dividends on the rate of return allowed by regulatory bodies, which translates into a market for the shares. If we, in turn, rely solely on the market price and dividend growth rate for our required return on equity, then we are being influenced by the market, which, in turn, is being influenced by the Board's decision. Thus, employing the DCF method, we would, in effect, be anticipating what the market is expecting the Board to do thus introducing circularity. The same problem occurs if we use analyst forecasts.

The Utility Equity Risk Premium Over Utility Bonds

Q. Would you please comment on the conclusion by Ms. McShane that "there is no logical reason to conclude that the utility equity risk premium over the utility bonds has declined in the past 5-6 years".[86]

A. There are many reasons why this premium has declined. First, as we discussed in the previous section, forward-looking estimates of the equity risk premium foretell a substantially reduced or zero equity risk premium in the future. Second, relatively greater demand for equities compared to bonds, all else held equal, should tighten the spread between equities and bond returns. Third, the relative ability to diversify away the impact of shocks has improved for stocks versus bonds. Not only are the risk-reduction benefits from diversification higher, on average, for stocks versus bonds because of the former's lower within-asset-class average

[86] Ms. McShane, page 25, of evidence.

correlation but the cost of obtaining these diversification benefits has declined relatively more for stocks versus bonds. Fourth, as discussed in Section IV, the relative investment risks associated with holding diversified portfolios of equities and bonds depend upon the holding period. They are higher for equities for short holding periods (such as one year) and lower for equities for long holding periods (such as 20 years).

Standards of Fair Return

Q. Would you please comment on the statement made by Ms. McShane that "a fair and reasonable return falls within a range, bounded by the cost of attracting capital and the returns achievable by firms of similar risk to utilities (comparable earnings standard)".[87]

A. There are a number of problems with this statement. First, in effectively competitive environments, the typical firm is on average expected to earn a rate of return equal to its cost of capital. Second, the returns as measured under the comparable earnings standard are a poor proxy of the returns achieved by firms for comparisons against their costs of capital.

Use of the Prospective Market Risk Premium Method

Q. Please explain how Ms. McShane obtained market risk premium estimates using the prospective market risk premium method.

A. Ms. McShane also relies upon an ex ante market risk premium estimate.[88] She derives her estimate by applying a dividend discount model (DDM) to value the TSE300 and the S&P500. She uses the constant-growth version

[87] Ms. McShane, page 33, of evidence.
[88] Ms. McShane, pages 46 and 47 and Schedules 10 and 11, of evidence.

of the DDM where dividends are assumed to grow from year to year at the same rate forever.[89] She proxies the "market's expectations of future growth" by using the five-year growth rate forecasts reported by financial analysts to I/B/E/S and First Call. Based on this method, she derives an expected annual return for the TSE300 of 14.1%, which is equal to an expected 2.1% dividend yield plus a 12.0% expected annual growth rate. Similarly, she derives an expected annual return for the S&P500 of 15.8%, which is equal to an expected dividend yield of 2.2% plus an expected annual growth rate of 13.6%. Compared to her long Treasury yield estimates, these market return estimates translate into risk premia estimates of 8.25% and 10.25% for the TSE300 and S&P500, respectively.

Q. Please explain your criticism of Ms. McShane's evidence based on the use of the prospective market risk premium method.

A. We have five major criticisms of Ms. McShane's evidence based on the use of this method.

First, her evidence suggests an implicit rate of growth forever that is both unreasonable and unsustainable either during the next five years or over the long term. To illustrate, if the long-run annual rate of inflation is assumed to be 3% in both Canada and the United States, then Ms. McShane's estimates assume that the TSE300 and S&P500 firms are expected to grow annually and forever at the astonishing real rate of 9.0% and 10.6%, respectively. Given that expectations for real growth for either the short or long run in both Canada and the United States are considerably below 9.0% and 10.6%, respectively, these estimates lack credence. Furthermore, the common belief is that most of the real growth,

[89] The DDM and its various versions are described in most introductory books on investments. For example, see chapter 16 of W.F. Sharpe, G. J. Alexander and D. J. Fowler, *Investments*

at least in the Canadian economy, has been and will continue to be generated by small and medium-sized firms. These firms are not well represented in the TSE300.

Second, the expected return on the TSE 300 of an annual 16% over the next five years, based on the latest earnings forecasts of analysts for 3Q 2001, is substantially above the estimates provided by investment professionals that were discussed in Section IV. To illustrate, the median total return expected on the TSE300 for the five years ending 2005 reported in the *2002 Fearless Forecast* from W.M. Mercer is 9.0%. This is almost 7% lower than that obtained by Ms. McShane. Thus, while using the forecasts of those who supply "free" investment information to investors produces an expected market risk premium in excess of 8.0% (according to Ms. McShane), using the forecast of those who make the investment decisions produces an expected market risk premium of 3.25% (i.e., the 9.0% from the *2002 Fearless Forecast* minus the 5.75% forecast of the long Canada yield of Ms. McShane).

Third, it is well documented in the published literature that the bottom-up market forecasts of financial analysts and top-down market forecasts of market strategists contain a large optimism bias. We discuss two representative studies next. Chopra (1998)[90] finds that the average consensus earnings per share growth forecasts made by analysts for the S&P500 index over the 1985-1997 time period is almost twice the actual growth rate. Chung and Kryzanowski (2000)[91] find a significant optimism bias in bottom-up and top-down forecasts of earnings per share by analysts for the S&P500 index for the current fiscal year (FY1) and

(Scarborough, Ont.: Prentice Hall Canada Inc., First Canadian Edition, 1993).

[90] V. K. Chopra, Why so much error in analysts earning forecasts? *Financial Analysts Journal*, 54:6 (1998), pp. 35-42.

[91] R. Chung and L. Kryzanowski, Market timing using strategists' and analysts' forecasts of S&P500 earnings, *Financial Services Review*, 8:3 (2000).

subsequent fiscal year (FY2).[92] They find that the optimism bias is significantly higher in the bottom-up forecasts compared to the top-down forecasts on average. They examine the 218 months of such annual forecasts over the period from January 1982 through February 2000. The bottom-up forecasts of financial analysts exhibit a statistically significant mean optimism bias of 17.5% and 30.5% for the next and subsequent fiscal years (FY1 and FY2), respectively. They also find that these average biases grew substantially when the period from November 1995 through February 2000 was added to the January 1982 through October 1995 period. Our conjecture, based on the forecasts reported in Ms. McShane's evidence, is that this optimism bias continued to grow through at least the third quarter of 2001.[93] Furthermore, for the past two years, analysts have been criticized for the aggressive "hyping" of stocks. The research director of the world's largest securities firm told its analysts to be more critical.[94]

Fourth, Ms. McShane argues that the relevance of the forecasts is whether they are a better proxy for investor expectations than history. She refers to a number of studies that find that the forecasts of analysts are better than the use of time-series methods to forecast future growth rates. While the forecasts of analysts have been better than time-series forecasting methods, both do a "poor job" in forecasting changes in earnings per share. Further, we have reason to believe that the alleged superiority of analysts to forecast future earnings will diminish, if not be eliminated by regulatory rule changes that level the playing field in terms of corporate disclosure. Firms can no longer disclose private information to analysts prior to the disclosure of such information to the general public.

---

[92] Similarly, Chung and Kryzanowski (1999) find that the quarterly EPS forecasts for the S&P400 and S&P500 are, on average, optimistically biased for the top-down forecasts of market strategists that are reported to I/B/E/S. R. Chung and L. Kryzanowski, Accuracy of consensus expectations for top-down earnings per share forecasts for two S&P indexes, *Applied Financial Economics* 9 (1999), pp. 233-238.

[93] Ms. McShane, Schedule 11, of evidence.

[94] Dave Ebner, Merrill Lynch tells analysts to be more critical, *Globe and Mail*, March 7, 2002, p. B18.

Fifth, Ms. McShane argues that the growth forecasts of investment analysts provide "the most direct measure available of what growth expectations underlie equity market prices…".[95] The question that comes to mind is: Why use earnings growth forecasts of investment analysts to generate extremely noisy estimates of future return expectations when you can directly obtain the future return expectations of investment professionals?

Q. Would you please comment on the quality of earnings reported in the recent past and those to be reported in the near future against which the forecast accuracy of financial analysts are judged?

A. The quality of reported earnings during at least the past few years appears not to be very high. As we discussed earlier, more recent reported earnings were inflated due to the use of aggressive accounting practices by firms. Other problems that affect reported earnings include:

- Pension fund accounting where many companies projected higher returns on their pension assets during the bull market of the late 1990s, which allowed firms to reduce corporate contributions and increase company earnings. For example, General Electric now assumes that its pension fund will earn 9.5%. If this actuarial assumption is reduced downwards as one would expect given future return prospects, this will adversely affect corporate profits.
- Stock options have become a substitute for salary and other forms of remuneration, especially in the high-tech sector more recently. However, they have not historically been costed under Canadian or U.S. GAAP. A Merrill Lynch study estimates that 2000 profits would be

[95] Ms. McShane, page 47, of evidence.

61% lower if technology companies had to account for these options as a cost of doing business.[96]

- Under Canadian GAAP, companies can write off good will in one "big bath" quarter. They can record it as a special, one-time charge outside of operating income. A 2000 amendment to U.S. GAAP now allows this practice in the United States. According to estimates by Prudential Financial and Bear Stearns, such writeoffs in 2002 are expected to raise U.S. corporate profits by 4.4% for large cap firms and 14.6% for small cap firms, and raise corporate profits for the computer-services sector by 14.6%.[97]

Q. What is your opinion on the use of forecasts by analysts to estimate the cost of capital?

A. We are reluctant to use these forecasts because they tend to be optimistic, sometimes excessively optimistic, and the amount of the bias varies in an unknown fashion over time. Some illustrations are:[98]

- Eleven of the 17 leading analysts who followed Enron still rated the stock as a "buy" or "stong buy" as late as November 8, 2001. This was after Enron restated $1 billion in profit as a loss, fired its chief financial officer and was under investigation by the U.S. SEC.
- Charles Hill, director of research at Thomson Financial/First Call noted that only 1.8% of all current stock recommendations are "sells", even in this bear market. He went on to complain that the compensation packages of many analysts are tied too closely to the performance of the lucrative investment banking operations of the major brokers.

---

[96] As reported in Larry MacDonald, More fallout from Enron, *The Gazette*, February 27, 2002, p. D-3.
[97] As reported in Larry MacDonald, More fallout from Enron, *The Gazette*, February 27, 2002, p. D-3.
[98] Barrie McKenna, Enron analyst bristles at hoax, *The Globe and Mail*, February 28, 2002, p. B1 and B2; and Marilyn Geewax, We were duped: analysts, *The Gazette*, February 28, 2002, p. E4.

- Lehman Brothers maintained its “strong buy” rating on Enron as its stock price went from $80 a share to less than one dollar last year.

It is important to note that the performance of the rating agencies is often not better, and was not better in the case of Enron.

Q. What conclusion do you draw from this analysis?

A. We conclude that the estimates obtained using the prospective market risk premium method result in market risk premium estimates that are too unreliable to be used as a proxy for the fair required return on equity capital.

<u>The Relationship Between Accounting and Investor Rates of Return</u>

Q. The Comparable Earnings Test relies on a mapping between accounting rates of returns (ROEs) and investor expected rates of returns. In particular, it assumes that higher rates of accounting returns imply higher expected rates of return by investors. Would you please comment on the validity of this assumed relationship?

A. Unfortunately, there is no such mapping since the returns that investors expect depend upon the investment risk they bear, while accounting rates of return depend upon the investment risks that firms bear. This has been aptly stated as follows:

> “A word of caution: We all are accustomed to hearing that well-managed firms will provide high rates of return. We agree this is true if one measures the firm’s return on investments in plant and equipment. The CAPM, however, predicts returns on investment in the *securities* of the firm.

> Let us say that everyone knows a firm is well run. Its stock price will therefore be bid up and, consequently, returns to shareholders who buy at those high prices will not be excessive. Security prices, in other words, reflect public information about a firm's prospects, but only the risk of the company (as measured by beta in the context of the CAPM) should affect expected returns. In a rational market investors receive high expected returns only if they are willing to bear risk."[99]

Fair Rate of Return Estimates Based on the Comparable Earnings Methodology

Q. Please explain your criticism of the evidence of Ms. McShane based on the use of the Comparable Earnings method.

A. This test arises from the notion that capital should not be committed to a venture unless it can earn a return commensurate with that available prospectively in alternative ventures of comparable risk. While capital needs to be allocated efficiently so that the risk-adjusted returns are equivalent across firms and uses, the Comparable Earnings Test does not measure if this is the case. The Comparable Earnings Test measures rates of return but does not compare them with the opportunity cost of capital as is commonly done with measures such as Economic Value Added. Thus, we conclude that this test should not be used as a tool to estimate a fair return on equity for a utility.

Furthermore, there is widespread agreement among utility and intervenor witnesses and Boards that the Comparable Earnings Test is not

[99] Zvi Bodie, Alex Kane, Alan J. Marcus, Stylianos Perrakis and Peter J. Ryan, *Investments* (McGraw-Hill Ryerson, 3rd Canadian edition, 2000), p. 249.

appropriate for determining a fair rate of return.[100] For example, in 1999, the Alberta Energy and Utilities Board stated:[101]

> "In the Board's view, the comparable earnings test is sensitive to accounting practices of the sample firms, the sample selection, the selected business cycle and discontinuities caused by mergers, divestiture or restructuring. Given the historical corporate restructuring and economic uncertainty, which may adversely affect the test results, the Board gives little weight to the comparable earnings test in this proceeding for the purposes of determining an appropriate rate of return."

Despite this widespread agreement against its use, Ms. McShane places a significant weight on the results of applying the Comparable Earnings Method when determining her recommended fair rate of return on common equity for NSPI.

The widespread agreement against the use of the comparable earnings test is based on a number of problems with its use.

Q. What is the basic problem with the use of the Comparable Earnings Test for fair rate of return determination for utilities?

A. The basic problem is that there is neither a theoretical underpinning nor any empirical support for the comparable earnings approach to estimating a regulated fair rate of return for a utility. As an ad hoc approach to estimating a regulated fair rate of return, there are no agreed-upon rules for deciding upon how the Comparable Earnings Test should be implemented.

[100] The direct testimony of Dr. M.J. Vilbert for TransAlta Utilities Corporation, May 2000, is an example of an utility witness, and the direct testimony of Drs. L.D. Booth and M.K. Berkowitz for Alberta Trustco, August 2000, is an example of an intervenor witness.
[101] Alberta Energy Utilities Board Decision U099099, November 25, 1999, p. 326.

Q. Would you discuss some of the problems encountered in implementing a Comparable Earnings Test for fair rate of return determination?

A. We will review some of the problems encountered in implementing a Comparable Earnings Test.

First, there is no agreement on how long and what time period should be used in the test. Some analysts use a full business cycle while others use a fixed time period of five or ten years. The results tend to be sensitive to the choice of the time period.

Second, there is no agreement on how structural changes in the economy or a number of economic sectors should be dealt with. Furthermore, structural changes may invalidate the usefulness of past rate of return series for predicting future expected rates of return.

Third, the predictive usefulness of historical time series of rates of return on equity appears to remain untested. Unlike equity returns that are forward looking in that they incorporate expectations, rates of return on equity are backward looking.

Fourth, as an accounting-based measure, comparable earnings will only coincide with the investor's opportunity cost (desired rate of return) by accident. There is no conceptual reason to expect that comparable earnings represent a rational expectation of an investor's desired rate of return from investing in the firm.

Fifth, as an accounting-based measure, comparable earnings are subject to variations in the quality of earnings caused by accounting reinstatements, business combinations and divestitures, accounting choice of what is extraordinary, accounting choices of what is expensed and what is capitalized, and managerial choices about accounting practice. Our discussion in Section IV about the increasing use of "aggressive accounting" by firms is one source of why earnings numbers are not very reliable information for determining equity risk premia.

Sixth, Comparable Earnings Tests suffer from survivorship bias since they tend to be retrospective. This tends to inflate the average rates of return found for the comparable sample, as we will subsequently demonstrate for the 17 sample used by Ms. McShane.

Seventh, the Comparable Earnings Test is very dependent upon the criteria or screens used to select the sample members. Most analysts use accounting-based risk proxies to screen possible candidate firms. These screens are an attempt to identify a sample that is similar in risk to the low risk utilities. These accounting-based risk proxies measure total risk and not the systematic risk which is important to diversified investors. Thus, some firms with a high systematic risk survive the screening process. Some of the screens, such as ones that screen out firms with a high coefficient of variation for book returns, bias performance upwards. The coefficient of variation of book (or accounting) returns measures the uncertainty of returns divided by the mean return. Its inverse is a Sharpe-like measure of performance that provides the mean return per unit of standard deviation. High Sharpe-like ratios indicate better performance. For example, the CAPM (Capital Asset Pricing Model) assumes that the Market Risk Premium per unit of standard deviation of return (essentially the Sharpe ratio) is positive and constant.[102] Thus, screening out firms

[102] The literature using the Sharpe ratio to measure portfolio performance using market (not accounting) data is extensive. This literature included S. Lalancette, L. Kryzanowski and M.C. To, Performance attribution using an APT with pre-specified macrofactors and time-varying risk premia," *Journal of Financial and Quantitative Analysis* 32:2 (June 1997), pp. 205-224; S. Lalancette, L. Kryzanowski and M.C. To, Performance attribution using a multivariate intertemporal asset pricing model with one state variable, *Canadian Journal of Administrative Sciences* 11:1 (March 1994), pp. 75-85; and L. Kryzanowski and A.B. Sim, Hypothesis testing

with high coefficients of variation tends to screen out firms with low performance based on the Sharpe-like measure. Stated differently, the coefficient of variation of book returns screen retains firms that are most desired from an investor's viewpoint given their high return-to-variability ratio. Such firms include those with market power to earn sustainable economic rents.

Eighth, the screens used by some experts produce comparable samples with an average price-to-book ratio and an average price-to-earnings ratio that exceeds that of a typical utility. We know from basic valuation theory that the price-to-earnings ratio increases with increasing return-on-equity, and that the price-to-book ratio also increases with increasing return-on-equity. Thus, given this positive relationship between return-on-equity and both the price-to-earnings ratio and the price-to-book ratio, it should not be surprising that the average return-on-equity for the comparable sample exceeds that of the sample of utilities. A higher price-to-book ratio is an indication that investors think a firm has opportunities to earn a rate of return on their investment that exceeds the market capitalization rate. While Canadian Boards have appeared to be generous to utilities when viewed in hindsight, there is still an upper cap on how much their rate of return can exceed their true cost of capital. A higher price-to-earnings ratio is an indication that investors think that a firm has considerable profitable future growth opportunities.

Q. Would you please illustrate the net effect of these problems using the sample used by Ms. McShane?

A. We illustrate the net effect of these problems by examining the market performance of the sample of 17 firms used by Ms. McShane in her

with the Sharpe and Treynor portfolio performance measures given non-synchronous trading, *Economic Letters* 32 (1990), pp. 345-352.

implementation of the Comparable Earnings Method. This comparable earnings sample of 17 firms is hereafter referred to as the 17 sample or portfolio. Ms. McShane argues that the risk of her 17 sample is comparable to that of an average utility. As noted earlier, intervenors believe that utilities are less risky than the market (range of relative risks of 50% to 70% of that of the market). Finance logic then suggests that the return of the 17 sample firms should be between the yield or return on long Canada's and the return on the TSE300 index. The problems identified above suggest that the performance of the 17 sample firms will be biased upwards, and may be biased to such a large extent that this sample outperforms the market over at least the screening period used to select the samples.

If we take the period that matches in the evidence presented in Table 2A available from the Canadian Institute of Actuaries (namely, the 1991-2000 period), we can compare the annual compound returns for the 17 portfolio with those for the TSE300 index. Over this ten-year period, the 17 portfolio and the TSE300 earned annual compound rates of return of 14.22% and 13.14%, respectively. Thus, not unexpectedly given the biases introduced by using the Comparable Earnings Test, we find that the 17 sample or portfolio outperformed the TSE300 index, although it had a much lower investment risk (beta of 0.41).

To further quantify the performance-enhancement bias in the selected 17 sample, we examine the performance of the 17 sample using some standard portfolio performance measures. Specifically, we first form an equally-weighted portfolio of the 17 stocks, and calculate this portfolio's monthly return for the 120-month period, 1991-2000. This time period corresponds to the period over which Ms. McShane studies the balance sheet returns for the sample. We then calculate the excess returns on this 17 portfolio and the TSE300 index by subtracting off the risk-free T-bill rate from both of these return series. We then regress the excess returns on the 17 portfolio against the excess returns on the TSE300 index. The intercept of this regression is a measure of the excess returns or free lunch associated with holding this portfolio over this ten-year period. It is both adjusted for market movements and risk, and is commonly referred to as the portfolio's alpha. We then calculate the Sharpe ratio for the 17 portfolio and the market. This is calculated, for example, for the 17 portfolio by subtracting the average risk-free rate from the average monthly return of this portfolio, and then dividing this difference by the standard deviation of monthly returns for the 17 portfolio.

We find that the 17 portfolio has extraordinary investment performance over this 10-year period; namely:

- The 17 portfolio has a higher mean monthly return than the TSE 300 (1.2% compared to 1.1%).
- The 17 portfolio has a lower total risk as measured by the standard deviation of monthly returns than the TSE 300 (3.0% versus 4.4%).
- The 17 portfolio has a higher Sharpe ratio (i.e., higher average risk premium per unit of total risk) than the TSE300 (0.23 versus 0.15).
- The alpha or free lunch for the 17 portfolio is both positive and highly significant (p-value of 0.0652), and indicates that an abnormal return of about 0.49% per month (or about 5.2% per annum) was earned by investors who were fortunate to hold this portfolio over this ten-year period.
- Not only did the 17 portfolio yield a higher mean monthly return than the TSE300 but it had substantially less investment risk given its estimated beta of 0.41.

Q. Did you conduct any other analyses that have an impact on the validity of using the Comparable Earnings Test?

A. Yes, we calculate the ROEs for all the firms included in StockGuide. For the 10-year time period, 1991-2000, we obtain grand mean and median ROE values of –5.67% and 5.68%, respectively. If we implement standard trimming procedures of trimming 0.5% from both tails of the distribution to correct for the possible impact of outliers, the mean ROE increases to –4.85%. If we use the mean and median for the time-series of median ROE for each of the ten years, we obtain values of 5.76% and 6.73%, respectively.

These results suggest that the ROE for a firm with the same investment risk as the typical firm in the Canadian market is less than 6%. Since this average ROE is less than the risk-free proxy over this ten-year period of 7.4%, this leads to the implausible conclusion that the implied risk premium is negative (with the upward bound of 6% - 7.4%, or –1.4%).

Q. Would you comment on the statement by Ms. McShane that the "comparable earnings test applied to Canadian industrials indicates a return in the range of 11.5-13.0"?[103]

A. A simple test of whether or not these estimates are reasonable and logically consistent is to calculate what these estimates generate as an implied risk-free rate using the same historic data from which the estimates are generated. This is basically an in-sample test of the logical consistency of the estimation model or procedure used by Ms. McShane to generate a risk premium for utilities based on the comparable earnings approach.

We show the logical inconsistency in her approach using three steps. First, we describe the market risk premium adjustment used by Ms. McShane to obtain the return for utilities from her estimate of the required return for her sample of industrials. Second, we use the same market risk premium adjustment method to obtain the return for the market from her estimate of the required return for her sample of industrials. Third, we show that subtracting away the market risk premium used in step one from the market return obtained in step two provides a considerably higher risk-free rate than the risk-free rate used in step one. In other words, the estimation model or procedure used by Ms. McShane is logically inconsistent, and thus incorrect.

Step One. Ms. McShane adjusts her market risk premium of 6.5% for the difference of –0.07 in the mean adjusted betas for Electric/Gas Utilities and her sample of industrials. The market risk premium adjustment is obtained by multiplying -0.07 by her estimate of the market risk premium of 6.5% to get approximately -50 basis points (actually about -46 basis points). She then adjusts her various industrial return estimates downward by 50 basis points to get the implied returns for utilities.

Step Two. If we use the same adjustment procedure to get the market return, we get a difference in the mean adjusted betas of the market and the sample of industrials used by Ms. McShane of 0.44 (i.e., 1.0 – 0.56). Multiplying this difference by Ms. McShane's estimate of the risk premium of 6.5% gives 2.86%. This is the value that is added to the various estimated mean returns for her sample of industrials to get the corresponding estimates of the market return. Adding this 2.86% to the range of average values reported in Schedule 20 of 12.1% to 13.7% yields a return range for the market of 14.96% to 16.56% based on the 1991-2000 period. Adding this 2.86% to the range of average values reported in Schedule 20 of 13.9% to 16.8% yields a return range for the market of 16.76% to 19.66% based on the 1996-2000 period. Thus, as expected, the market return estimates are higher than the so-called low risk sample

[103] Ms. McShane, page 75, of evidence.

of industrials used by Ms. McShane. They also imply that the required annual Canadian equity market return should be between 14% and almost 20%. The reasonableness of these market return estimates can be compared against the mid-term median, upper quartile and highest forecasts of the return on the TSE300 of 10.0%, 10.5% and 18.0%, respectively, reported in the Wyatt survey, and the median and 95 percentile long-term forecasts of the return on the TSE300 of 9.0% and 13.0%, respectively, reported in the Mercer *2002 Fearless Forecast*. Both of these surveys have been discussed earlier in Sections II and IV of our evidence.

Step Three. If we now subtract away Ms. McShane's estimate of the risk premium for the market of 6.5% used in steps one and two from the market return estimates obtained in step two, we obtain a range of risk-free rate estimates of 8.46% to 10.06% based on the 1991-2000 period, and 10.26% to 13.16% based on the 1996-2000 period. However, Ms. McShane's estimate of the risk-free rate is substantially lower at 5.75%. Thus, her own procedure is not internally logical since it generates an internal inconsistency error of her estimated risk-free rate that ranges from 1.96% to 3.56% based on the 1991-2000 period, and ranges from 3.76% to 6.66% based on the 1996-2000 period. The percentage inconsistency errors are 30.2% to 54.8% based on the 1991-2000 period, and 57.8% to 102.5% based on the 1996-2000 period.

Q. What recommendation do you draw from this analysis?

A. We recommend that the Board should apply no weight to the Comparable Earnings evidence submitted by witnesses. The method is not only devoid of scientific merit and theoretical underpinnings but its substantive implementation difficulties make it unsuitable to play a role in the determination of a fair rate of return for a utility.

<u>Market Pressure Adjustment</u>

Q. Would you please comment on the adjustment made by Ms. McShane for market pressure?[104]

A. We begin with the Canadian evidence on the announcement day effect of seasoned equity offerings (SEOs).

First, with the exception of the 1996 article in the CIR, the other studies that are referred to by Ms. McShane are not reliable because they make no adjustment for market movements and/or the return expected given the investment risk of the issuer. The one exception finds an average two-day decline of 2.4% for 106 domestic issues between 1991 and 1993.

Second, the list of studies is incomplete. Three studies that should be added to the list include:

- The study by Gordon and Srivastava, which finds that private placements of restricted equity issues in Canada take place at an average discount near zero.[105]

- The study by Kryzanowski and Rakita, which investigates the market performance of 427 seasoned equity offerings (SEOs) issued during the 1993-1997 period by Toronto Stock Exchange (TSE) listed companies.[106] Consistent with the literature for non-resource firms, public non-resource SEOs and private non-resource SEOs have

[104] Ms. McShane, pages B-2 and B-3, of evidence.
[105] Gordon, Myron J. and Ashwani K. Srivastava, (1995), The Structure of Price Discounts on Private Equity Placements. *Research in Finance*, 13, pp. 185-201.
[106] Lawrence Kryzanowski and Ian Rakita, An Empirical Analysis of Canadian Seasoned Equity Offerings, paper presented at Multinational Finance Society (Garda 2001) and the Administrative Sciences Association of Canada (Montreal 2000).

significantly negative and positive mean cumulative abnormal returns (CARs) of –1.162% and 1.816%, respectively, over a three-day announcement period. They identify a noticeable run-up prior to the announcement for public offerings by resource companies, and an even more dramatic run-up for private placement offerings for non-resource companies.

- Kryzanowski and Rubalcava investigate the market performance of all the domestic and international SEOs issued by Canadian firms cross-listed on the TSE and U.S. trade venues over the period 1993-1998.[107] The sample of domestic issues consists of 116 primary and 58 secondary SEOs. They find that the cumulative abnormal return is 8.69% from 25 to 2 days before the announcement day, 0.86% from the day before to the day after the announcement day, and –2.07% from the second day through the 25th day after the announcement day. This is hardly evidence that supports price pressure.

We now continue with the difficulties involved in determining if any announcement day abnormal returns for seasoned equity offerings (SEOs) are due to price pressure. There are two problems with making a reliable determination that such effects are evidence of price pressure.

First, one has to be able to determine whether any price decline at the time of the offer announcement is due to firm-information-related effects (changes in firm fundamentals or future cash flows) or market-information-related effects (price pressure). Since Kryzanowski and Rubalcava find that the significant determinants of the abnormal returns for their three-day announcement day are predominantly firm information related, they

[107] Lawrence Kryzanowski and Arturo Rubalcava, Valuation effect of SEOs by Canadian cross-listed shares, working paper, Concordia University, 2002.

conclude that there is no unambiguous evidence for a price pressure effect associated with SEOs.

Second, there is a severe sample selection bias associated with an examination of SEOs since most seasoned equity offerings are announced when the stock has had prior positive cumulative abnormal returns. Thus, one should not be surprised to find price declines thereafter due to the selection bias inherent in a sample of SEOs. The prior price run-up also is a sign of firm-specific information being incorporated into stock prices.

VI. COST OF NEW DEBT

Q. Please explain the method that you used to estimate the cost of new debt for NSPI for 2002.

A. Our estimate of the cost of new debt for NSPI for 2002 is obtained by adding up the separate estimates for each of the three new debt cost components. The first cost component is the cost of long-term risk-free debt. The second cost component is the premium for the credit risk of NSPI. The third cost component is the cost of issuing new debt by NSPI. This component often is referred to as a flotation cost or allowance. As was discussed for new issues of equity in Section IV, the cost of issuing new debt by NSPI includes underwriting fees paid for marketing the issue, and other underwriting and issue expenses for legal and accounting services, printing of issuing documents, and applicable registration fees.

With regard to the first component of the cost of new long-term debt, our estimate of the prospective yield on long-term Government of Canada bonds is 5.90%. This estimate is 15 basis points higher than the estimate made by Ms. McShane in her evidence.[108] The basis for our higher estimate is set out in Section II of the evidence.

With regard to the second component of the cost of new long-term debt for NSPI, we need to estimate the credit risk spread for NSPI. We estimate that NSPI is of average risk for a Canadian integrated, electric utility based on the reasons set out in Section III of our evidence. We acknowledge that NSPI has a split debt rating by the bond rating agencies, S&P and DBRS, of BBB+ and A (low), respectively.

[108] Ms. McShane, page 32, of evidence.

We obtain our initial estimate of the required credit risk spread for NSPI in two steps. In step one, we determine the required credit risk spread for an A (low)-rated issuer of debt. In the second step, we determine what adjustment, if any, is required for an issuer of debt that has a split rating, where one rating is A (low) and the other is BBB+. In the first step, we use the somewhat high estimate provided by Mr. Falconer from CIBC World Markets data that the indicated ten-year spread in basis points of A (low) rated electric utility bonds is 90 to 95 basis points (bps). He also shows that the spread has increased during the most recent economic "recession" or period of slow growth in Canada.[109] As economic growth "picks up", this temporary widening of the spread should decrease. Because we forecast an economic recovery by the end of 2002, we adopt the smaller end of Mr. Falconer's range (a yield spread of 90 basis points) as our initial estimate of the required credit risk spread.

We next examine what adjustment, if any, should be made for the split rating for NSPI debt. To do this, we examine the time series of yield spreads for two bonds, a Canada and a NSPI bond, which have almost the same coupon, term-to-maturity and duration. For this purpose, we use the Canada 5.5% 2009/06/01 and the NSPI 5.55% 2009/06/01. We then calculate the yield spread of the NSPI 5.55% over the Canada 5.5% for the longest time period for which we could obtain data. This is the time period from 10 February 2000 through 7 March 2002. An examination of the yield spreads in Schedule 16 shows that the yield spreads are not materially affected by the 21 December 2001 announcement by S&P that they downgraded the debt of NSPI a notch from A- to BBB+. Further, in Section III of our evidence, we quote from a Scotia Capital fixed income analyst, Stephen Dafoe, who makes exactly the same point. Nevertheless, to account for possible estimation error, we increase our credit risk premium by five basis points to 95 basis points.

[109] Mr. Falconer, page 11, of evidence.

With regard to the third component of the cost of new long-term debt for NSPI, we use the median percentage fee for long-term debt (maturity over ten years) of 50 basis points from Schedule 13 as a starting point. If this cost is amortized over 20 or 10 years, we obtain annual percentage underwriting fees of 2.5 or 5 basis points, respectively. Reflecting other issue-related costs, we estimate that the third cost component should not be more than 5 basis points on an annual basis, and may be even less. Adding up our debt cost components, we obtain: a long-Canada yield of 5.90%, yield spread of 95 basis points, and issue costs of 5 basis points for a total of 6.9%.

Q. Are there any other adjustments that could be made to this estimate?

A. Yes. A further adjustment could be made to reflect the strong possibility that the term and the durations of the sample of A-rated Utility Bonds used by Mr. Falconer are shorter than those of the benchmark Long-Term Government of Canada Bonds. Thus, the estimated credit risk premium is likely to contain a premium that captures any term or duration differences. We make no adjustment for any potential term or duration differences that would probably lower the credit risk premium estimate.

Q. Would you comment on how your interpretation of the impact of a rating downgrade for NSPI differs from that of Ms. McShane and Mr. Falconer?

A. To be fair, it is easier to interpret the impact of a rating downgrade after it occurs, or after it partially occurs, than before it occurs. Nevertheless, the actual impact on NSPI of the partial downgrade of its long-term debt does not support the dire predictions of Ms. McShane or Mr. Falconer. Ms. McShane predicted that a “one notch downgrade would drop the company into the BBB ratings, which constrains its access to debt markets".[110] The market's reaction to the downgrade hardly supports her prediction. Mr. Falconer predicted "if NSPI's rating were to decline to "BBB" (high) from "A" (low), its incremental borrowing costs would increase".[111] In his ex post examination of the impact of the recent downgrade of NSPI by S&P, Mr. Falconer concludes "the spreads have widened significantly on NSPI's existing debt and preferred shares".[112] Based on two graphs, NSPI concludes "while general market credit spreads were widening, NSPI spreads widened by 25 to 30 basis points".[113] The ex post reaction, as depicted in Schedule 16, indicates that there was no material impact on incremental borrowing costs for NSPI from moving from a common A- rating to a split A-/BBB+ rating. Furthermore, the accompanying drop in the commercial paper rate expected by Mr. Falconer also did not materialize when S&P downgraded NSPI.[114] In essence, the sky above NSPI did not fall from the partial downgrade of the long-term debt of NSPI.

Q. Would you please comment on underwriter relationships in general, and the underwriter relationships of Emera/NSPI in particular?

A. In addition to the activities involved in pricing and marketing specific issues, underwriters are now expected to provide after-market support, including the provision of information on the firms. The available evidence

[110] Ms. McShane, page 12, of evidence.
[111] Mr. Falconer, page 11, of evidence.
[112] Mr. Falconer, response to IR-36. Page 572 of the CD contains his response.
[113] NSPI, response to IR-67. Pages 780 and 781 of the CD contain the response by NSPI. The use of a single issue for one firm (the Bank of Nova Scotia or BNS) as a proxy for the general market for each of two terms to maturity is flawed since the long Canada already reflects market movements. This comparison merely depicts how the yield spreads over Canada's have varied over time for one bond rated by S&P as A-/BBB+ and for another bond rated by S&P as A+ (stable). The BNS bond rating was checked on 11 March 2002 and is of February 28, 2002. It is available at: http://www.standardandpoor.com/RatingsActions/RatingsLists/CanadianIssuers/icr_am_013102.pdf.
[114] Mr. Falconer, page 12, of evidence.

indicates that the analysts of lead underwriters tend to recommend the stocks of underwritten firms with greater enthusiasm.

Emera/NSPI appears to have a good relationship with its underwriters. Over the five-year period 1997-2001, we identified two issues by Emera (1 short-term debt and 1 common equity), and 14 issues by NSPI. We found no evidence of withdrawn issues. In terms of lead underwriters, CIBC was the lead for the common equity issue by Emera, and for 7 of the issues by NSPI. Of the 11 long-term debt issues by NSPI, RBC and CIBC were the leads for 6 and 5 issues, respectively.

Q. What conclusion do you draw from this analysis?

A. We conclude that the estimated 2002 cost of new debt to NSPI is 6.9%. This is the summation of an estimated long Canada rate of 5.9%, a required credit risk spread of 95 basis points, and a flotation allowance of 5 basis points.

APPENDICES A - D

APPENDIX A

Brief Curriculum Vitae for Lawrence Kryzanowski

Dr. Lawrence Kryzanowski is currently a Full Professor of Finance and Ned Goodman Chair in Investment Finance at Concordia University. He also is Co-Director of the Concordia-McGill-Xiamen (CMX) Project of the Canada-China University-Industry Partnership Program in Financial Services. He is currently a Fellow at CIRANO, a member of CREPÉE, a Principal Researcher at the Chair in Management of Bio-Industries at UQAM, and a scientific committee member of Institut de Finance Mathématique de Montréal. He has been a visiting scholar at the University of British Columbia, a research associate at the University of Rochester, and a resident consultant at the Federal Department of Finance.

Dr. Kryzanowski has extensive experience teaching undergraduates, MBA, MSC and Ph.D. students, and executives for the Institute of Canadian Bankers, Shanghai Banking Institute, CMX, Concordia University, McGill University and Dalhousie University. Dr. Kryzanowski has extensive experience in developing or managing the development of instructional textbooks for the Institute of Canadian Bankers (ICB) and the Canadian Securities Institute (CSI), which includes the *Investment and Portfolio Management* text for the ICB, and the *Canadian Securities Course* text for the CSI.

Dr. Kryzanowski is an active educator, mentor, consultant and expert witness in financial services, including investment management, risk pricing and management, and regulation and operations of global financial markets, institutions and participants. He is author or co-author of 80 refereed journal articles and seven books or monographs. Dr. Kryzanowski is the first recipient of Prix ACFAS/Caisse de dépôt et placement du Québec, which recognizes an exceptional contribution to research in finance. During the past year, Dr. Kryzanowski was inaugural recipient, with co-authors, of the BGI Canada Award and OSFI Award (latter with Dr. Roberts) for excellence in research on capital markets and on regulation of financial institutions, respectively. His eleven other paper awards for co-authored work are from the *Multinational Finance Journal* and various North American academic conferences. Dr. Kryzanowski is a former co-editor of finance with Dr. Roberts at the *Canadian Journal of Administrative Studies*, and founding chairperson of the Northern Finance Association. Dr. Kryzanowski is currently an Editor of the *Multinational Finance Journal*, an Associate Editor of the *International Review of Financial Analysis*, and is on the editorial boards of the *Canadian Investment Review* and *Finance India*.

Dr. Kryzanowski has experience in preparing evidence as an expert witness in utility rate of return applications, stock market insider trading court proceedings, and confidential final offer arbitration hearings for setting of fair rates for the movement of various products by rail. Together with Dr. Roberts, he prepared a report and briefed counsel on rate of return considerations in the pipeline application in 1997 of Maritimes and Northeast, and prepared evidence on the fair return on equity and the recommended capital structure for the distribution tariff application 2000 of Atco Electric and of Utilicorp Networks Canada (Alberta) Ltd. They are currently preparing evidence for another matter to appear before the Alberta Energy and Utilities Board.

Dr. Kryzanowski is sought for his technical ability and advice on various matters in financial economics. Working jointly with Dr. Roberts, he has consulted for the Superintendent of Financial Institutions, Federal Department of Finance, Canada Investment and Savings, among others. He has also consulted for Hydro Quebec, National Bank, Bombardier, and others.

Dr. Kryzanowski received a B.A. in Economics and Mathematics from the University of Calgary and earned his Ph.D. in Finance at the University of British Columbia.

Brief Curriculum Vitae for Gordon S. Roberts

Dr. Gordon S. Roberts is currently CIBC Professor of Financial Services and Area Coordinator, Finance Area, at York University's Schulich School of Business. Prior to joining York University, he was Bank of Montreal Professor of Finance at the School of Business, Dalhousie University. Dr. Roberts has held positions as Visiting Professor and Visiting Scholar at Tilburg University (the Netherlands), Deakin University (Melbourne, Australia), University of Toronto, University of Arizona, Xiamen University (China) and the University of Zimbabwe.

In addition to teaching undergraduates, MBA and Ph.D. students at these universities, Dr. Roberts has extensive experience in executive teaching for the Institute of Canadian Bankers and in the Pension Investment Management School sponsored by the Schulich School jointly with pension consulting firms William Mercer Inc. and Frank Russell.

An active researcher in the areas of corporate finance, bond investments and financial institutions, Dr. Roberts is author or co-author of over forty journal articles and three corporate finance textbooks. In 2000, he shared with Dr. Kryzanowski the OSFI award for excellence in research on the regulation of financial institutions. Dr. Roberts is a former co-editor of finance with Dr. Kryzanowski of the *Canadian Journal of Administrative Studies*. He is currently an Associate Editor of the *Journal of Banking and Finance*, and serves on the editorial boards of *FINECO* and the *Banking and Finance Law Review*.

Dr. Roberts is experienced in preparing evidence for utility rate of return hearings. From 1995 – 1997 he submitted prefiled testimony as a Board witness in rate hearings for Consumers' Gas. In 1996, he served as an expert advisor to the Ontario Energy Board in its Diversification Workshop. In 1997, he co-prepared (with Dr. Kryzanowski) a report for the Calgary law firm, MacLeod Dixon, on rate of return considerations in the pipeline application by Maritimes and Northeast. In 2001, he and Dr. Kryzanowski filed evidence on three electricity regulatory matters in Alberta. They are currently preparing evidence for another matter to appear before the Alberta Energy and Utilities Board.

Sought for his advice on financial policy, Dr. Roberts has consulted for the Superintendent of Financial Institutions, the federal Department of Finance, Canada Investment and Savings, Canada Mortgage and Housing Corporation, and Canada Deposit Insurance Corporation, among others.

Dr. Roberts received a B.A. in Economics from Oberlin College and earned his Ph.D. at Boston College. He has been listed in the Canadian Who's Who since 1990.

APPENDIX B

Recent Thinking and Estimates of U.S. and Other Country Equity Risk Premia

1. Based on Realized Rates of Return:

Reichenstein (2001) summarizes the predictions of several academic and professional scholars that long-run real stock returns will be below historical standards and that the equity risk premium will be well below historical standards, and even negative according to some scholars.[1] The academic studies are by Jagannathan, McGrattan and Scherbina (2000), Siegel (1999) and Fama and French (2001). The practitioner studies are by Brown (2000) and by Arnott and Ryan (2001). The real stock return estimates are 2.9% to 4.4% for Fama and French, 3.2% for Arnott and Ryan, 3.3% for Siegel, 4.8% for Jagannathan et al, and 5.2% for Brown.

Fama and French (2001) obtain estimates of the U.S. equity risk premium of 2.55% and 4.32% for 1951-2000 when they use rates of dividend and earnings growth to measure the expected rate of capital gain. These equity risk premium estimates are much lower than the 7.43% estimate produced by using the average stock return over this period of time. They conclude that their evidence shows that the high average realized return for 1951-2000 is due to a decline in discount rates that produces large unexpected capital gains. Their main conclusion is that the stock returns (and realized equity risk premia) of the last half-century is a lot higher than what was expected by investors ex ante. The lower estimates of expected stock returns are less than the income return on investment that suggests that investment by corporate U.S. is on average profitable. In contrast, the much higher estimates of expected stock returns from using the traditional time-series means suggests that investment by corporate U.S. is on average unprofitable (its expected return is less than its cost of capital).

According to Fama and French (2001), “many papers suggest that the decline in the expected stock return is in part permanent, the result of (i) wider equity market participation by individuals and institutions and (ii) lower costs of obtaining diversified

[1] Cited articles in this appendix are listed in the references found between the text and the tables to this appendix.

equity portfolios from mutual funds (Diamond, 1999; Heaton and Lucas, 1999; Siegel, 1999)".

Jagannathan et al (2000) demonstrate that the U.S. equity risk premium has declined significantly during the last three decades. They calculate the equity premium using a variation of a formula in the classic Gordon stock valuation model. While the premium averaged about 7 percentage points during 1926-70, it only averaged about 0.7 of a percentage point after that. They support this result by demonstrating that investments in stocks and consol bonds of the same duration would have earned about the same return between 1982 and 1999, a period over which the equity risk premium estimate is about zero.

There are a number of studies not reviewed by Reichenstein (2001). These are reviewed next.

In a conference presentation on October 15, 2001, Robert A. Arnott of First Quadrant estimates the U.S. equity risk premium for the 75 years from December 1925 to be 4.7%, and to have oscillated around zero beginning in the early 1980s.[2] He estimates the forward-looking U.S. equity risk premium from October 2001 to be 0.3%±.

In a study (undated) by Deutsche Asset Management, the expected long-run equity risk premia are 2.5% over government bonds or 3.0% over cash for the U.S., Euroland, Japan and the U.K. (see Schedule B-1). These equity risk premia are based on two approaches, where the first estimates what equities can return based on free cash flows that they generate, and the second estimates what equities need to return to get investors to hold them instead of less risky assets.

Based on reasonable priors and allowing for structural breaks, Pastor and Stambaugh (2002) obtain estimates of the equity risk premium of between 3.9 and 6.0 percent over the period from January 1834 through June 1999. The estimated premium rises through much of the nineteenth century and the first few decades of the twentieth century. It declines fairly steadily after the 1930's except for a brief period in the mid

[2] Specifically, Exhibit 4a on page 21 of Arnott (2001).

1970's. The estimated premium exhibits its sharpest decline to 4.8% during the decade of the 1990's.

Ibbotson and Chen (2001) forecast the equity risk premium through supply side models using historical information. They conclude that "contrary to several recent studies on equity risk premium that declare the forward looking equity risk premium to be close to zero or negative, we find the long-term supply of equity risk premium is only slightly lower than the straight historical estimate". Their equity risk premium estimate is about 4% in geometric terms, and 6% on an arithmetic basis. Their arithmetic estimate is about 1.25% lower than the straight historical average estimate. Interestingly, their various estimation procedures generate geometric mean estimates of the U.S. equity risk premium that are converted to arithmetic estimates for reporting purposes.

2. Actual versus Expected Equity Risk Premia

A few studies examine whether or not actual or realized equity risk premia are a good proxy for expected or required equity risk premia. The findings of two of these studies are summarized in Schedule B-2. The study (undated) by Deutsche Asset Management aptly summarizes these findings as follows:

> In sum, a wealth of theoretical and empirical evidence suggests that the historical, realized equity premium (5% - 7%) exceeded what equities were expected to deliver in the past, and very likely exaggerates what they should be expected to deliver in the future. An equity premium of 3% - 4% may have been closer to the true, ex-ante premium in the past, and the lower end of that range seems the most that we should anticipate (and that investors will require) now that economic/political conditions are more stable and people are more 'plugged in' to the benefits of equity investing. So we take 3% as an upper bound for the equity premium going forward.

It should also be kept in mind that these equity risk premia are calculated in reference to short-term government bonds (such as T-bills) and **not long-term government bonds**.

3. Synthesis

All of the studies conclude that the U.S. equity risk premium has narrowed substantially, and is expected to be lower in the future. The U.S. equity risk premium estimates vary from zero or slightly negative (Jagannathan et al, 2000) to about 6 %

(Ibbotson and Chen, 2001). These studies strongly suggest that any forecast **for the U.S.** over 5% based on T-bills is in the optimistic tail of the distribution of possible equity risk premium estimates.

The two studies dealing with realized and expected equity risk premium find that the expected equity risk premium when measured **against short-term** government bonds in the U.S. has ranged between 3.4% and 4.2% depending on the time period considered, and has averaged 3.5% over 101 years for a sample of 15 developed countries.

References:

Arnott, Robert D., 2001, Is the risk premium still dead?, Microsoft PowerPoint Presentation, YMG Conference, October 15. Available at: http://www.ymg.ca/news/Conferences/Conference2001/Rob%20Arnott%20-%20First%20Quadrant.pdf.

Arnott, Robert D. and Ronald J. Ryan, 2001, The death of the risk premium, *Journal of Portfolio Management*, Summer, 61-74.

Brown, Anthony, 2000, What's next for the S&P 500?, *Journal of Investing*, Winter, 60-66.

Deutsche Asset Management, undated, What can we expect for asset returns in the long term? *Deutsche Asset Management's View*.

Diamond, Peter A., 1999, *What stock market returns to expect for the future?* Center of Retirement Research at Boston College, September, Number 2.

Dimson, Elroy, Paul Marsh, and Mike Staunton, 2000, *Millennium Book II: 101 Years of Investment Returns*, London Business School and ABN-AMRO.

Fama, Eugene F. and Kenneth R. French, 2001 The equity premium, Working Paper no. 522, The Center for Research in Security Prices, Graduate School of Business, University of Chicago, April.

Heaton, John, and Deborah Lucas, 1999, Stock prices and fundamentals, In: *Macroeconomics Annual 1999*, Ben Bernanke and Julio Rotemberg (eds.), National Bureau of Economic Research, MIT Press, Cambridge, MA, 213-242.

Ibbotson, Roger G. and Peng Chen, 2001, The supply of stock market returns, working paper, June.

Jagannathan, Ravi, Ellen R. McGrattan and Anna Scherbina, 2000, The declining U.S. equity premium, *Quarterly Review of Federal Reserve Bank of Minneapolis*, Fall, 3-19.

Pastor, Lubos and Robert F. Stambaugh, 2002, The equity premium and structural breaks, Forthcoming *Journal of Financial Economics*.

Reichenstein, William, 2001, The investment implications of lower stock return prospects, *AAII Journal*, October, 4-7.

Siegel, Jeremy J., 1999, The shrinking equity premium, *Journal of Portfolio Management*, Fall, 10-17.

Schedule B-1. Expected long-run returns in local currency terms (annualized, percent)

	Cash		Gov't Bonds		Equities	
	Nominal	Real	Nominal	Real	Nominal	Real
U.S.	4.50	2.00	5.00	2.50	7.50	5.00
Euroland	3.75	2.00	4.25	2.50	6.75	5.00
Japan	3.00	2.00	3.50	2.50	6.00	5.00
U.K.	4.50	2.00	5.00	2.50	7.50	5.00

Source: Deutsche Asset Management, undated, 2.

Schedule B-2. Actual versus 'expected' equity risk premium in %[a]

Study	Country	Dates	Actual	Expected
Fama & French (2001)	U.S.	1872-2000	5.6	3.5
Fama & French (2001)	U.S.	1872-1950	4.4	4.2
Fama & French (2001)	U.S.	1951-2000	7.4	3.4
Dimson et al. (2000)	U.S.	1900-2000	5.6	4.0
Dimson et al. (2000)	15 countries[b]	1900-2000	5.1	3.5

[a]The actual premium is the compound, annualized rate of return less the compound, annualized return on short-term government debt. The expected premium uses dividend growth and earnings growth models to estimate equity returns.
[b]Australia, Belgium, Canada, Denmark (from 1915), France, Germany (ex. 1922/23), Ireland, Italy, Japan, Netherlands, Spain, Sweden, Switzerland (from 1911), U.K. and U.S.

Source: Deutsche Asset Management, undated.

APPENDIX C

Beta Adjustment to Reflect Sensitivity to Interest Rate Changes

One of the rationales for using the adjusted beta method for utilities is the need to adjust raw utility betas upward to be more consistent with the interest rate sensitivity of the common equity shares of utilities.

As is the case for the TSE300 index, the returns of utilities are sensitive to changes in both market and bond returns. This suggests that utility returns may be better modeled using these two potential return determinants or factors. However, one should not confuse the sensitivity of utility returns with the premium required by investors to bear market and interest rate risk when investing in utility equities.

In the traditional one-factor CAPM, where the only factor is the market, one measures relative risk by estimating the utility's beta by running the following regression:

$$r_i = a_i + b_i R_m + e_i$$

where r_i and R_m are the return on utility *i* and the market *m*, respectively; and

b_i is the beta coefficient of utility *i*.

The utility's required rate of return then is given by:

$$\bar{r}_i = r_f + b_i(\bar{R}_m - r_f)$$

where r_f is the risk-free rate, which is proxied here by the yield on a long-term Canada;

$(\bar{R}_m - r_f)$ is the so-called equity market risk premium; and

all the other terms are defined as before.

In a two-factor CAPM, one obtains the relative priced risks for utility *i* by estimating the utility's betas by running the following regression:[3]

$$r_i = a_i + b_{1i}R_m + b_{2i}R_b + e_i$$

where r_i, R_m and R_b are the return on utility *i*, the equity market *m* and long Canada's, respectively; and

b_{1i} and b_{2i} are the beta coefficients of utility *i* (i.e., the sensitivities to market and interest rate risk, respectively).

The utility's required rate of return then is given by:

$$\bar{r}_i = r_f + b_i(\bar{R}_m - r_f) + b_i(\bar{R}_b - r_f)$$

where r_f is the risk-free rate, which is proxied here by the yield on a long-term Canada;

$(\bar{R}_m - r_f)$ is the so-called equity market risk premium;

$(\bar{R}_b - r_f)$ is the so-called interest rate risk (bond market) premium; and

all the other terms are defined as before.

While one would expect the estimates of R_m, R_b and $(\bar{R}_m - r_f)$ to be positive and significant, such is not the case for $(\bar{R}_b - r_f)$. Over the long run, we would expect the average return on long Canada's to be equal to the yield on long Canada's (the proxy for the risk-free rate in rate of return settings). This is because our expectation is that rates would fluctuate randomly so that return would be above yield to maturity in some periods and below it in others. Thus, while it is true that utility returns are sensitive to interest

[3] This two-step procedure for testing asset pricing models, such as the CAPM, originates with Eugene Fama and James MacBeth, Risk, return, and equilibrium: Empirical tests, *Journal of Political Economy* 71 (1973), pp. 607-636.

rates, it is not true that interest rate risk will have a positive risk premium over the long run.

We now illustrate the above by first calculating the betas for the two-factor CAPM for our sample of seven utilities over the 1990-2001 period. In doing so, we use correct econometric procedures by using the orthogonalized long Canada bond returns. When this correct econometric procedure is used, the market betas are the same as those obtained using the single-factor CAPM for each utility, and the interest rate betas are the same as those obtained using the two-factor CAPM (without orthogonalization) for each utility. These results are reported in Schedule C-1. As expected, the beta estimates for each factor are positive (and generally) statistical significant at conventional levels.

Next, we calculate the bond market risk premia over various time periods that correspond to those used previously to calculate the equity market risk premia. These results are reported in Schedule C-2. As expected, over long periods, such as 1948-2001 or 1957-2001, the bond market risk premia is less than 60 basis points. While it is much larger over the 1980-2001 period at 3.676%, this is offset by the low equity market risk premium of 1.570%. Furthermore, if we use the median betas (equity market and bond market) for the utilities from Schedule C-1, we find that the combined equity and bond market risk premia for the average utility ranges from 1.245% for the 1957-2001 period to 2.191% for the 1980-2001 period.

Schedule C-1

This table provides the market and bond return betas for our sample for seven utilities based on the estimation of a two-factor CAPM over the period, 1990-2000. The two utilities that do not have data for the full time period are eliminated from the sample. They are Pacific Northern Gas and Enbridge. All betas are calculated using monthly total returns for the utility and the TSE300 index. The year 2001 was not included because monthly long Canada returns were not available for 2001.

Variable	BC Gas	Canadian Utilities	TransAlta Corp.	TransCanada Pipelines	Westcoast Energy	Atco Ltd.	Fortis Inc.	Mean	Median
Market beta	0.363	0.433	0.231	0.350	0.268	0.500	0.294	0.349	0.350
Orthogonalized bond return beta	0.344	0.438	0.651	0.472	0.387	0.475	0.360	0.447	0.438

Schedule C-2

This table provides the equity and bond market premia over yields on long Canada's for various time periods.

Time Period	Equity market risk premia	Bond market risk premia	Total risk premia[a]
1948-2001	5.469	0.156	1.978
1951-2000	4.237	0.273	1.601
1957-2001	2.856	0.556	1.245
1980-2001	1.570	3.676	2.191

[a]This is calculated using the mean betas for the utility sample given in Schedule C-1. For example, 1.978 = (.350*0.05469)+(0.438*0.00156).

APPENDIX D

The Impact of Fundamental Changes Including Globalization on Expected Equity Market Risk Premia

The Basic Relationship

In a CAPM economy, the risk premium on the market portfolio is related to its variance by the average degree of risk aversion.[4] This can be stated as:

$$\bar{r}_m - r_f = \bar{A}\sigma_m^2$$

where $\bar{r}_m - r_f$ is the market risk premium;

$\bar{A}$ is the average degree of risk aversion in the market; and

σ_m^2 is the risk of the market.

Canadian Market is Totally Segmented

If the Canadian market was totally segmented from other international markets, then all of its risk, σ_m^2, would be non-diversifiable. Thus, investors would require compensation for all of σ_m^2.

Relationship Between Risk Premia and Risk Tolerance

Let us now use Question 2 from "Concept Check" in Bodie et al. (2000) to illustrate what happens when the risk tolerance of investors increases, and so forth. This question is as follows:

[4] This relationship is found in a number of sources. Please see equation (7.2) in the following investment textbook: Zvi Bodie, Alex Kane, Alan J. Marcus, Stylianos Perrakis and Peter J. Ryan, *Investments* (McGraw-Hill Ryerson, 3rd Canadian edition, 2000), p. 244.

"Question 2 · Data from the period 1957-1998 for the TSE 300 index yield the following statistics: Average excess return, 3.60 percent; standard deviation, 16.08 percent.

a. To the extent that these averages approximated investor expectations for the period, what must have been the average coefficient of risk aversion?
b. If the coefficient of risk aversion were actually 1.5, what risk premium would have been consistent with the market's historical standard deviation?"[5]

We begin with the answer to part a using the equation given above. We first calculate the variance of return on the market by multiplying 16.08% by 16.08% to get 2.59%. The average coefficient of risk aversion is then equal to: 3.60% divided by 2.59% to get 1.39.

We now provide the answer to part b where market risk aversion is higher at 1.5 instead of 1.39. In this case, the market risk premium is equal to 1.5 times 2.59%, or 3.88%. In other words, everything else held constant, an increase in the risk aversion (decrease in risk tolerance) from 1.39 to 1.5, increases the equity market risk premium from 3.60% to 3.88%.

We now extend the question by introducing a utility with the same standard deviation of return of 16.08% as the market and a correlation with the market of 0.5. Thus, this utility's beta or relative risk is equal to its standard deviation of return of 16.08% times its correlation with the market of 0.5, all divided by the standard deviation of return for the market of 16.08%. This yields a beta of 0.5. Thus, this utility is one-half as risky as the market in terms of their non-diversifiable risks. In part a, the utility's own relative market risk premium would be 0.5 times 3.60%, or 1.80%. In part b, the utility's own relative market risk premium would be 0.5 times

[5] Zvi Bodie, Alex Kane, Alan J. Marcus, Stylianos Perrakis and Peter J. Ryan, *Investments* (McGraw-Hill Ryerson, 3rd Canadian edition, 2000), pp. 244-245.

3.88%, or 1.94%. Thus, if the beta of the utility does not change as one would expect given that only risk aversion has changed, its own relative market risk premium increases when market risk aversion increases (risk tolerance decreases), and its own relative market risk premium decreases when market risk aversion decreases (risk tolerance) increases.

Relationship Between Risk Premia and Market Portfolio with Changing Risk

We now extend the question by assuming that the composition of the market shifts to more risky industries, such as high-technology, bio-technology, and so forth. Thus, we assume that the coefficient of average risk aversion is still 1.5, and the standard deviation of the market increases from 16.08% to 20%. We have no reason to expect the standard deviation of the utility would change from its 16.08%, and we would expect that the correlation of returns between the utility and the market would decrease, assumed for the moment to be about 0.4. What are the new risk premia for the market and the utility?

We first calculate the new variance of return for the market by multiplying 20% by 20% to get 4%. We then get the new market risk premium by multiplying 1.5 times 4% to get 6%. We obtain the new beta for the utility by multiplying the utility's own unchanged standard deviation of return of 16.08% by the utility's own new correlation with the market of 0.4, and then divide this by the now higher standard deviation of return for the market of 20%. We get a new (and lower) beta for the utility of .32. The utility's relative risk premium is now equal to its beta of 0.32 times the new market risk premium of 6, or 1.92% (i.e., about the same as before except for rounding error). Thus, the utility's relative risk premium will increase if the correlation does not drop from 0.5 to 0.4, will remain unchanged if the correlation drops from 0.5 to 0.4, and will actually decrease if the correlation drops from 0.5 to below 0.4. The evidence that we presented earlier on the rolling betas and correlations lead to the conclusion that the correlation would drop below 0.4.

These results are not surprising, since while the total market risk premium has increased from 3.80% to 6%, the risk premium per unit of risk has remained constant at 1.5. Thus, unlike the case where the coefficient of risk aversion changes, increased market risk due to a changing market composition into risky assets that are less correlated with existing assets will lower the relative risk premium for the utility, and is likely to lower it enough that the utility's own relative risk premium will decrease.

<u>Relationship Between Risk Premia and Market Integration/Globalization</u>

Suppose now that the Canadian market is integrated with world markets. What is the proper risk premium for the Canadian market?

To answer this question, let us assume as above that the standard deviation of the Canadian market remains at 16.08%, that the average risk aversion is 1.5 both within and outside of Canada, that the risk-free rate is the same in Canada as it is internationally, and that there are benefits from international diversification. The benefits from international diversification are such that the risk premium for an internationally diversified portfolio with the same standard deviation of returns as the Canadian market is higher (say, 6%) than the previous value calculated for Canada-only investment of 3.88%.

Does this mean that the appropriate risk premium to be used for the TSE is now 6% instead of 3.88%? The answer is definitely no. While the internationally diversified portfolio and the Canadian market portfolio have the same standard deviation of return, they do not have the same level of non-diversifiable risk. While all of the total risk of the internationally diversified portfolio is non-diversifiable, much of the total risk of the

Canadian market portfolio is now diversifiable, according to the theory and empirical evidence on international portfolio diversification. Thus, if 50% of the risk of the Canadian market portfolio is diversifiable when this portfolio is included in a well-diversified international portfolio, then the appropriate risk premium is not 6% or 3.88%, but it is one-half of 6% or 3%. This is why the theory and empirical evidence finds that globalization decreases the cost of capital.

Schedule 1

Forecasts for Interest Rates for December 31, 2002

The table sets out data from a sample of 81 investment managers surveyed by Mercer. We also look at two banks: BNS and TD. Our forecast is simply the consensus.

Source	30-year U.S. Treasuries	30-Year Canada's
Mercer Fearless Forecast		
95th percentile	6.0%	--
median	5.5	5.9%
5th percentile	4.9	--
Bank of Nova Scotia	5.65	5.85
Toronto Dominion Bank	5.8	5.95
Kryzanowski and Roberts	**5.5**	**5.9**

Sources: 2002 Fearless Forecast: Forecasts by 81 Canadian and International Managers, William Mercer, January 2002; http://www.scotiacapital.com/English/bns_econ/forecast.pdf and http://www.td.com/economics/qef/usde01.pdf.

Schedule 2

Debt Ratings for the Sample of Canadian Utilities, Emera and Nova Scotia Power 2002

Corporate Issuer	DBRS Rating	DBRS Debt Rated	Standard & Poor's Rating
Atco Ltd.	A (low)	Corporate	N/R
BC Gas	A (low)	Corporate	BBB+
Canadian Utilities	A	Corporate	A+
Enbridge Inc.	A	MTN and Debentures	A-
Fortis Inc.	BBB (high)	Unsecured Debentures	A-
Pacific Northern Gas	BB (high)	Secured Debentures	BB-
TransAlta Corp.	A (low)	Unsecured Debentures	BBB+
TransCanada Pipelines	A	Unsecured Debentures & Notes	A-
Westcoast Energy	A (low)	Unsecured Debentures	A-
Average	A (low)		A-
Emera Incorporated	**BBB (high)**	**MTN**	**BBB+**
Nova Scotia Power Inc.	**A (low)**	**Unsecured Debentures and MTN**	**BBB+**

Sources: Dominion Bond Rating Service website: www.dbrs.com, Standard & Poor's website:www.standardandpoors.com, March 1, 2002.

Schedule 3

Capital Structures for Utilities 1999-2000 (percentage of long-term capital**)**

Utility:	Long-term debt & debentures		Preferred Shares		Common Equity	
	2000	**1999**	**2000**	**1999**	**2000**	**1999**
ATCO LTD.	77.04%	77.58%	0.00%	0.00%	22.96%	22.42%
B C GAS INC.	68.16%	64.70%	5.45%	0.00%	26.39%	35.30%
CANADIAN UTILITIES LIMITED	56.50%	56.31%	7.85%	8.05%	35.66%	35.64%
ENBRIDGE INC.	68.61%	69.63%	1.53%	1.65%	29.86%	28.73%
FORTIS INC.	63.93%	60.95%	0.00%	0.00%	36.07%	39.05%
PACIFIC NORTHERN GAS LIMITED	53.36%	55.37%	3.25%	4.34%	43.39%	40.28%
TRANSALTA CORPORATION	53.15%	54.44%	0.00%	0.00%	46.85%	45.56%
TRANS CANADA PIPELINES LTD.	68.22%	70.93%	2.31%	3.88%	29.47%	25.19%
WESTCOAST ENERGY INC.	62.31%	62.99%	9.03%	9.82%	28.67%	27.19%
Average	63.47%	63.66%	3.27%	3.08%	33.26%	33.26%
EMERA	54.16%	57.22%	0.00%	0.00%	45.84%	42.78%

Source: Calculated with data from Stock Guide.

Schedule 4

Coverage ratios, allowed and earned ROEs for selected utilities 1999-2000

Utility	Interest Coverage		Cash Flow to Debt		ROE	
	2000	**1999**	**2000**	**1999**	**2000**	**1999**
Atco Ltd.	2.98	2.88	0.18	0.19	14.39	14.13
BC Gas	2.07	2.10	0.09	0.11	16.60	13.35
Canadian Utilities	3.15	3.05	0.18	0.20	15.44	14.54
Enbridge Inc.	1.96	2.02	0.10	0.11	18.11	14.50
Fortis Inc.	1.96	2.22	0.10	0.11	9.73	8.55
Pacific Northern Gas	2.33	2.42	0.16	0.13	9.75	10.79
TransAlta Corp.	3.42	2.55	0.22	0.18	25.81	9.22
TransCanada Pipelines	1.79	1.63	0.09	0.07	13.99	-1.56
Westcoast Energy	1.88	1.65	0.08	0.07	13.18	9.32
Average	**2.39**	**2.28**	**0.13**	**0.13**	**15.22**	**10.32**
Emera	**1.94**	**1.86**	**0.15**	**0.14**	**10.88**	**10.83**

Schedule 5

Allowed Common Equity Ratios 2000

Utility	**Allowed**	**Decision**
ATCO LTD.		
ATCO ELECTRIC	35.70%	U97065
ATCO GAS NORTH	34.50%	E94001
ATCO GAS SOUTH	37.20%	2000-09
B C GAS INC.	38.20%	L61-00
CANADIAN UTILITIES LIMITED		
ENBRIDGE INC.	35.00%	RP-2000
FORTIS INC.		
PACIFIC NORTHERN GAS LIMITED	37.30%	LP61-00
TRANSALTA CORPORATION		
TRANSALTA TRANSMISSION	35.00%	U99099
TRANSALTA DISTRIBUTION	54.50%	U99099
TRANS CANADA PIPELINES LTD.	30.00%	RH-3-94
WESTCOAST ENERGY INC.	35.00%	RH-2-94
Average	**37.24%**	
NOVA SCOTIA POWER INC	**35.00%**	**NSUARB-P-868**

Source: Board decisions.

Schedule 6

Four Benchmarks for NSPI Common Equity Ratio

1. Average of actual equity ratios for 9 utilities	33.26%
2. Average allowed equity ratio for sample	37.24%
3. Median allowed equity ratio for sample	35.00%
4. NSPI allowed equity ratio in 1996 decision	35.00%
5. Average allowed equity ratio for 5 gas utilities	36.44%
6. Average allowed equity ratio for 2 comparable gas utilities Selected by Scotia Capital	36.75%
Range of benchmarks (rounded)	**33 – 37%**

Schedule 7

This table contains a comparison of the wealth implications for equity investors of using arithmetic versus geometric mean returns based on an assumed investment of $6592.58 by two different investors in two different utilities. For ease of exposition, the two utilities are assumed to have the same investment risk as the market (i.e. their betas are one) and to be well diversified.

Year end	For the total return TSE300 index:			Portfolio value when promised annual return is:	
	Index value	Annual return	Annual return relative	Geometric mean	Arithmetic mean
1989	6592.58			6592.58	6592.58
1990	5617.01	-0.14798	0.85202	7287.57	7357.44
1991	6291.90	0.120151	1.120151	8055.83	8211.03
1992	6201.72	-0.014333	0.985667	8905.08	9163.65
1993	8220.23	0.325476	1.325476	9843.86	10226.80
1994	8205.73	-0.001764	0.998236	10881.60	11413.29
1995	9397.97	0.145294	1.145294	12028.75	12737.43
1996	12061.95	0.283463	1.283463	13296.82	14215.20
1997	13868.54	0.149776	1.149776	14698.58	15864.41
1998	13648.84	-0.015842	0.984158	16248.11	17704.97
1999	17960.99	0.315935	1.315935	17960.99	19759.06

The annual arithmetic and geometric mean returns are 0.116018 and 0.10542, respectively.

Schedule 8

This table contains various estimates of the historical annual risk premia of stocks over the risk-free rate for various time periods. Stocks are proxied by the returns on the TSE300 index. The risk-free rate is proxied by yields and returns on T-bills and Long Canada's.

	Historical annual risk premia relative to:			
	T-bills		Long Canada's	
Time Period:	Yields	Returns	Yields	Returns
1957-2001				
Arithmetic mean	3.95	3.83	2.86	2.29
Geometric mean	2.80	2.69	1.69	1.61
1948-2001				
Arithmetic mean	6.73	6.63	5.47	5.31
Geometric mean	5.56	5.45	4.27	4.55
1951-2001				
Arithmetic mean	5.43	5.32	4.24	3.96
Geometric mean	4.31	4.20	3.09	3.27
1980-2001				
Arithmetic mean	2.53	2.36	1.57	-2.11
Geometric mean	1.58	1.42	0.60	-2.46

Source: Cansim, matrices B4237 and B14013; CFMRC; and W.M. Mercer.

Schedule 9 (page 1 of 3)

This table contains some quotes describing the recent behavior of high-tech stock prices as being a bubble or mania in panel A, and some quotes describing the recent examples of "aggressive" accounting by firms when reporting their financial performance in panel B.

Panel A: Quotes dealing with high-tech stock prices as being a bubble or mania

"Educated observers have been confidently predicting the end of the go-go market for years, only to wind up like roadkill at Pamplona: run over by the charging bulls. But the seemingly tireless market has created a paradox. The more it rises, the more people think it can continue rising, a belief that becomes more implausible with each upward tick. As a result, the market has never looked so dangerous and investors have rarely appeared so overconfident, inviting comparisons to the stock market crashes of 1929 and 1987. ``People have the feeling right now that they can't lose in the market,'' says Robert Shiller, professor of economics at Yale University and author of the forthcoming book *Irrational Exuberance*. ``The typical thing people will say is: `Sure it will go down, of course there will be a correction, but if you hold on for the long term you can't lose.' And that's really a mistake to think that you can't lose.'' ….

Is this a rational market, or is it beginning to resemble some sort of pyramid scheme? ``The name we have for that, and we've had it for quite a long time, is the `greater fool theory,''' says Lawrence Kryzanowski, professor of finance at Concordia University in Montreal. ``It's okay to buy one of these stocks as long as there is a greater fool in the line behind you.' ….

What does it all mean? For many observers, it spells big trouble. ``Most experienced investors fully understand that the tech stocks are in a bubble, but they are hoping that they will be able to reach the exits early enough to avoid major pain when the inevitable burst occurs,'' says a recent report from Martin Barnes, managing editor of Montreal-based *The Bank Credit Analyst*. ``Of course, history tells us that very few will reach the exits in time and most will get trampled underfoot.'' This is why Greenspan commented in January that the market could turn into one of history's ``euphoric speculative bubbles,'' making an implicit connection to the heady days of 1929….

By most opinions, Research In Motion has great potential and its earnings are indeed soaring, but that sort of growth may be an awful lot to expect. ``People are not mad,'' says Shiller. ``But history shows that there are times of excessive optimism.'' Says Kryzanowski: ``Every time we have a period of a hot market, people say `It's different.' And every time it corrects, you never hear from these people again.'' [David Berman, 2000, Market overboard: We're living through history's greatest stock market boom, but investors are getting jittery. What happens when the party's over?, *National Post Business*, April, pp. 54-60.]

Schedule 9 cont'd (page 2 of 3)

"The global high-tech stock markets ran up from the summer of 1998 to an apex in March, 2000, and then had a spectacular fall to an apparent nadir on Sept. 21, 2001. This wild swing in valuations, representing the seeming creation and then destruction of hundreds of billions of dollars of wealth, seems like yet another bubble, the most recent in the long history of *Extraordinary Popular Delusions and the Madness of Crowds* as depicted by Charles MacKay in his seminal 1841 book of that title. [Duncan Stewart, We have a habit of blowing bubbles, *National Post*, February 2002, p. SM1.]

"Jeremy Siegel, author of the best-selling book *Stocks For The Long Run* and a strong advocate of equity investing, says this decade will not be a replay of the 90's, as some people think. The bubble bursting and the end of the bull market was no "little hiccup" and it is "manifestly ridiculous" to believe that earnings growth – which drives stock prices – can average 8% to 12% this decade." [William Hanley, Bear market shakes our faith in stocks, *National Post*, February 2002, p. SM11].

"The Triple Waterfall collapse of technology stocks was history's most egregious financial mania. [Donald Coxe, Chairman and Chief Strategist, Harris Investment Management Inc., in: BMO Nesbitt Burns, *Basic Points*, February 8, 2002, p. 1.]

"What makes the business cycle unique is that it created the most extraordinary asset bubble in history. Perhaps not unique but nonetheless worth noting is that the Federal Reserve did little to stop it. True, Mr. Greenspan famously warned of irrational exuberance (that, hard as it is to believe, was five years ago). Yet interest rates were left unchanged for three months and even then he took only a feeble shot, tightening credit supply by a thin 25 basis points." [Vox, 2002, Where was the Fed as bubble grew?, *The Globe and Mail*, March 8, p. B10.]

Panel B: Quotes dealing with examples of "aggressive" accounting by firms when reporting their financial performance

"The FBI and federal prosecutors … have opened a preliminary inquiry into …software company's books….Former employees have said that Computer Associates began using pro forma accounting, a practice that can make profits seem larger, because it ran out of ways to inflate its results under standard accounting rules and had to find a new method….Computer Associates…has reported its financial results on a pro forma basis since October, 2000." [Associated Press, Computer Associates falls on inquiry news, *The Globe and Mail*, February 21, 2002, p. B26.]

Schedule 9 cont'd (page 3 of 3)

"The global association that oversees equity analysts [AIMR] is calling for major changes in accounting practices and the end to political and corporate interference with bodies that set accounting standards…. It described Enron's failure as "a deplorable but all-too-natural consequence of the erosion of the financial reporting system in the U.S."" [Richard Blackwell, Group pushes greater independence for accounting, *The Globe and Mail*, February 23, 2002, p. B3.]

"The Ontario Securities Commission will use its powers to override accounting principles set by self-regulatory organizations if they do not makes changes to ensure an Enron-style collapse doesn't happen in Canada, OSC chairman David Brown said yesterday. There needs to be a much more "robust" set of accounting rules that gives investors an accurate picture of the financial condition of every company, Mr. Brown said…. Accounting rules have drifted from a general statement of principles, to a more rules-based approach, Mr. Brown said. Particularly in the United States, this had allowed auditors to approve financial reports that comply with the rules, but don't necessarily reflect reality." [Richard Blackwell, 2002, OSC warns on accounting principles, *The Globe and Mail*, March 8, p. B4.]

Schedule 10

This table provides the rolling five-year betas for our sample of three utilities that are cross-listed in the TSE and in the NYSE, and have at least five years of data for each market. We do not calculate the rolling betas for the first two rolling five-year periods for Enbridge to conform to our later treatment of these periods for this utility. All betas are calculated using monthly total returns for the utility (from the TSE or NYSE) and the TSE300 or the S&P500 indexes.

Five-year period	Canadian market (TSE)				U.S market (NYSE)			
	TransCanada Pipelines	Westcoast Energy	Enbridge Inc.	Mean	TransCanada Pipelines	Westcoast Energy	Enbridge Inc.	Mean
1990-1994	0.574	0.571			0.393	0.312		
1991-1995	0.540	0.557			0.394	0.255		
1992-1996	0.489	0.611	0.498		0.409	0.300	0.136	
1993-1997	0.338	0.531	0.440		0.350	0.347	0.151	
1994-1998	0.544	0.453	0.478		0.540	0.485	0.129	
1995-1999	0.239	0.261	0.237		0.179	0.426	0.081	
1996-2000	0.580	0.134	0.046		0.119	0.194	-0.001	
1997-2001	0.130	0.072	0.065		0.014	0.040	-0.096	
1990-2001[a]	0.222	0.065	0.261	0.183	0.122	0.146	-0.048	0.073
Mean of eight rolling 5-year periods	0.429	0.399	0.294	0.374	0.300	0.295	0.066	0.220

[a]The shorter period of 1992-2001 is used for Enbridge.

Schedule 11

This table provides the rolling five-year betas for our sample of nine utilities and for our sample of nine utilities plus NSPI/Emera. If thin or no trading plagues any five-year period, we do not calculate a beta for that utility. This was the case for NS Power Holdings for the first three rolling five-year time periods, for Pacific Northern Gas for the first six rolling five-year time periods, and Enbridge for the first two rolling five-year time periods. All betas are calculated using monthly total returns for the utility and the TSE300 index.

Five-year period	BC Gas	Canadian Utilities	NS Power Holdings[a]	Pacific Northern Gas	TransAlta Corp.	TransCanada Pipelines	Westcoast Energy	Enbridge Inc.	Atco Ltd.	Fortis Inc.	Mean without Emera	Mean with Emera
1990-1994	0.608	0.592			0.558	0.574	0.571		0.715	0.462	0.583	0.583
1991-1995	0.635	0.498			0.606	0.540	0.557		0.712	0.533	0.583	0583
1992-1996	0.562	0.561			0.585	0.489	0.611	0.498	0.600	0.390	0.537	0.537
1993-1997	0.474	0.634	0.405		0.462	0.338	0.531	0.440	0.546	0.310	0.467	0.460
1994-1998	0.479	0.616	0.564		0.536	0.544	0.453	0.478	0.623	0.484	0.527	0.531
1995-1999	0.352	0.530	0.414		0.285	0.239	0.261	0.237	0.509	0.320	0.342	0.350
1996-2000	0.243	0.361	0.275	0.453	0.065	0.580	0.134	0.046	0.377	0.216	0.275	0.275
1997-2001	0.251	0.325	0.294	0.260	0.078	0.130	0.072	0.065	0.332	0.130	0.183	0.194
Mean	0.450	0.515	0.390	0.357	0.397	0.429	0.399	0.294	0.552	0.356	0.437	0.439
First four rolling periods											0.542	0.541
Last four rolling periods											0.331	0.337

[a]Now called Emera Inc.

Schedule 12

This table provides the rolling five-year correlations for our sample of nine utilities with the market, and for the nine utilities plus Emera in the sample with the market. If thin or no trading plagues any five-year period, we do not calculate a correlation for that utility. This was the case for NS Power Holdings (Emera) for the first three rolling five-year time periods, for Pacific Northern Gas for the first six rolling five-year time periods, and Enbridge for the first two rolling five-year time periods. All correlations (rhos) are calculated using monthly total returns for the utility and the TSE300 index. The mean relative standard deviations (sigmas) of the sample of utilities to the market are also presented.

Five-year period	BC Gas	Canadian Utilities	NS Power Holdings	Pacific Northern Gas	TransAlta Corp.	Trans Canada Pipelines	Westcoast Energy	Enbridge Inc.	Atco Ltd.	Fortis Inc.	Mean rho with:[a]		Relative mean sigmas with:[a]		
											EMA Out	EMA In	EMA out	EMA in	TRP out
1990-1994	0.571	0.581			0.458	0.492	0.407		0.468	0.485	0.495	0.495	1.193	1.193	1.198
1991-1995	0.544	0.485			0.523	0.506	0.362		0.447	0.494	0.480	0.480	1.232	1.232	1.260
1992-1996	0.513	0.512			0.579	0.481	0.415	0.440	0.439	0.391	0.471	0.471	1.148	1.148	1.166
1993-1997	0.476	0.619	0.445		0.456	0.310	0.414	0.325	0.451	0.361	0.427	0.429	1.104	1.082	1.081
1994-1998	0.557	0.655	0.605		0.553	0.464	0.440	0.442	0.571	0.603	0.536	0.543	0.993	0.986	0.963
1995-1999	0.363	0.554	0.426		0.248	0.185	0.291	0.221	0.480	0.424	0.346	0.355	1.018	1.013	0.979
1996-2000	0.238	0.358	0.299	0.287	0.058	0.079	0.120	0.042	0.291	0.311	0.198	0.208	1.808	1.719	1.097
1997-2001	0.257	0.363	0.344	0.134	0.064	0.019	0.065	0.060	0.281	0.180	0.158	0.177	1.763	1.672	1.108
Mean	0.440	0.516	0.424	0.211	0.367	0.317	0.314	0.255	0.429	0.406	0.389	0.395	1.282	1.256	1.106
First four rolling periods											0.468	0.469	1.169	1.164	1.176
Last four rolling periods											0.309	0.321	1.396	1.348	1.037

[a]EMA refers to NSPI/Emera, and TRP refers to TransCanada Pipelines.

Source: CFMRC.

Schedule 13

This table reports the % issue fees for Canadian utilities based on issues over the five-year period, 1997-2001

Type of financing	Maturity[a]	Number of issues	Median %Fee	Amortization period in years	Annual Amortized % Fee
Debt	< 10 years	52	0.37		
Debt	> 10 years	52	0.50	20	0.025
Preferred		16	3.00	50	0.06
Common		15	4.00	50	0.08

Issuers with following SIC codes: 4612 (crude petroleum pipelines), 4911 (electric services), 4922 (natural gas transmission), 4923 (natural gas transmission and distribution), and 4924 (natural gas distribution). Debt maturity is measured as maturity date compared to announcement date of the issue.

Source: Financial Post Data Group.

Schedule 14

Comparison of Witnesses' Rate of Return Evidence Against Adjustment Formulas

Source	**Long-Canada Forecast**	**Recommended Return**	**Risk Premium (Basis Points)**
Witnesses			
Kryzanowski/ Roberts	5.90%	8.03%	213
McShane	5.75%	11 – 12%	525 – 625
*Regulatory Boards***			
NEB	5.90%	9.74%	384
OEB	5.90%	9.64%	374
BCUC	5.90%	9.42%	350
Manitoba PUB	5.90%	9.53%	364
Average for Boards	**5.90%**	**9.58%**	**368**

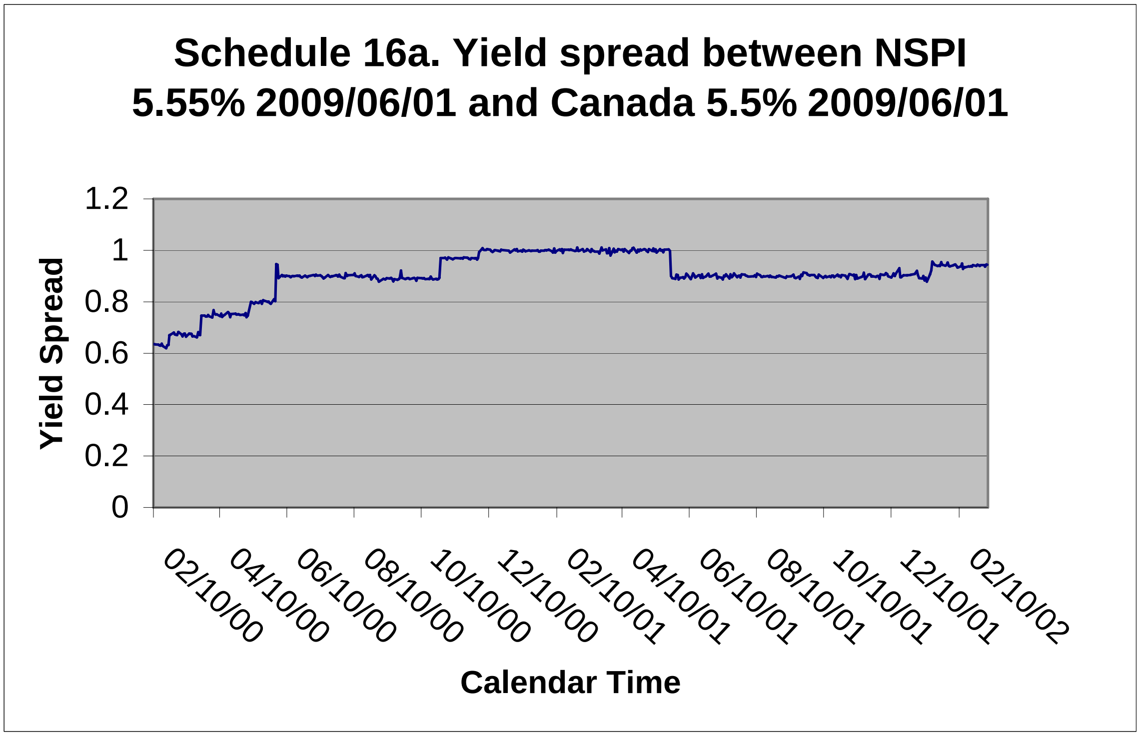
Schedule 15

This table reports the measure of performance for the Gas/Electric sub-group of the TSE300 Index using the TSE 300 Index as the benchmark portfolio. The measure of abnormal performance is given by the estimated intercept or alpha from a regression of the excess return on the sub-group against the excess returns on the TSE 300 index. An excess return is equal to the return on the sub-group (or TSE 300) for month t minus the risk-free rate for month t. In performance tests, the risk-free rate is proxied by the T-bill return.

	1980-2000		1991-2000	
	Sub-group	TSE300	Sub-group	TSE300
Panel A: Annualized monthly mean and standard deviation of returns				
Mean	13.54%	12.80%	14.78%	14.44%
Standard deviation	13.94%	16.82%	12.44%	15.10%
Panel B: Regression results				
Alpha (abnormal return or “free lunch”)	2.70%		6.16%	
Beta	0.46		0.29	

Source: TSE 300 and Gas/Electric sub-group total return indexes.

Schedule 16



Schedule 16b.		
Relative Time	Calendar Time	Yield Spread[a]
-5	12/16/01	0.909
-4	12/17/01	0.930
-3	12/18/01	0.895
-2	12/19/01	0.895
-1	12/20/01	0.900
0	**12/21/01**	**0.903**
1	12/24/01	0.903
2	12/27/01	0.904
3	12/28/01	0.906
4	12/31/01	0.908
5	01/02/02	0.920

[a]Yield spread of NS Power 5.55 06/01/09 over Canada 5.5 06/01/09.

Before the Régie de l'Energie du Québec

In the matter of:

Hydro Québec Distribution ("HQ DIST")

2003 Distribution Tariff Application (DTA) Demande R-3492-2002

Evidence of Fédération canadienne de l'entreprise indépendante ("FCEI") / Union des municipalities du Québec ("UMQ") & Option consommateurs ("OC") On Capital Structure and Rate of Return on Common Equity

Prepared Testimony of

Dr. Lawrence Kryzanowski and Dr. Gordon S. Roberts

Ned Goodman Chair in Investment Finance, John Molson School of Business, Concordia University, Montreal, Canada; and CIBC Professor of Financial Services and Area Coordinator, Schulich School of Business, York University, Toronto, Canada.

January 2003

TABLE OF CONTENTS **Page**

I. INTRODUCTION AND SUMMARY

Q. Please state your names, employment and professions.

A. We are Dr. Lawrence Kryzanowski of Concordia University and Dr. Gordon S. Roberts of York University. Dr. Kryzanowski is currently Ned Goodman Chair of Investment Finance at the John Molson School of Business, Concordia University. He earned his Ph.D. in Finance at the University of British Columbia. Dr. Gordon S. Roberts is currently CIBC Professor of Financial Services and Area Coordinator, Finance Area, at York University's Schulich School of Business. He earned his Ph.D. in Economics at Boston College.

Q. Please describe your experience relative to your current role of submitting evidence before the Régie.

A. Dr. Kryzanowski has experience in preparing evidence as an expert witness in utility rate of return applications, stock market insider trading court proceedings, and confidential final offer arbitration hearings for setting of fair rates for the movement of various products by rail. Together with Dr. Roberts in 1997, he prepared a report for the Calgary law firm, MacLeod Dixon, on rate of return considerations in the pipeline application by Maritimes and Northeast. For a group of organizations collectively and more recently referred to as the UNCA Intervenor Group (formerly FIRM Customers), Drs. Kryzanowski and Roberts provided evidence on the fair return on equity and the recommended capital structure for Atco Electric Limited in its 2001/2002 Distribution Tariff Application and for UtiliCorp Networks Canada (Alberta) Ltd. ("UNCA") in its 2001/2002 Distribution Tariff Application and its 2002 Distribution Tariff Application (DTA) No. 1250392 before the Alberta Energy and Utilities Board. On behalf of the

Province of Nova Scotia, they provided evidence and testified before the Nova Scotia Utility and Review Board in the matter of Nova Scotia Power Inc. in 2002.

Dr. Roberts is also experienced in preparing evidence for utility rate of return hearings. From 1995–1997 he submitted prefiled testimony as a Board witness in rate hearings for Consumers Gas. In 1996, he served as an expert advisor to the Ontario Energy Board in its Diversification Workshop. As noted above, together with Dr. Kryzanowski, he has also prepared evidence on rate of return and capital structure considerations for a pipeline application by Maritimes and Northeast in 1997, electricity applications by Atco in 2000, by UNCA in 2000 and 2002, and by Nova Scotia Power Inc. in 2002.

More broadly, Drs. Kryzanowski and Roberts often provide technical expertise and advice on financial policy. Among their consulting clients in recent years are the Superintendent of Financial Institutions, the federal Department of Finance, Canada Investment and Savings, Canada Mortgage and Housing Corporation, and Canada Deposit Insurance Corporation. Our brief *curricula vitae* are attached as Appendix A.

Q. What is the purpose of the evidence that you are presenting here?

A. Fédération canadienne de l'entreprise indépendante ("FCEI") / Union des municipalities du Québec ("UMQ") and Option consommateurs ("OC") have retained us to provide evidence on the fair return on equity and the recommended capital structure for Hydro Québec Distribution ("HQ DIST") in the present rate case (file R-3492-2002).

Q. Please describe the general approach that you have used in preparing your evidence.

In preparing our evidence we considered and used various techniques for determining an appropriate capital structure and for measuring the fair return on equity for a regulated utility. Although HQ DIST is owned by the government of Québec, we follow the stand-alone principle under which capital structure and the fair return on equity are determined as if the company were "standing alone" as a shareholder-owned entity. For determining an appropriate capital structure for HQ DIST, we conducted an analysis of the bond ratings, capital structures, interest coverage ratios, returns on equity and equity ratios (both actual and those allowed by regulators) for a comparable sample of utilities. We then determined an appropriate equity ratio for HQ DIST based on this analysis and HQ DIST's business risk relative to its peer group. For the determination of the recommended rate of return on equity, we considered and eliminated various approaches as being unreliable, and formulated our recommended rate of return primarily based on the Equity Risk Premium Test. We supplement our rate of return evidence by conducting a Discounted Cash Flow (DCF) analysis.

Q. Please provide a summary of your evidence indicating the major conclusions of each section.

A. Section II examines current economic and financial market conditions in the U.S. and Canada and forecasts those economic variables that we use as inputs in the capital structure and fair rate of return tests.

Two long-term trends make up an important context to our forecast here as well as to our analysis of the fair rate of return on equity in Section IV of our evidence. The first trend relates to the development of derivatives markets and opportunities for corporations to hedge and better manage risks. Second, knowledgeable market participants expect equity risk premiums will be significantly lower in the future than suggested by extrapolation from realized equity returns in the boom years of the second half of the 1990s.

Turning from trends to our economic forecast, we note that consumer spending and business investment in Canada both slowed at the end of 2002 but are expected to remain reasonably healthy in 2003. Consumer confidence is strong and interest rates are still very low. Home prices and housing starts were up in 2002 balancing the negative wealth effect from equity markets. The unemployment rate is expected to dip marginally to just over 7 percent in 2003.

Partially balancing this positive prospect is the fact that the picture in the important U.S. economy is far less positive. Further, there is a risk that a war in Iraq could lead to higher oil prices, which would reduce the purchasing power of households. While higher prices for oil would be good for Canadian producers, a war could depress consumer and business confidence in both the U.S. and Canada. Additionally, closer to home, there remains concern about the economic impact of ratifying the Kyoto Accord. Despite these negative factors, economic forecasters predict solid real GDP growth in Canada in the range of 3 - 4 percent in 2003 coupled with steady inflation between 2 to 3 percent.

Focusing on Québec, in 2002, housing and job markets were buoyant and the provincial economy outperformed Canada's. This better performance was evidenced across the board in real GDP growth and growth in employment, as well as in the percentage increases in both retail sales and housing starts. The forecast for 2003 remains very positive despite a forecasted slowing in housing starts as the home market starts to cool off.

Turning to interest rates, for rate-making purposes we require a forecast of the rate on 30-year Canada's. We examine forecasts from four sources: Consensus

Economics, Bank of Montreal, Bank of Nova Scotia and Toronto Dominion Bank. Using 2003 as our "test year", we employ forecasts for June 30, 2003 to represent an "average" for the year. The average of these four forecasts is a 30-year Canada rate of 5.95%. Rounding up, we forecast the long-term interest rate at 6.0%.

Section III contains our views on the appropriate capital structure for HQ DIST. We begin by examining relevant financial data for a sample of nine Canadian utilities. We analyze their bond ratings, capital structures, interest coverage ratios and returns on equity. Next, we briefly review the practical implications of finance theory on capital structure for electric utilities and particularly for HQ DIST. We then analyze the business risk of HQ DIST as a stand-alone entity and conclude that, in a Canadian context, this risk is below that of an average integrated electric utility and below that of an average gas distributor. Next, we turn to examining the equity ratios of comparable companies – both the actual ratios and the ratios allowed by regulators. Based on these examinations and tests, we conclude that an appropriate equity ratio for HQ DIST is 34% or the mid-point of our estimated range of 33% to 35% for HQ DIST.

In Section IV, we estimate the fair rate of return for HQ DIST using the Equity Risk Premium Test. We assess the expected market risk premium for the average Canadian stock at 4.70%. We check and reaffirm this conclusion using a Discounted Cash Flow (DCF) test employing historical and future estimates of dividend growth rates for the market proxy. Next, we determine that HQ DIST is 50% as risky as the S&P/TSX Composite. We add an adjustment of 10 basis points for flotation costs. Given our point forecast of a long-term Government of Canada bond rate of 6.0%, we are recommending a return on equity of 8.45%. Our return on equity recommendation allows HQ DIST a risk premium (with inclusion of the flotation cost adjustment) of 245 basis points over our forecast for long Canada yields.

Section V of our evidence contains our comments and critique of certain aspects of the evidence of Dr. Morin. We begin this section by highlighting that there is no disagreement between Dr. Morin's and our 2003 forecast of the 30-year Canada yield. We next discuss two sources of bias that inflate the recommended common equity ratio in Dr. Morin's evidence. Then we proceed to the major area of disagreement; namely, the rate of return on equity. We show that Dr. Morin's implementation of various standard methodologies for estimating the rate of return on equity consistently leads to inflated estimates of both the market risk premium and the investment risk of HQ DIST. In turn, this leads to inflated rates of return on equity estimates for HQ DIST. We end this section with a comparison of the two recommendations for the return on equity for HQ DIST by Dr. Morin and ourselves against the estimate that would be obtained if it were calculated using the various adjustment formulas presently in use by some Canadian regulators. This comparison indicates that recommended rates of return drawn from regulatory formulas do not take into account the trend toward a substantially lower equity risk premium. For this reason, they should be regarded as a generous upper bound. Our own recommendation is somewhat lower. Dr. Morin's recommendation is clearly substantially higher than the results of the regulatory formulas.

Q. Please summarize your recommendations for the rate of return portion of your evidence using a format that is suitable for comparing your recommendation with those of Dr. Morin.

A. The following table contains the summary.

	Component		Flotation Allowance	Total	Weight
	1	2			
Discounted Cash Flow Test	N/A	Risk Premium of 4.70% for S&P/TSX Composite is conservatively high	N/A	N/A	0%; for bench-marking purposes only
Equity Risk Premium Test	Risk-free Rate of 6.0%	Risk Premium (50% of) of 4.70% = 2.35%	0.10%	8.45%	100%
Recommendation	6.0%	2. 35%	0.10%	8.45%	100%

II. ECONOMIC AND FINANCIAL MARKET CONDITIONS

Q. How is this portion of your evidence organized?

A. We begin by discussing two long-term trends in capital markets that form an important backdrop to our forecast here and to our analysis of the fair rate of return on equity in Section IV. These include the development of derivatives markets offering opportunities for corporations to hedge risks and shifts in expected market risk premiums. Next, we present our view of the economic outlook for Canada and Québec. We conclude with our forecasts of the long Canada rate to be used in our rate of return analysis.

Q. Are there any long-term trends that influence your forecasts?

A. Yes, there are. The first relates to the development of derivatives markets and opportunities for corporations to hedge risks. The second trend addresses shifts in expected market risk premiums.

Q. Please state your views on how corporate hedging opportunities are evolving.

A. The market for derivative securities continues to grow on an annual basis. Internationally, the aggregate turnover of exchange-traded financial derivatives contracts has increased from slightly over $90 trillion U.S. in December 1999 to $169 trillion U.S. in June 2002.[1] The vast majority of exchange-traded financial derivatives contracts are interest rate related, with the rest being currency or equity related. For example, in June 2002, approximately 90.4% of the outstanding notional principal was associated with interest rate contracts, 9.1% with stock market index contracts, and 0.5% with currency contracts. By region,

[1] http://www.bis.org/publ/qtrpdf/r_qt0209d.pdf.

North American markets account for most contracts, followed by Europe and Asian-Pacific markets.

The above values do not include Over-The-Counter (OTC) contracts not traded on an exchange. These encompass interest rate, currency, equity, commodity and credit risk related contracts. Notional amounts of all OTC contracts rose from around $88 trillion U.S. in December 1999 to approximately $111 trillion in December 2001. Approximately 69% of this amount represents interest-rate contracts. Recently, there has been rapid growth in credit derivatives with volumes growing 100% a year since 1996 with $1900 billion U.S. of outstanding over-the-counter derivatives contracts.[2]

For Canada, the *Bank of Canada Review* reports that the average daily turnover more than doubled between 1995 and 2001.[3] For currency swaps and OTC foreign exchange options, average daily turnover rose from $0.8 billion U.S. to $2.6 billion. For forward rate agreements, interest rate swaps, and OTC interest rate options, average daily turnover rose from $4.3 billion U.S. to $9.9 billion.

Clearly, the derivative securities market continues to grow quickly, and the reasons for this growth warrant exploration. There are important economic benefits associated with the existence of such contracts, in terms of increasing market efficiency and market completeness. Derivative securities are used to hedge, speculate, arbitrage, and leverage. Related to each of the above, derivative securities ensure market completeness, through providing opportunities that are otherwise unavailable.

---

[2] Smith, C., 2002, Equity derivatives enter the dialogue, *The Banker*, 152:916, pp. 40-42.
[3] http://proquest.umi.com/pqdweb?TS=1015190609&Did=000000090066226&Fmt=6&Deli=1&Mtd=1&Idx=5&Sid=1&RQT=309&Q=1&IE=x.pdf.

Hedging improves the efficiency of markets by transferring risk from those who do not wish to bear it to those who do. This practice is called risk management. There are a number of hypotheses as to why firms wish to transfer risk. Some argue that hedging reduces taxes, thereby increasing firm value. Others argue that hedging increases firm value through decreasing the costs associated with financial distress. “Financial distress” refers to a situation where the firm faces bankruptcy, which may result in high costs, such as legal fees and asset redeployment costs. Hedging can reduce such costs by lowering the probability of bankruptcy by reducing the business and financial risks of a firm.

Canadian evidence suggests that firms that use derivatives to hedge tend to have higher leverage and lower credit ratings than firms that do not hedge.[4] This supports the contention that hedging plays a role in reducing the likelihood of financial distress. As well, firms that use derivatives have longer maturity debt. These results are generally similar to those for the U.S.

The discussion above suggests that there are both OTC and exchange-traded markets through which Canadian companies may hedge. Further, there are a number of strong reasons why a Canadian company may wish to do so.

Q. How do these growing opportunities for risk management relate to a Canadian electric utility that relies mainly on hydro power?

A. Utilities which rely on hydroelectric generation are not exposed directly to the costs of fuels such as oil, natural gas and coal. Due to large amounts of debt in their capital structures, they are exposed to financial risk resulting from unexpected shifts in interest rates. Further, fluctuations in commodity prices

[4] Jalilvand, A., Why Firms Use Derivatives: Evidence from Canada, *Canadian Journal of Administrative Sciences*, 16, September 1999, pp. 213-228.

which reflect the financial health of large industrial customers can produce variability in utility revenues resulting in business risk. Fluctuations in weather which affect demand for heating and air conditioning also result in business risk. As discussed earlier, a number of derivatives products exist that allow utilities to hedge these risks thus managing and controlling financial and business risks.

Because these contracts are largely traded on U.S. exchanges and are U.S. dollar denominated, a Canadian electric utility also faces exchange-rate risk. There are a number of ways that the utility can reduce or eliminate this risk. For example, the utility can purchase U.S.$/CDN$ forward contracts, whereby it has the obligation to purchase a specific amount of U.S. dollars for a specific Canadian dollar price, at a specific time in the future. The utility can also hedge the foreign exchange risk using currency futures options.

We conclude that there are a growing number of hedging opportunities open to Canadian electric utilities seeking to control exposure to the risk of unexpected shifts in interest rates, commodity prices and the U.S. dollar.

Q. In addition to the growth of hedging opportunities, what is the second trend related to market risk premiums?

A. After the recession of the early 1990s, the rest of the decade was an ideal period in capital markets due to a long economic expansion and falling interest rates. As evidence of the economic expansion, note that between January 1990 and December 1999 real GDP in Canada grew by 37.33%.[5] Average real GDP growth in Canada was 2% annually between 1990 and 1998, and was 5.1% in 1999 and 4.4% in 2000. Annual average real GDP growth in the U.S. was 2.9% between 1990 and 1998, and averaged 4.1% in 1999 and 2000. As evidence of

[5] See CANSIM II SERIES V498943, V122484 and V121817.

falling interest rates, 91-day Canadian T-Bills decreased from 12.13% in January 1990 to 4.82% in December 1999, while U.S. T-Bills decreased from 7.75% to 5.37%. In brief, most of the 1990s was an ideal period for capital markets characterized by strong and sustained growth for much of the period and falling interest rates.

Because the boom years of the 1990s were such a unique period, knowledgeable market participants do not expect that the excess of equity returns over long Canadian bond yields will be as high in the future. Evidence of falling equity premia comes from the Watson Wyatt *21st Annual Canadian Survey of Economic Expectations 2002*, a survey of Canadian economists and portfolio managers. For the long run, the survey reports a median forecasted total return on the S&P/TSX Composite index of 8% between 2007-2016, and a median forecasted yield on Canadian ten-year bonds of 5.8% between 2007-2016. This suggests a market risk premium over 10-year Canada bonds of 2.2%. Although the Watson Wyatt survey does not report forecasts for 30-year bonds, we deduce that, given a positively sloping yield curve, the risk premium over 30-year bonds will be even smaller.

In Section IV of our evidence and in Appendix C, we return to the equity risk premium and summarize a large body of research predicting that, in the future, it will be well below its historical average.

Q: What is your forecast for the Canadian economy for 2003?

A. The Canadian economy displayed strong growth in the first half of 2002 and then slowed to a respectable annual pace of just over 3 percent annual growth in real

GDP in the third quarter.[6] This pace is likely to continue through the fourth quarter of 2002 and throughout 2003. The Canadian economy has grown faster than the U.S. since 1999 and this is expected to continue in 2003. Nonetheless, the Canadian forecast remains importantly dependent on what happens in the U.S. Accordingly, our discussion will focus on Canada but mention salient points about the U.S. economic forecast.

Consumer spending and business investment in Canada both slowed at the end of 2002 but these are expected to remain reasonably healthy in 2003. Consumer confidence is strong and interest rates are still very low. Home prices and housing starts were up in 2002 balancing the negative wealth effect from equity markets. The unemployment rate is expected to dip marginally to just over 7 percent in 2003. Profits before tax and the rate of capacity utilization are two measures of the health of corporate Canada and both rose at the end of 2002.

Partially balancing this positive prospect are three, potentially negative factors. First, the picture in the important U.S. economy is far less positive. Consumer confidence and spending are far weaker and corporate profits declined in the third quarter. While strengthening in the U.S. recovery is expected in 2003, this could be postponed to 2004 if there is a further slide in U.S. stock markets. Second, there is a risk that a war in Iraq could lead to higher oil prices which would reduce the purchasing power of households. While higher prices for oil would be good for Canadian producers, a war could depress consumer and business confidence in both the U.S. and Canada. Third, closer to home, there remains concern about the economic impact of ratifying the Kyoto Accord.

[6] Our economic forecast is drawn from BMO Financial Group Economics, *Outlook* 2003, November 1, 2002; TD Economics, *The Bottom Line*, November 29, 2002 and *Provincial Economic Outlook*, November 25, 2002 on www.td.com/economics; and Scotia Economics, *Market Trends*, November 29, 2002, www.scotiabank.com.

Important details are unknown and this is creating uncertainty and causing reductions in planned investments in oil sands projects in the west.

Despite these negative factors, economic forecasters predict solid real GDP growth in Canada in the range of 3 to 4 percent in 2003 coupled with steady inflation between 2 to 3 percent.

Q. Please explain your forecast for the Québec economy in 2003.

A. In 2002, housing and job markets were buoyant in Québec and the provincial economy outperformed Canada's. This better performance was evidenced across the board in real GDP growth and growth in employment, as well as in percentage increases in both retail sales and housing starts.[7] Further, beyond housing starts, nonresidential capital spending was up reflecting investment by both the public sector and private business.

The forecast for 2003 remains very positive despite a forecasted slowing in housing starts as the home market starts to cool off. The Québec economy has two prominent manufacturing sectors that are not expected to do well in 2003: autos will slow with a GM plant closure while telecommunications will still be depressed. On the positive side, forecasted strengthening of the U.S. economy should boost exports and tourism. Real GDP growth in Québec is forecast just above the national average by BMO Economics. TD Economics and Scotia Economics are more conservative placing 2003 real growth just below Canada's average. The consensus view is that 2003 will be another good year for Québec's economy with real GDP growth in a range of 2.9 to 4.1 percent.

Q. What are your views on the Canadian dollar?

[7] http://www.bmo.com/economic, *Outlook 2003*.

A. Reflecting the forecast of continued stronger performance of the Canadian economy and accompanying tighter Canadian monetary policy putting upward pressure on short-term rates, TD Economics forecasts a stronger Canadian dollar at $0.67 U.S. towards the end of 2003. BMO Economics looks for a slightly higher Canadian dollar at $0.676. Scotia Economics forecasts a more modest strengthening of the Canadian dollar to $0.645 towards the end of 2003. Based on the above, we forecast that the CDN$/US$ exchange rate will rise to between $0.645 and $0.676 by the end of 2003.

Q. What rate do you recommend as the long Canada rate for use in market risk premium analysis?

A. For rate-making purposes we need to forecast the rate on 30-year Canada's. While there are forecasts of this rate by respected economics groups, others focus exclusively on forecasting 10-year Canada yields. This practice reflects the market trend toward concentrating on the more liquid 10-year bonds. Accordingly, we examine forecasts for both rates. To obtain a second forecast of the rate on 30-year Canada's, we follow the National Energy Board's practice of adding an average spread to the consensus forecast on 10-year Canada's.

As seen in Schedule 1, we draw on forecasts from Consensus Economics and on forecasts provided by the economics departments of three Canadian chartered banks. Using 2003 as our "test year", we employ forecasts for June 30, 2003 as representing an "average" for the year.[8] Beginning with the 10-year forecasts, Consensus Economics reports that the median forecast for 10-year Canada's was 5.70%. Bank of Montreal's forecast is also 5.70%. Scotiabank Group forecasts that the 10-year Canada rate will be 5.30% in the second

[8] An exception is the Consensus Economics forecast which is for September 2003.

quarter of 2003. From TD Economics comes a forecast for 5.55%. We average these forecasts to obtain 5.56% as our forecast for the 10-year Canada rate in June 2003.

To transform our 10-year forecast into a prediction for the rate on 30-year Canada's we add the average spread between these two instruments as observed over the first three quarters of 2002. According to BMO Economics this spread averaged 39 basis points. Rounding to 40 basis points and adding to 5.56% gives us 5.96% as our 30-year Canada's forecast.

As a check on this forecast, we recalculate the 30-year forecast as the simple average of forecasts from the two banks that predict this rate: 6.00% from Bank of Montreal and 5.90% from TD. This gives us an average of 5.95% virtually identical to what we obtained earlier.

Recognizing that these forecasts vary somewhat and erring on the side of caution, we adopt a long-term rate of 6.00% for purposes of our analysis of the fair rate of return on equity for HQ DIST. The use of this rate has two advantages. First, by rounding the rate, we are able to simplify our presentation. Second, and more importantly, 6.00% is the rate Dr. Morin employs in his evidence and this eliminates a minor difference between his evidence and ours allowing us to focus on the remaining important areas of disagreement.

Q. Please provide your forecast for the 30-year U.S. Treasury bond yield.

A. Our forecast for the U.S. Treasury bond yield follows the same methodology we employ for the long-term Canada rate. We obtain forecasts from the same three banks for June 30, 2003.[9] BMO Economics forecasts a rate of 5.20% while the

[9] We do not have access to a U.S. forecast from Consensus Economics.

forecast from TD Economics is 5.25%. Following its practice for Canadian rates discussed earlier, Scotia Economics limits its forecasts to a 10-year horizon and predicts the rate on U.S. 10-year Treasuries as 4.50% for June 30, 2003. To convert this to a 30-year forecast we follow our earlier practice of adding the average spread over the first three quarters of 2002. For U.S. Treasuries this was 0.61% according to BMO Economics and gives us a third forecast for 30-year U.S. Treasuries of 5.11%. Our forecast is the average of this rate and the forecasts from the other two banks or 5.19%.

III. CAPITAL STRUCTURE

Q. Please explain how you have organized this section of your evidence on capital structure.

A. We begin by examining relevant financial data for a sample of nine Canadian utilities drawn from *Stock Guide*. This sample consists of gas and electric utilities and pipelines that are covered in *Stock Guide* and have publicly traded common shares. We require the included companies to be publicly traded to ensure consistency between our samples here and in later sections where we present our evidence on the fair rate of return. We analyze bond ratings, capital structures, interest coverage ratios and returns on equity for our sample companies. Next, we briefly review the practical implications of finance theory on capital structure for electric utilities. We review the business risks faced by HQ DIST and relate them to these implications. We then turn to examining the equity ratios of comparable companies – both the actual ratios and those allowed by regulators in Canada. We conclude this section of our evidence with our recommendation on the appropriate equity ratio for HQ DIST.

Q. What evidence can you present on bond ratings and capital structures for Canadian utilities?

A. Schedule 2 displays Dominion Bond Rating Service (DBRS) and Standard & Poor's (S&P) bond ratings in December 2002 for our nine Canadian utilities: three gas utilities, five electric utilities and one oil pipeline.[10] These companies represent a current sample of utilities with publicly traded shares for which data are available in *Stock Guide*. In forming this sample we seek to measure ratings and financial ratios for the traded entity associated with the regulated utility. In

[10] Westcoast Energy is dropped from our sample. Duke Energy acquired the company in March 2002. Only interim statements were issued in 2001.

focusing on traded companies, our goal is to maintain sample consistency throughout our evidence. We recognize, however, that many of the traded companies include nonregulated businesses in addition to the regulated utility. We control for any bias by commenting on the differences as well as comparing our conclusions to those drawn strictly for regulated entities.

The bond ratings are from the websites of DBRS and S&P. Starting with the DBRS ratings, Schedule 2 shows that these ranged from A for Canadian Utilities, Enbridge and TransCanada Pipelines down to BB (high) for Pacific Northern Gas. The Schedule shows that the typical Canadian energy utility is rated A (low) by DBRS. For ease of comparison, Schedule 2 also shows the A rating of HQ but does not include it in our sample comparisons.

We next turn to the S&P ratings and make a similar comparison. The S&P ratings for the utilities in our sample ranged from A+ for Atco and Canadian Utilities down to BBB+ for BC Gas, Emera and TransAlta. Standard & Poor's does not rate Pacific Northern Gas. The Schedule shows that the typical Canadian energy utility is rated A- by S&P. Again, Schedule 2 shows separately that S&P does not rate HQ.

The next step is to examine the actual capital structures of the companies in our sample for 1999 through 2001, the latest years for which data are available in *Stock Guide*. Focusing on the 2001 ratios, Schedule 3 reveals that there is considerable variation in common equity ratios for these companies ranging from a high of 46.06% for Pacific Northern Gas down to 24.54% for Atco Ltd. The average percentage of common equity for these companies was 35.69% in 2001. Schedule 3 also presents common equity ratios for 2000 and 1999. With the exceptions of BC Gas and TransCanada Pipelines, the ratios were quite stable over these three years.

In addition, Schedule 3 shows the percentages of long-term debt and preferred shares in the capital structures of these companies. Again, there was considerable variation in the proportionate use of financing across companies. On average, the companies employed 62.26% long-term debt and 2.05% preferred shares in 2001. These ratios show common equity, long-term debt and preferred shares as percentages of long-term capital excluding short-term debt. If we include short-term debt, Schedule 4 shows that the percentage of debt falls marginally to 60.50% for the average utility for 2001. Given the marginal nature of this difference, we continue our focus on long-term capital.

The presentation of ratios for the same group of companies continues in Schedule 5. The first three columns show the coverage ratio, EBIT/ Interest expense.[11] The average coverage ratio was 2.62 in 2001. The next three columns display cash flow to debt which averaged 0.14 in all three years.

Q. What conclusions about an appropriate capital structure for an electric utility can you draw from Schedules 2 - 5?

A. The schedules show that, from the vantage point of DBRS, Canadian Utilities, Enbridge and TransCanada Pipelines are the only companies which enjoy an A credit rating. The other companies are all rated A (low) (or lower). For S&P, only two companies in our sample (Atco and Canadian Utilities) are rated A+. As stated earlier, the typical company is rated A(low) by DBRS and given a comparable A- rating by S&P. Of the nine utilities in our sample, four received a rating below A- (A (low)) from at least one of the rating agencies. Yet, despite their lower ratings, these companies have experienced no difficulties in accessing capital markets to raise long-term financing.

[11] EBIT are earnings before interest and taxes.

We conclude that the experience of the other companies in Schedules 2-5 suggests that a bond rating of BBB (high) (BBB+) or higher is sufficient to maintain good access to capital markets.

Q. Schedule 5 also contains data on ROEs for the companies in your sample. Do these data support your argument that a bond rating of BBB (high) or above is sufficient for a regulated electric utility?

A. Yes, they do. The ROE figures for 1999 through 2001 show that all but one of the companies earned positive ROEs in all three years. The one company that did not, TransCanada, suffered losses due to a one-time event, a failed diversification program in 1999. Further, a 2001 study on the Canadian electric utility industry by DBRS, concludes that actual earned ROEs typically exceed ROE targets set by regulators.[12] This strongly suggests that having a bond rating of BBB (high) did not impede these companies from profitably conducting their businesses.

Q. Your discussion shows that the typical Canadian utility in your sample has a bond rating of A (low) from DBRS or A- from S&P. Further, a number of companies have BBB ratings. What is the relevance of this sample for HQ which enjoys a higher bond rating of A?

A. The bond rating of HQ is based on the province of Québec as stated in the DBRS press release of October 7, 2002, which is available at: www.dbrs.com/web/sentry?COMP=1400&DocId=114042). Under the stand-alone principle of regulation, we must set aside the impact of provincial

[12] G. Lavalee, M. Kolodzie and W. Schroeder, The Canadian Electric Utility Industry, Dominion Bond Rating Service, November 2001, p. 49.

ownership of HQ and assess a fair capital structure from the standpoint of an investor-owned utility of comparable risk. This standard is provided by our sample in Schedule 2. Our analysis establishes that the sample represents a group of companies which can proxy for the risk that would be faced by HQ DIST if it were investor owned. Applying the stand-alone principle, we use this sample to establish an appropriate capital structure for HQ DIST.

Q. Turning from examining data to the realm of finance theory, what can we learn from finance theory about the appropriate level of the equity ratio for a regulated electric utility?

A. The first thing we can learn is to be suspicious of attempts to determine an appropriate equity ratio using a formula. Unlike other areas in finance, research on capital structure can offer only qualitative policy advice. To quote a leading, current corporate finance textbook:

> "We clearly have no unique formula that can establish a debt-equity ratio for all companies."[13]

While we expect an introductory textbook to contain an element of simplification in order to present material to beginning students, this statement has yet to be superceded by advanced research.

Q. In the absence of a formula, can you explain the key considerations in determining capital structure?

A. In the same textbook we find the following:

[13] S.A. Ross, R.W. Westerfield, J. F. Jaffe and G.S. Roberts, *Corporate Finance*, Third Canadian Edition, Toronto, McGraw-Hill Ryerson, 2003, p. 465.

"From a theoretical perspective and from empirical research, we present three important factors in the final determination of a target debt-equity ratio:[14]

1. Taxes. If a company has (and will continue to have) taxable income, an increased reliance on debt will reduce taxes paid by the company and increase taxes paid by some bondholders…
2. Types of assets. Financial distress is costly, with or without formal bankruptcy proceedings. The costs of financial distress depend on the types of assets that the firm has. For example, if a firm has a large investment in land, buildings, and other tangible assets, it will have smaller costs of financial distress than a firm with a large investment in research and development. Research and development typically has less resale value than land; thus, most of its value disappears in financial distress.
3. Uncertainty of operating income. Firms with uncertain operating income have a high probability of experiencing financial distress, even without debt. Thus, these firms must finance mostly with equity. For example, pharmaceutical firms have uncertain operating income because no one can predict whether today's research will generate new drugs, and the product development process generally is long and costly. Consequently, these firms issue little debt. By contrast, the operating income of utilities generally has little uncertainty<u>. Relative to other industries, utilities use a great deal of debt [emphasis added].</u>

[14] S.A. Ross, R.W. Westerfield, J. F. Jaffe and G.S. Roberts, *Corporate Finance*, Third Canadian Edition, Toronto, McGraw-Hill Ryerson, 2003, pp. 465-6.

Q. What does consideration of these three factors tell us about the appropriate amount of debt for an integrated utility?

A. For any company, if we set aside factors 2 and 3 for a moment, factor 1 tells us that a company should use a large proportion of debt financing to reduce its cost of capital. Simply stated, factors 2 and 3 restrain the company's use of debt in order to reduce the cost of financial distress and the probability that it will occur due to low operating income. Turning from speaking in general about any company to focusing on a regulated electric utility, we believe that factors 2 and 3 are largely mitigated by the special features of this industry.

For an electric utility, the costs of financial distress (factor 2) are reduced because its assets make excellent collateral. Further, the regulation process allows the company to go back to its regulator to apply for relief in the unlikely event that it does not earn its fair rate of return in a given year. We term this unlikely based on the DBRS study cited above which states that Canadian electric utilities typically earn more than their allowed ROEs. Additionally, in the extreme event that an electric utility became insolvent, it is highly likely that the regulator (and other governmental bodies) would work with the company to find new investors or a merger partner so that service (and thus, asset usage) would not be interrupted. This is what occurred with the bankruptcy of Pacific Gas and Electric Company in California.[15] As a result, the cost of financial distress is far lower than for a nonregulated firm.

The third factor is the probability of financial distress. As stated in the quotation, this probability is low for utilities because operating income has low variability. In conclusion, we come back to the beginning of our answer to this question. If we

[15] K. Gaudette, Bankrupt Pacific Gas and Electric hopes to avoid state laws, Associated Press, *The Nando Times*, January 25, 2002, www.nando.net/business/story/228567p-2199342c.html.

set aside factors 2 and 3 (the costs of financial distress and the probability of financial distress), the theory suggests that a company should use a high proportion of debt. Our comments on factors 2 and 3 explain why it makes sense to downplay them in practice for this industry. With the focus then on the first factor, taxes, we would expect regulated electric utilities to be among the most highly leveraged industries.

Q. Your answer to the previous question addressed integrated electric utilities as a whole. How do you assess the business risk of HQ DIST?

A. Our answer focuses on uncertainty of operating income introduced earlier in our overview of important factors in the determination of capital structure. Factors that increase costs to a utility such as higher energy prices or a lower Canadian dollar do not necessarily increase business risk. Management can prevent these factors from increasing the uncertainty of operating income in several ways. First, it can forecast their impacts and build them into proposed pricing. In a fair regulatory environment, such costs will be allowed and passed on to customers. Second, management can engage in hedging to control the impact of such factors on operating income. Business risk is only increased if these two approaches to controlling risk fail. We now apply this framework for assessing business risk to HQ and HQ DIST.

HQ is a monopoly in a stable and mature market with very limited competition. The company's asset base of around $60 billion makes it the largest electric utility in the Canadian context. The customer base is spread relatively evenly among industrial, residential and institutional customers in Québec with a sizeable market outside the province. The company has produced stable earnings without a rate increase since 1998. It has achieved this largely by cutting costs. In its mature market, generation capacity is comfortably above projected domestic demand. The economic slowdown in 2001 slowed growth in demand but modest growth resumed with economic recovery in 2002. The company's 2001 Annual Report (p. 4) forecasts annual growth of 1.2% through 2016.

In 2001, the company was reorganized to conform with FERC guidelines by dividing into four entities: HQ DIST, HQ TransÉnergie, HQ Production and HQ Ingénierie. Deregulation is developing more slowly in Québec than in Alberta, Ontario and the U.S. Thus, HQ DIST will continue to enjoy monopoly access to virtually all of its supply for the foreseeable future. The new Act adopted in 2000 mandates that HQ Production deliver up to 165TWh, termed the "heritage pool" to HQ DIST at a fixed price of 2.79 cents per kilowatthour. According to the company's 2001 Annual Report (p. 4): "This is the lowest rate in North America for such a large quantity of power". Additional demand will be filled by tenders to independent producers as well as HQ Production. Based on 2001 total electricity sales in Québec of 152.2 TWh and projected growth of 1.2% annually, HQ DIST expects that the heritage pool will be sufficient to fill domestic demand until 2006 (*Annual Report*, pp. 25 and 52). Even then, the deregulated supply is projected to represent just over 2 percent of total power needs.

The near-monopoly position enjoyed by HQ DIST on the supply side is mirrored by a preferential position in the retail market. There are no plans to open the retail market in Québec to competition. The law governing Québec's energy sector does not currently allow for retail competition (only pilot projects under the direction of the government are allowed, and there are no such projects under discussion at the moment). In addition, the low cost of electricity in Québec reduces the interest of other energy providers in the province.

HQ DIST is also in a strong position with its large-power customers, "industrial, commercial and institutional organizations that require more than 5 MW of power." The company's *Annual Report 2001* demonstrates that electricity prices to large customers are close to the lowest in North American cities while large customers report high levels of satisfaction with HQ DIST. According to the *Annual Report*: "Low, stable electricity rates are incentives to set up or maintain operations in Québec" (p. 13).

HQ DIST has ten small competitors in the Québec wholesale distribution market ---nine municipal systems and one regional cooperative (*HQ Strategic Plan 2002-2006*, p. 18). These competitors have only limited distribution rights and are quite small, except for Hydro-Sherbrooke. Together, they serve about 135,000 customers (HQD-2, document 2, page 7-36) compared to HQ DIST's customer base of 3 million. This suggests that there is minimal risk of large customers bypassing HQ DIST in favour of other electricity distributors.

Q. Your discussion establishes that, in comparison with other Canadian electricity distributors, HQ DIST enjoys lower risks with respect to supply, retail and wholesale competition. What is your view of the risk of competition from alternative fuels such as natural gas?

A. The threat from gas is not a substantial one for several reasons. First, electricity dominates natural gas in the Québec market. In 1999, the distribution of Québec's overall energy market by source was:

- Coal: 1.18 %
- Petroleum: 41.70 %
- Natural gas: 15.71 %
- Electricity: 41.4 %

This distribution has been stable since the early 1990's.[16]

Second, the natural gas sector is almost completely deregulated, except for transportation and distribution. This has resulted in large price fluctuations. Since 1999, natural gas prices have fluctuated between $3 and 6 per Gj. In particular, during 2001, a major increase in natural gas prices made gas uncompetitive. More recently, this price has stabilized between $3.75 and $6 per Gj. Although gas prices are down and are competitive with electricity, future price trends are uncertain. Third, HQ DIST is prepared to offer more attractive "time of use" and interruptible rates where necessary to retain large, industrial customers (*Strategic Plan 2002-2006*, p. 52).

Fourth, the natural gas market is mature in the industrial and commercial sectors, whereas there is still some growth potential in the residential sector. Still electricity dominates the residential market; HQ DIST has over 3 million customers, natural gas only 150,000. The only threat over the next 3-5 years on the residential side comes from replacement of electric water heaters with gas as well as heating in new construction and conversions in older homes. As Dr. Morin notes, the cost of conversion represents a barrier (p.17).

Q. Are there any other risks faced by HQ DIST?

A. Risk of higher costs due to bad weather (ice storm) requiring higher capital expenditures, which is referred to by Dr. Morin, is mitigated by regulation. From 2002 forward, these can be recovered by deferred charges if approved by the Régie (*HQ Strategic Plan 2002 -2006*, p. 40).

[16] See: www.mrn.gouv.qc.ca/energie/energie/energie-portrait.jps#bilan.

The net income of HQ is sensitive to unexpected shifts in interest rates and exchange rates as well as to the price of aluminum as smelters represent a major customer. To control these risks, the company conducts hedging using derivative instruments in order to control its exposures within acceptable limits.

Environmental concerns are not a potential risk to HQ Production because 96 percent of its power capacity is hydro (*Annual Report*, p. 44). When greenhouse gas emission standards are raised to comply with the Kyoto Accord, it is highly unlikely that HQ Production will face any significant costs of upgrading its plants or potentially see some of its assets stranded. This lack of exposure to environmentally-driven costs enhances the competitiveness of Hydro against producers using other types of inputs reducing the company's business risk.

Q. Please state your views on the risk posed by the regulatory environment faced by HQ DIST.

A. Like all other parts of HQ, HQ DIST is regulated by the Régie. Dr. Morin indicates that regulatory risk can arise when allowed returns do not fit market expectations or allowed capital structures vary from what is fair and reasonable in view of business risks. He further notes two reasons for assessing the regulatory risk for HQ DIST as above average. First, the current hearing represents the first time that the company is appearing before the Régie and there may be uncertainty about whether the process will be fair and reasonable. Second, a prior decision on TransÉnergie took four years imposing a significant regulatory lag on the company.

While we agree with Dr. Morin, that regulatory risk is a legitimate part of business risk, we disagree with his assessment of this risk as above average for two reasons. First, it is our understanding that the Régie, mindful of the regulatory lag associated with the TransÉnergie hearings, is committed to speedy completion of the present hearing. Second, our earlier review of earned ROEs for Canadian utilities and comparison with allowed rates of returns showed that regulators are typically generous to utilities.

Q. How do the risks faced by HQ and HQ DIST affect their earnings?

A. Since HQ is government owned its actual leverage is high and this tends to inflate ROE. Nonetheless, HQ's ROE was only 6.6 percent in 1999, 7.7 percent in 2000 and 7.6 percent in 2001. As Schedule 5 shows, these returns on equity were low compared to those of shareholder-owned utilities. If HQ were a shareholder-owned company, this signal of weak profitability would indicate heightened risk of financial distress. Recognizing the reality of government ownership reveals that low profitability is largely an artifact of government policy. This is particularly the case for HQ DIST.

Like the overall company, HQ DIST shows substandard returns over the last three years. It had a loss on its segmented net income in both 2000 and 2001. According to the *Annual Report*, total revenue was up in 2001 despite the continuing rate freeze, a warmer winter and the economic slowdown which impacted industrial demand. Still, reported expenses increased by more than revenues due to increases in distribution operations and enhancements in service quality.

In commenting on these returns, it is important to note that controlled prices to the consumer and cross-subsidies between consumer groups make divisional accounting within HQ somewhat artificial. As a result, the reported shortfall of HQ DIST does not reflect any heightened business risk in this division. Rather it reflects the impact of several subsidies resulting from government policies.

The first subsidy comes in the form of the moratorium on rate increases imposed in 1998 and scheduled to last until 2004. This represents a subsidy to consumers by HQ DIST. This subsidy is really a transfer from one hand to the other of individual citizens because HQ DIST is government owned. As the agent of its citizens, the government can effectively decide how it wants to reap the benefits of ownership. One possibility is to charge customers a market-determined rate, which tends to maximize the rate of return on equity. Another possibility is to charge customers a below-market rate, set so that the resulting rate of return on equity is low compared to that in the previous case. Thus, artificially reduced prices to consumers can be viewed as a use of potential higher profits, or as a type of cash distribution to de facto shareholders in lieu of higher dividend payments.

A second subsidy comes in the form of the relatively “comfortable” profit margin (in the 2.79 cents/KWh for the first 165 TWh consumed) guaranteed to the producer by the government, which is ultimately reflected in a relatively higher cost structure for HQ DIST. This is a subsidy to the generation unit by distribution. A third subsidy arises from government policy of providing electricity at low rates to domestic users, resulting in cross-subsidization in favour of domestic users at the expense of commercial and industrial users. This has encouraged greater use of electricity for home heating.

Does this situation imply a higher financial risk for HQ DIST? We do not think so. Taking as given that the regulation process in Québec is a fair one, it is likely that HQ DIST’s lower financial profitability will be remedied by higher rates over the medium term. Further, even under present rates there are good prospects for higher returns. HQ plans to control operating expenses across the company and to reduce financial expenses with lower leverage. Together with modest revenue growth of 1.6 percent annually, HQ forecasts that these cost-control measures will boost ROE to 9.1 percent by 2006.

Q. Please summarize the conclusions of your analysis of HQ DIST's business risk.

A. Our analysis shows that HQ DIST is in a favourable position with regard to the major factors causing business risk for a regulated electric utility in Canada. We conclude that the business risk facing HQ DIST is below average for a Canadian electric utility. We base this assessment on our view that the regulatory process and prudent management practices will combine to mitigate the potential risks we discuss. Further, given the relative lack of competition, mature market, controlled supply and input price and the deliberate pace of deregulation, our view is that the business risk faced by HQ DIST is somewhat lower than that faced by the average electricity distribution company in Canada.

Q. Your discussion compares HQ DIST against competing electricity distribution companies in Canada. How does its business risk compare to that of a gas distribution company?

A. In many respects, the risks are comparable as noted by Standard & Poor's guidelines and by Dr. Morin (p. 17). It is important to note, however, that HQ DIST enjoys an important advantage over gas distributors – its supply is guaranteed at a favourable fixed rate in quantities sufficient to meet forecasted demand until 2006. As a result, HQ DIST is protected against forecasting risk that occurs when unexpected price increases from producers must be passed on to consumers causing unforeseen reductions in demand. This occurred to gas distributors in 2001. For example, Gaz Métropolitain and Company, Limited Partnership states in its *2001 Annual Report* (p. 18):

> "Three factors beyond the Partnership's control have an impact on deliveries: economic growth rate, temperatures and competing energy prices. While the economic slowdown in North America during the 2001 fiscal year certainly did not help the Partnership, it was the severe spike in gas prices that hurt deliveries the most."

Due to lower forecasting risk, HQ DIST faces overall business risk lower than that of a gas distributor.

Q. Given your assessment of the business risk of HQ DIST as below average for an integrated electric utility and below that of a gas distributor, what capital structure do you recommend?

A. In response to an earlier question, we briefly explained why we believe the determination of capital structure represents a qualitative judgment. Following that approach and dovetailing with the qualitative approach taken by Canadian regulatory bodies in past decisions, we arrive at our recommendation by developing a number of benchmarks for HQ DIST's common equity ratio.

First, we turn to Schedule 3 where we observe that the average actual equity ratio for utilities in our sample is 35.69% for 2001, the most recent year for which we have data. This represents one useful benchmark for the equity ratio for an integrated utility. Other benchmarks are useful for two reasons. First, like any sample average, our average equity ratio depends on the sample drawn and can vary somewhat for this reason. Second, as we indicated earlier, the average is based on equity ratios for traded companies which include nonregulated activities as well as regulated utilities.

As a check on our calculations we examine the equity ratios allowed by various Canadian regulatory bodies for the companies in our sample for which we obtained data from past decisions. The sample includes Atco Electric, Atco Gas and Pipelines, B.C. Gas, Enbridge, Emera, Pacific Northern Gas, TransAlta, and TransCanada Pipelines and is displayed in Schedule 6. There, we calculate the average allowed equity ratio for these 8 companies as 35.99%. The analysis in Schedule 6 reinforces our conclusion that the average "generous" equity ratio for an integrated electric or gas utility is around 36%.

Q. Why do you call this average equity ratio "generous"?

A. We term it "generous" because it represents the result of a regulatory process in which decisions by regulatory bodies take as input the views of opposing parties each representing its own interest. We already showed how the regulatory process may be regarded as generous as it almost always results in the regulated companies earning an ROE in excess of the allowed return.

Focusing the discussion of generosity on the common equity ratio leads to a similar conclusion. Regulated utilities have little incentive to optimize the use of debt in their capital structures. Having a capital structure with insufficient debt increases the weighted cost of capital because equity is the most expensive form of financing. In the case of regulated utilities, this "extra" cost associated with insufficient debt may be recovered through the process of regulation. If the company can persuade its regulator to approve this unwarranted extra equity, there is no cost to the company from a higher cost of capital. If this occurs, then the regulated company has unused debt capacity which can be a benefit to the parent holding company. The assets of the regulated utility can then serve as collateral to increase the borrowing power of the unregulated part of the holding company adding value for the shareholders. If this occurs, the shareholders gain unfairly at the expense of the customers of the regulated utility who have to pay higher rates to “compensate” the regulated utility for the cost of carrying unwarranted extra equity.

Q. Can you develop another benchmark common equity ratio from what was recommended and allowed by the Régie for TransÉnergie in 2001?

A. Yes, we can. In 2001, the Régie awarded TransÉnergie a common equity ratio of 30%. Our analysis of the environment facing HQ in 2003 shows that it is not today materially more risky than in 2001. This suggests that a common equity ratio of 30% remains sufficient for transportation activities. We agree with the view expressed in the TransÉnergie hearing by Drs. Booth and Berkowitz, adopted by the Régie in its decision and expressed by Dr. Morin in his current evidence on page 17, that electricity distribution is somewhat more risky than transportation. Accordingly, a common equity ratio of more than 30% is appropriate for HQ DIST.

Q. Do you have any other benchmarks?

A. Yes, another useful benchmark is the common equity ratio for gas utilities. Earlier in our evidence, we characterize the business risk faced by an electricity distribution utility as slightly below that of a gas utility. In Schedule 6, we can identify a subsample of four gas utilities for which we have data on allowed equity ratios: Atco Gas and Pipelines, B.C. Gas, Enbridge and Pacific Northern Gas. The average allowed equity ratio for this subsample is 36.75%. This suggests that regulatory boards in Canada regard 36% - 37% as an appropriate allowed equity ratio for a gas company.

To test the reasonableness of this conclusion, we also examine the allowed equity ratios for two alternative gas companies: Gaz Métropolitain and Union Gas. These companies are not included in our sample because they do not have publicly traded common shares: Gaz Métropolitain is a limited partnership and Union Gas is not in Stock Guide. The allowed equity ratios for these companies are 38.50% and 35.00%, respectively, averaging 36.75%. Once again, we find 36-37% as the range representing what regulatory bodies have allowed gas utilities. Turning to actual capital structures reinforces this conclusion. Common equity represented 38.68% of long-term capital for Gaz Métropolitain in 2001 and 35.53% for Union Gas for an average actual common equity ratio of 37.11%

Q. Please summarize the five benchmarks that are relevant in determining an appropriate common equity ratio for HQ DIST.

A. Schedule 7 contains a summary and shows that the five benchmarks range from 36% to 37% when rounded.

Q. Please state your recommendation for the common equity ratio for HQ DIST.

A. We form five estimates of the appropriate equity ratio for HQ DIST. The first is based on the average of actual equity ratios for nine utility companies. The second estimate is the average equity ratio allowed these companies by their regulatory boards. The third estimate is the average allowed equity ratio for 4 gas utilities. The fourth benchmark is the average allowed equity ratio for 2 alternative gas companies. The fifth and final benchmark is the average of the actual equity ratios of these two alternative gas distributors. These benchmark equity ratios all fall in a narrow range of 36% - 37%. Our analysis of the business risk faced by HQ DIST assesses this risk as below that of the average shareholder-owned electric utility in Canada as well as below that of a gas distributor. This suggests that a fair common equity ratio for HQ DIST should be below 36%, the bottom of this range.

Our recommendation is to set the common equity ratio at 34% (i.e., the midpoint of our estimated range of 33% - 35%), which is above the middle of the range between 30% awarded for TransÉnergie by the Régie and the 36% average award for gas distributors. It is also below our average for integrated utilities. By setting our recommendation above the 30% awarded TransÉnergie we adjust for the higher risk of electricity distribution over transportation. On the other hand, by targeting the common equity ratio below 36%, we recognize the lower risk in electricity distribution in comparison to gas distribution.

IV. RATE OF RETURN ON COMMON EQUITY

Q. How is this section of your evidence organized?

A. We begin with a discussion of the general regulatory principles that are appropriate in conducting our fair rate of return analysis. We then present our implementation of the Equity Risk Premium Test. For this estimation method, the recommended rate of return on equity is equal to the estimate of the risk-free rate plus the premium (or additional return) that investors would require to bear the risk equivalent to an equity investment in HQ DIST. For the estimate of the risk-free rate, we use the estimate for the yield on long Canada's for 2003 determined earlier in Section II.

We then estimate the premium (or additional return) that equity investors require to bear HQ DIST's investment risk (commonly referred to as the own equity market risk premium or own equity premium for HQ DIST). Since HQ DIST's own equity premium is obtained by multiplying the equity market risk premium (i.e., the premium for investing in a well diversified equity portfolio such as the S&P/TSX Composite index) by the relative investment riskiness of HQ DIST, we provide estimates of each of these two components in turn.

We first estimate the required market risk premium for Canadian equities based on historical and forward-looking estimates for Canada and the U.S., and recent evidence that suggests that previously estimated equity risk premia using realized returns have produced an upwardly biased estimate of required equity risk premia. The expected risk premia estimates of various academic and practitioner scholars, and of surveys of Canadian investment professionals suggest that equity risk premia in the future will be much lower than those historically, and may even be nil or negative. We argue using finance theory that most of the fundamental changes in the Canadian market imply that the equity risk premium is decreasing, and will decrease further in the future. We explain why some have argued that the equity risk premium can be low, nil or negative given that the risk (standard deviation of returns) of equities is higher than the risk of bonds and cash only over short holding periods of one year but is lower than the risk of bonds or cash over longer holding periods of ten to twenty years depending on the evidence examined. We estimate an equity market risk premium of 4.70%.

We then use a DCF test, using historical and future estimates of dividend growth rates, to check the reasonableness of our estimate of the equity market risk premium of 4.70%. We conclude that our estimate is conservatively high.

We then estimate the relative investment riskiness or beta of HQ DIST as being 0.5, and show that the betas of utilities have been decreasing over time, although we make only a minimal adjustment for this latter observation. We then demonstrate that the two primary rationales that have been given for using the adjusted beta method when calculating the required rate of return on equity are not valid. We then multiply the estimate of the equity market risk premium by the estimate of the relative investment riskiness or beta of HQ DIST to obtain our estimate of the own equity premium for HQ DIST of 2.35%.

This is followed by the presentation of our "bare bones" cost of equity estimate. We add 10 basis points to the "bare bones" cost to compensate HQ DIST for potential equity flotation or issuance costs. We end this section with our return on equity recommendation for HQ DIST of 8.45%. Our return on equity recommendation allows HQ DIST a risk premium (including the flotation cost adjustment) of 245 basis points over our forecast for long Canada yields of 6.0%.

Discussion of General Principles

Q. What regulatory principles have you found appropriate in conducting your analysis of the fair rate of return on equity capital for HQ DIST?

A. We believe that the regulatory process should ensure that HQ DIST earns a return on common equity that would adequately compensate equity investors for its risk level if it were a public company. Further, this rate of return on equity would enable HQ DIST to maintain its financial integrity and to meet its financial obligations. The shareholders' interests must be balanced with the interests of the customers of HQ DIST who are entitled to safe and reliable service at reasonable rates.

Q. What rate of return test have you used to determine the fair rate of return on common equity for HQ DIST?

A. In designing our testimony, we identified various techniques that are commonly used for measuring the fair rate of return on equity both before the Régie and in other jurisdictions. We have based our conclusions regarding the fair rate of return on common equity primarily on the Equity Risk Premium Test. We do not employ the Comparable Earnings Approach because we believe that it is without merit and unsuitable for use in determining a fair rate of return on equity for a utility. Since Dr. Morin does not use this approach, section V of our evidence *does not* include a detailed discussion of this point, unlike our evidence in previous cases. Although we consider the DCF Test to be inferior to the Equity Risk Premium Test, we use the DCF Test to provide additional estimates of equity market risk premium using both historical and forward-looking estimates of share price or dividend growth. We use these estimates as further inputs for judging the reasonableness of our estimates of the implied equity premium using the Equity Risk Premium Test. Section V includes a detailed discussion of why the DCF Test is deemed to be inferior to the Equity Risk Premium Test, and why the DCF Test is best applied at the market and not individual firm level.

<u>The Equity Risk Premium Test</u>

Q. What is the Equity Risk Premium Test?

A. The Equity Risk Premium (ERP) Test estimates the cost of equity capital for utility companies with respect to other publicly traded investment opportunities that are available to investors. It is an attempt to find the risk-adjusted “opportunity cost” for investing in the shares of utility companies. This cost is based on the gross rate of return required by equity investors; i.e., the rate of return required by equity investors before trade costs and taxes.

Q. What approach have you used to implement the Equity Risk Premium Test.

A. There are several ways to implement the Equity Risk Premium Test. The Test which we conducted uses the following inputs:

1. the yield forecasted for 2003 for long Canada's (input #1);
2. a forward-looking risk premium for the S&P/TSX Composite based on its realized values over various periods between 1924 and 2001 for Canada, and 1802 and 2001 for the United States (input #2);
3. the investment riskiness (market beta) of HQ DIST relative to the market portfolio as proxied by the S&P/TSX Composite (input #3); and
4. an adjustment to cover fees involved with potential equity offerings or issues by HQ DIST (input #4).

As noted earlier, the reasonableness of the estimate of input #2 is judged based on comparisons against future estimates of market returns, and estimates of the risk premium obtained from the DCF Test for the market portfolios in both Canada and the US. The four input estimates for the Equity Risk Premium Test are combined as follows:

(Input #1) + [(Input #2) *x* (Input #3)] + (Input #4) = recommended rate of return on equity for HQ DIST.

We now need to detail how we obtained the final estimates of each of the four inputs, and to present the recommended rate of return on equity for HQ DIST that results from a combination of the final estimates of the four inputs.

Long Canada yield estimate (input #1)

Q. What is your estimate of the long-term risk-free rate that will prevail during 2003?

A. As discussed in Section II, we have forecasted the midpoint of the range of the long-term Government of Canada bond rate to be 6.0%.

Equity market risk premium estimate (input #2): Some measurement considerations

Q. What considerations go into the measurement of the market risk premium?

A. The market risk premium reflects equity investors' assessment of the expected (or required) return differential from investing in a diversified portfolio as compared to investing in the risk-free benchmark security. It indicates the total incremental return that equity investors require for bearing the non-diversifiable risk of the diversified portfolio relative to investing in the risk-free benchmark security. In Canada, the diversified portfolio is usually chosen to be a well-diversified equity market portfolio or index such as the S&P/TSX Composite Index. The reason is that this portfolio is well diversified when viewed from a domestic-only investment perspective. The equity risk premium occurs because risk-averse investors require a positive reward for bearing each unit of risk, and equities exhibit risk. The reward required for bearing each unit of risk increases as investors become less risk tolerant, and decreases as investors become more risk tolerant. The equity risk premium is the total compensation that investors require to bear the total risk (in this case, non-diversifiable risk only) of the diversified portfolio. We use the equity risk premium here in a forward-looking sense to project the required return on a diversified portfolio.

Since the market only rewards investors for bearing non-diversifiable risk and individual investments (such as stocks in specific utilities) are not by themselves well-diversified portfolios, this requires an estimation of the relative non-diversifiable risk or beta of each candidate utility relative to the diversified market portfolio. The equity risk premium is then adjusted upwards or downwards to reflect the relative **non-**diversifiable risk of the candidate utility relative to the diversified market portfolio. The lower non-diversifiable risk of HQ DIST relative to that for the diversified market portfolio necessitates a downward adjustment in the risk premium added to the forecasted long-term risk-free rate to calculate the cost of equity for HQ DIST.

Because the forward-looking or *ex ante* risk premium is difficult to observe, cost of equity studies typically place a heavy weight on measurement of historical or *ex post* risk premiums. This approach involves thorny measurement issues because historical measures may be biased or noisy proxies for forward-looking variables.

One important difference between expected and realized risk premia relates to the occurrence of a negative risk premium. The expected risk premium measures the expected return differential of a well-diversified but risky portfolio of equities over risk-free government securities. Since investors are risk averse, they would not invest in equities unless they expected the risk premium to be non-negative. However, since realizations can differ from rational expectations, the historical or realized market risk premium can be negative for any given period of time.

To illustrate, the total return (i.e., dividend yield plus investment value change) for the S&P/TSX Composite for 1990 was minus 14.80%. This resulted in a negative risk premium for 1990 when the risk premium is calculated using the Long Canada return of 3.34%. This negative risk premium was not a good proxy of the risk premium expectation of equity investors at the beginning of 1990. As of January 2, 1990, those investors holding equities must have expected that equities would outperform Long Canada's over the year. Similarly, investors holding equities must not have expected the negative total returns achieved by the S&P/TSX Composite in 1992, 1994, 1998, 2001 and 2002.

To address this potential difficulty with historical data, return on equity studies generally employ periods of at least ten years so that the realized market risk premium is positive. Also, the difference between the average realized and the average expected risk premia should diminish, as the measurement period gets longer if the underlying return distribution is normal and remains unchanged over this longer measurement period. This is commonly referred to as returns being IID normal, or independently and identically and normally distributed, in that they have the same normal distribution at each point in time and returns are independent over time. This assumption suffers from various important drawbacks. First, even if single-period returns are assumed to be normal, then multiperiod returns cannot also be normal since they are products (**not** sums) of the single-period returns. Second, several studies using longer-horizon or multi-year returns conclude that there is substantial mean-reversion (i.e., negative serial correlation) in stock market prices at longer horizons.[17] Third, the plausibility of the assumption that returns are IID diminishes as the time period gets longer. Drs. Campbell, Lo and MacKinlay state this as follows:[18]

> …the assumption of identically distributed increments is not plausible for financial asset prices over long time spans. For example, over the two-hundred-year history of the New York Stock Exchange, there have been countless changes in the economic, social, technological, institutional, and regulatory environment in which stock prices are determined. The assertion that the probability law of daily stock returns has remained the same over this two-hundred year period is simply implausible.

This means that due to fundamental shifts in economies and/or markets (technically, referred to as regime shifts), the use of too distant time periods may result in the inclusion of time periods that are no longer representative of currently possible market returns and/or market risk premia. Fundamental changes have occurred over time in the level of market integration across international markets, the level of market frictions (particularly, trade costs), and so forth. For example, much of the impact of the globalization of economies and financial markets, and of financial innovations has occurred over the past 30 to 40 years. Dr. Jones notes that trade costs drive a wedge between gross equity returns and net equity returns. His analysis shows that the average cost to buy or sell stocks has dropped from over 1% of value as late as 1975 (i.e., before the deregulation of brokerage fees) to under 0.18% today. He concludes that, while

[17] For examples, see E. Fama and K. French, 1988, Permanent and temporary components of stock prices, *Journal of Political Economy* 96, pp. 246-273; and J. Poterba and L. Summers, 1986, Mean reversion in stock returns: Evidence and implications, *Journal of Financial Economics* 22, pp. 27-60.
[18] John Y. Campbell, Andrew W. Lo and A. Craig MacKinlay, 1997, *The Econometrics of Financial Markets* (Princeton, New Jersey: Princeton University Press), pp. 32-33.

trade costs account for a small part of the observed equity premium, the gross equity premium is perhaps 1% lower today than it was earlier in the 1900's".[19]

A second difficulty arises if returns are not IID since both the market risk and its risk premium then are time-varying. *Ceteris paribus* (everything else held equal), the market risk premium will change over time, and can change drastically, with changes in the risk-free rate, risk tolerance of the representative investor, and the set of available investment opportunities. For example, the set of available investment opportunities has expanded significantly since the 1960's due to the astonishing variety of new risk management securities introduced in the 1980's and 1990's.[20]

A third difficulty arises because a period with a declining required equity market risk premium is likely to coincide with a temporarily increased realized equity market risk premium. Peter A. Diamond, Institute Professor at M.I.T., states this as follows for the U.S. market:[21]

> It is important to recognize that a period with a declining required equity premium is likely to have a temporary increase in the realized equity premium. This divergence occurs because a greater willingness to hold stocks, relative to bonds, tends to increase the price of stocks. Such a price rise may yield a higher return than the required return. For example, the high realized equity premium since World War II may be in part a result of the decline in the required equity premium. Therefore, it would be a mistake during the transition period to extrapolate what may be a temporarily high realized return.

Similarly, Glassman and Hassett argue that the equity premium will be dramatically less than it has been in the U.S. in the past. They raise the

[19] Charles M. Jones, 2001, A century of stock market liquidity and trading costs, working paper presented at an asset pricing workshop, Summer Institute, National Bureau of Economic Research, July 19-20.
[20] For example, see Merton Miller, Financial innovation: Achievements and prospects, 385-392, In: Donald H. Chew, Jr. (Ed.), *The new corporate finance* (New York: McGraw-Hill Irwin, third edition, 2001).
[21] Peter A. Diamond, What stock market returns to expect for the future?, *An Issue in Brief*, Centre for Retirement Research at Boston College, No. 2, September 1999, p. 2.

possibility that the realized rate of return in the intermediate period will be higher than in the long run if the required equity premium declines.[22]

A fourth difficulty arises because the reliability and comparability of the chosen proxy of the market portfolio varies considerably over time. To illustrate, most experts use the Canadian stock and Long Canada return series available from the Canadian Institute of Actuaries for the period from 1924 onwards. Thus, while the S&P/TSX Composite Total Return Index is used from December 1956, other proxies that are more likely to be contaminated by survivorship bias are used from 1924 to 1957. Similarly, S&P's U.S. dividend yields reported in Ibbotson and Sinquefield (1977) are used for the period January 1926-December 1933, after adjusting for the 0.17% difference between the S&P and TSE dividend yield index over the period January 1956-December 1965. While the long-term bond series is for bonds with a term-to-maturity of over ten years, the actual average maturity is less than 30 years, and varies over time. Given a positive realized term premium, this results in realized risk premia that are somewhat too high.

Q. To reiterate, what criteria need to be satisfied when deciding on what time period yields relevant data for calculating historical equity market risk premia in Canada?

A. The chosen time period should be the longest time period that satisfies the following two criteria:

First, the chosen time period should include no major regime shifts. Second, the chosen time period should have data that are reasonably reliable and are for a comparable proxy of the market portfolio over its duration.

[22] James Glassman and Kevin Hasset, Are stocks overvalued? Not a chance, *Wall Street Journal*, March 30, 1998; and Stock prices are far too low, *Wall Street Journal*, March 17, 1999.

Q. What period of time best satisfies these two criteria for the Canadian market?

A. In Canada, the time period since 1956 best satisfies these two criteria. First, reliable data for a comparable market proxy (the S&P/TSX Composite Index) are available only from 1956. The available Canadian equity market data prior to 1956 is usually obtained by splicing together series for equity portfolios with inconsistent formation characteristics. Because of the existence of interest rate controls and the absence of a Canadian money market to price fixed income securities, the data on fixed income securities are also of poor quality prior to 1956. Furthermore, this period of time incorporates much of the impact of globalization and financial market innovation on expected returns on equities and bonds. For these reasons, we begin with an examination of the post-1956 data for our ERP tests, and then examine returns prior to and after 1956.

Q. How should the historical market risk premium be calculated?

A. The historical market risk premium generally is calculated using holding period returns for a market proxy and for a risk-free proxy. In academic research on Canadian markets, the S&P/TSX Composite index and the T-bill rate generally are used as the proxies for the market and the risk-free rate, respectively. In contrast, in the rate setting process, the risk-free rate is proxied by the more risky Long Canada. Furthermore, in the rate setting process, the estimated market risk premium, after being properly adjusted for non-diversifiable risk differences between the candidate utility and the market, is added to the yield (not expected holding period return) on Long Canada's to get the cost of equity estimate for the candidate utility. How we deal with these inconsistencies is addressed as we describe the steps that we follow in our equity risk premium tests.

Equity market risk premium estimate: The appropriate average of historical annual data

Q. When is it preferable to use the arithmetic and the geometric average historical market risk premium?

A. As discussed more fully in Appendix B, the use of the geometric average or some weighted-average of the arithmetic and geometric averages is becoming conventional wisdom.

The arithmetic average is preferred when making investment decisions for a one-period investment horizon where the investment horizon is identical to the interval of time over which the historical returns are measured. Thus, if historical returns are measured on an annual basis, then the investment horizon is restricted to one year. The arithmetic average also is preferred when historical returns are normal IID or independently and identically distributed over the estimation period. As noted earlier, the normal IID assumption is not appropriate for asset returns over long estimation periods.

The geometric mean or some weighted-average of the geometric and arithmetic mean are preferred when the length of the investment horizon exceeds the return measurement interval, and the weight given to the geometric mean in any such weighted average increases as the investment horizon becomes longer. Similarly, the geometric mean or some weighted-average of the geometric and arithmetic mean are preferred when returns are <u>not</u> normal IID due to, for example, long-run mean reversion in asset returns, as has been found for stocks. Dr. Siegel notes that his work on risk premium using data for the period 1802-

2001 provides support for mean reversion for a 30-year horizon (i.e., the horizon used for Long Canada's in rate of return regulation).[23]

Dr. John Campbell at a recent *Equity Risk Forum* has aptly stated this argument as follows:[24]

> Which is the right concept, arithmetic or geometric? Well, if you believe that the world is identically and independently distributed and that returns are drawn from the same distribution every period, the theoretically correct answer is that you should use the arithmetic average. Even if you're interested in a long-term forecast, take the arithmetic average and compound it over the appropriate horizon. However, if you think the world isn't i.i.d., the arithmetic average may not be the right answer.
>
> I think that the world has some mean reversion. It isn't as extreme as in the highway example, but whenever any mean reversion is observed, using the arithmetic average makes you too optimistic. Thus, a measure somewhere between the geometric and the arithmetic averages would be the appropriate measure.

Q. What do you conclude from your assessment of whether the geometric or arithmetic mean market risk premium should be used in the Equity Risk Premium Test?

A. We conclude that the use of an equally weighted average of the arithmetic and geometric mean market risk premia is preferable. We conclude that, since the use of a weighted-average of the geometric and arithmetic mean market risk

[23] Jeremy J. Siegel, Historical results: Discussion, *Equity Risk Premium Forum*, November 8, 2001, p. 46.
[24] John Campbell, Historical results: Discussion, *Equity Risk Premium Forum*, November 8, 2001, p. 45.

premia grows with the level of market risk, strictly speaking no additional adjustment need be made to ensure the financial integrity of HQ DIST.

Equity market risk premium estimate: Impact of market frictions

Q. Are there any market frictions that should be kept in mind when examining historical market risk premia?

A. Historical market risk premia studies are based on gross and not net returns, although investors make decisions between investments of different risk based on net and not gross returns. There are at least two frictions that cause a divergence between gross and net returns from investment.

The first major market friction is taxes. As tax rates increase, investors require higher gross returns from investment to get the same net (after-tax) return, and vice versa when tax rates decrease. Similarly, if the tax rate reduction differs by type of asset, then their gross returns will change by different amounts to maintain their same net returns. To illustrate, if the effective tax rate on the return of a non-dividend-paying growth stock declines by more than that on the return of a long-term government bond, then the drop in the gross return of the stock to maintain its after-tax return will exceed the drop in the gross return of the bond. In turn, this will decrease the required equity market risk premium, all else held equal.

The second major market friction is trade costs, which include liquidity costs (as measured, for example, by the effective bid-ask spread), broker commissions, and so forth. In general, the gap between gross and net returns increases as trade costs increase, and decreases as trade costs decrease.

Equity market risk premium estimate (input #2): Initial Canadian estimate based on historical data

Q. What is your interpretation of the relevant data on historical market risk premia in Canada?

A. We begin with an examination of the 1956-2001 time period because it appears to best satisfy our dual criteria of being based on a consistent market proxy with reliable data, and being based on a time period that is likely to minimize the impact of major regime shifts on equity market premia estimation. We then examine two shorter periods, 1965-2001 and 1977-2001, and two longer time periods, 1951-2001 and 1924-2001. Based on the results reported in Schedule 8, the weighted average annual risk premium for the 1957-2001 period is 2.49%. The weighted average annual risk premium is lower at 1.63% and 1.75% for the two shorter time periods, 1965-2001 and 1977-2001, respectively, and is higher at 4.06% and 4.76% for the two longer time periods, 1951-2001 and 1924-2001, respectively. This strongly suggests that the equity risk premium has been declining in Canada over time.

In the interest of being very conservative in ensuring that our market risk premium estimate has a VaR-like or minimal probability of being too low, we choose an initial risk premium estimate of 4.7%, which is near the highest weighted risk premium of 4.76% that is reported in Schedule 8.

It also is important to note that we did not include the realized risk premium of minus 23.1% for Canada for 2002. Just adding this value to our longest time series of 1924-2001 lowers, for example, the annual arithmetic mean by 36 basis points from 5.38% to 5.02%.

Equity market risk premium estimate: Possible rationales for adjusting the initial Canadian estimate

Q. Do you have any reason to expect that there have been some fundamental changes since 1957 that have had an impact on the equity market risk premium?

A. Yes, there are at least 7 fundamental changes since 1957 that have had an impact on the equity market risk premium. While the effect of most of these individual changes and their net effect is to decrease the equity market risk premium, we make no such reduction to our initial equity market risk premium of 4.7%. This further bolsters our contention that our 4.7% estimate is very conservatively high.

A first fundamental change is the introduction of a capital gains tax in Canada in 1972. All else held equal, the introduction of a capital gains tax results in Canadian taxable investors increasing their required market risk premium on a before-tax or gross basis.

A second fundamental change is the more recent successive reductions in the capital gains inclusion rate. All else held equal, the successive reductions in the capital gains inclusion rate reduce the tax bite on an important component of investor returns from equity investment, and change the relative tax bite between equity returns and fixed income returns in favour of equity returns. Thus, all else held equal, the successive reductions in the capital gains inclusion rate result in Canadian taxable investors decreasing their required equity market risk premia on a before-tax or gross return basis.

A third fundamental change is the increased willingness or tolerance of Canadian investors to bear risk. All else held equal, an increase in investor tolerance to bear risk lowers the required equity market risk premium. This is easily seen in the world of the CAPM where the intercept and slope of the capital market line (CML) are the “price of time” and the “price of risk or market risk premium”, respectively. If all else is held constant, then the slope of the CML increases (decreases) as the market becomes less (more) risk tolerant.

A fourth fundamental change is the large inflow of funds into the market without a corresponding increase in viable investment opportunities. Based on data from the U.S. Federal Reserve Board, the number of shareholders increased by 32 million between 1989 and 1998, and stood at 84 million in the late 1990s. Based on a study conducted in 2000 for the Toronto Stock Exchange and World Investor Link, the proportion of Canadians that are shareowners is 23% in 1989, 37% in 1996 and 49% at the time of the study.[25] This large influx of capital chasing a set of viable investment opportunities that is growing at a slower rate led to a rapid increase in equity prices and a concurrent decline in the market risk premium. According to Diamond,[26] widening the pool of investors in the stock market through greater investor participation rates should lower the required risk premium.

David Rosenberg, Chief Canadian Economist and Strategist at Merrill Lynch, acknowledges this over-investment in the more recent past as follows:[27]

> “In our view, what triggered this bear market, in contrast to prior bear markets, was a recession induced by years of over-investment in technology, triggering massive excessive capacity, …”

---

[25] As reported in William Hanley, Bear market shakes our faith in stocks, *National Post*, February 2002, p. SM11.
[26] Peter A. Diamond, What stock market returns to expect for the future?, *An Issue in Brief*, Centre for Retirement Research at Boston College, No. 2, September 1999, p. 2.
[27] As reported in David Rosenberg, Analysis: Not your average bear, *National Post*, February 2002, p. SM4.

A fifth fundamental change is the more recent use of very aggressive accounting practices by firms to maintain or enhance their earnings growth. To illustrate public concern with this issue, Mr. Paul Volcker, a former Federal Reserve chairman, stated in testimony before the U.S. Senate that Enron's collapse exposed just one symptom of the accounting industry's problems. He went on to state that: "We have had too many restatements of earnings, too many doubts about 'pro-forma' earnings, too many sudden charges of billions of dollars to 'good will,' too many perceived auditing failures accompanying bankruptcies to make us at all comfortable." He went on to urge the adoption of international accounting standards "that reasonably reflect underlying economic reality".[28] Mr. Donald Coxe, Chairman and Chief Strategist of Harris Investment Management, describes aggressive accounting as follows:[29]

> "What does "aggressive accounting" mean? Well, the Nasdaq 100 companies reported $82.3 billion in combined losses to the SEC for the first three quarters of last year, but told shareholders they'd had profits of $19.1 billion, (according to SmartStockInvestor.com). The Big Five on Nasdaq (Microsoft, Intel, Cisco, Oracle, and Dell), reported $4.4 billion in net earnings to the SEC, while pleasing stockholders with reported earnings of $13.4 billion."

Coxe (p. 12) goes on to note:

> "Estimates for earnings on the S&P500 this year range from $37 to $57, depending on which accounting numbers are used. The stock market is, therefore, either wildly overpriced, or a bargain, depending on whether one uses pro forma, reported, adjusted, or GAAP earnings."

[28] Kellman, Laurie, Associated Press, Volcker says Enron only one symptom of problems in accounting industry, 2/14/2002.
[29] BMO Nesbitt Burns, *Basic Points*, February 8, 2002, p. 5.

Other examples of aggressive accounting are reported in Schedule 9.

A sixth fundamental change is the rapid growth in mutual funds, index products, derivative products and exchange traded funds. Since this allows small investors to acquire and manage diversified portfolios at lower cost, the required risk premium will be lowered since greater diversification means that these investors face less risk. Also, since the reduction in cost has been higher for equity versus fixed income investment vehicles, the equity risk premium relative to historical levels can be expected to decline. [30]

A seventh fundamental change is the continual evolution of the industrial composition of our economy and markets. This is neither unique nor confined to our more recent past. These changes are captured, albeit not perfectly, by market indexes such as the S&P/TSX Composite where the relative index weightings of industrial sectors with above-average and below-average economic prospects increase and decline over time. Since stock prices are based on the perceptions of the future economic prospects of firms, these prospects are reflected in the current prices, and thus, index weightings of firms in indexes such as the S&P/TSX Composite index. This is why the stock market is used as a leading indicator to forecast the economy in both Canada and the U.S.

Current stock prices also can reflect investor exuberance or false or misleading corporate information. This leads to what many investment professionals refer to as bubbles or mania. Bubbles can be firm-specific or market-wide. Since the list is long, three more recent firm-specific bubbles are Bre-X, Enron and Nortel (more than a $350-billion drop in market cap). Market-wide bubbles include the U.S. (and other) markets in 1928-29, the Japanese market in the early 1990s,

[30] Similar points are made about mutual funds by Diamond (1999), p. 2.

and the high-tech (or dot.com) bubble in 1998-2000. Some quotes from professional commentaries describing the latest up and down movements in high-tech prices as a bubble or mania are summarized in Schedule 9.

Q. What do these fundamental changes imply about your initial estimate of the equity market risk premium?

A. On balance, the fundamental changes suggest that our initial estimate of the equity risk premium is too high. Nevertheless, in the interests of being very conservative, we do not alter our initial estimate of the Canadian equity market risk premium to reflect this observation. The major lesson that one can learn from the most recent high-tech bubble is that one should not determine that markets or the economy have changed fundamentally based on only three or four years of data. Similarly, <u>spot estimates of the implied equity risk premium from DCF models using analyst forecasts at one point in time are not likely to be very meaningful</u>.

Equity market risk premium estimate: Canadian forward-looking estimates

Q. Are there any expectations data on Canadian stock and bond returns and the equity market risk premium that you considered in determining your estimate of the equity market risk premium?

A. Yes, we considered the forecasts by 81 Canadian and international investment managers contained in the *2002 Fearless Forecast* authored by W.M. Mercer Limited. The study notes on page 3 that perhaps its most interesting result is the relationship between managers' expectations for bond returns versus stock returns. A risk premium estimate of 3.0% over long Canada bonds is obtained based on the expectations of the managers that the S&P/TSX Composite Total

Return Index (TRI) will beat the Scotia Capital Universe TRI by 3.5% over the next five years, and the assumption that the yield curve will continue to be positively sloped. The study notes that this number is lower than the historical average and lower than expectations in recent *Fearless Forecasts*, but is higher than the 0% that some analysts believe is reasonable to expect and is higher than the 2.0% to 2.5% that is indicated by Mercer's own research. Douglas Porter and David Watt, from the Economist Research unit at BMO Nesbitt Burns, state that a reasonable range for the future equity premium is between 1.25% and 1.75%. They note that this leads to "real equities returns over the medium term [that] will closely resemble their historical norm" [our insertion].[31]

Equity market risk premium estimate: Historical and forward-looking estimates for non-Canadian markets

Q. Is there any value in examining the U.S. experience?

A. Yes, there is. First, as markets become more integrated, foreign-exchange and risk-adjusted returns become approximately equal across various world markets. This is referred to as the "law of one price". Second, examining other markets provides a test of how reasonable the Canadian estimates of the equity market risk premium are. However, one must be careful not to introduce an *ex post* selection bias when selecting which other market(s) to examine. Choosing the market that has grown to be the largest market or has had the best *ex post* performance introduces an *ex post* selection bias because its historical equity market risk premium will be among the highest among world markets. This is what happens when the U.S. equity market is chosen for this purpose. This is much like assessing the performance of the Montreal Expos by using the

[31] Douglas Porter and David Watt, Returning to equity returns, *Focus*, Economic Research, BMO Nesbitt Burns, February 22, 2002, pp. 4&5.

performance of the New York Yankees in baseball. This also is why the Japanese market for the last thirteen years is not chosen. The Japanese market at the end of December 2002 was at a level that was about 22% of its peak in 1989.[32]

In their book, Drs. Campbell, Lo and MacKinlay (1997)[33] report that the mean excess return of stocks over commercial paper (**not** long bonds) is about 6% in the U.S. when asset returns are measured annually over the period 1889 to 1994. Dr. Jeremy Siegel has conducted extensive studies of the equity risk premium for the US over the past 200 years. Based on his results, which are summarized in Schedule 10, the so-called Ibbotson time period, 1926-2001, has generated the highest weighted equity risk premium of 5.5%. Siegel notes that this equity premium is caused by real stocks maintaining their long-term historical average real return of almost 7%, while real bond and bill returns were below their long-term historical average real returns. In fact, for the 55 years up to 1982, the real return on bills averaged nearly zero. Siegel goes on to conclude that the reason why the equity premium is too high for this period is that historical real stock returns are biased upward to some extent and government bond returns were biased downwards over this period.[34] Mr. Richard Arnott and Peter Bernstein reach a similar conclusion that the realized equity premium exceeded the expected equity premium over this period.[35] Specifically, equity investors earned an annual 70 basis points more than what they expected and bond investors earned an annual 20 basis points less than what they expected. According to Arnott and Bernstein, one cause of this risk premium windfall was

[32]On December 29, 1989, the Nikkei 225 peaked at 38,957. On December 39, 2002, it closed at 8,579 according to the *Globe and Mail:* http://www.globeandmail.com/servlet/ArticleNews/business/RTGAM/20021230/wtoki1230/Business/businessBN/breakingnews .

[33] J.Y. Campbell, A.W. Lo and A. Craig MacKinlay, *The econometrics of financial markets* (Princeton, New Jersey: Princeton University Press, 1997).

[34] Jeremy J. Siegel, Historical results I, *Equity Risk Premium Forum*, November 8, 2001, pp. 31-32.

[35] Robert D. Arnott and Peter L. Bernstein. What risk premium is “normal”?, *Financial Analysts Journal* 58:2 (March/April 2002), pp. 64-85.

the unanticipated inflation of the late 1960s and 1970s that adversely affected realized bond returns. Another cause was the rise in price-to-dividend multiples from 18 to 70 times over the 1926-2001 period, with almost all of this increase occurring in the last 17 years of this period, that favourably affected stock returns. Mr. Arnott and Mr. Bernstein estimate that this rise in the price-to-dividend multiple added about 180 basis points or 1.8% to annual stock returns.

Of the five weighted-average equity risk premia reported in Schedule 10 for periods that begin prior to World War II and run through 2001, only the premium for the 1926-2001 period of 5.5% exceeds our forward-looking estimate for Canada of 4.7%. However, if we adjust the 1926-2001 realized risk premium downwards by 90 basis points to reflect the normal expectations of investors, as per Mr. Arnott and Mr. Bernstein, the adjusted equity market risk premium of 4.6% is now lower than our estimate of 4.7%. Furthermore, if we add the –37.9% realized risk premium for 2002 to the time period to examine the 1926-2002 time period, the realized arithmetic risk premium declines by 57 basis points from 6.2% to 5.63%. Thus, an examination of the US equity market risk premium experience suggests that our estimate of 4.7% for Canada is too high.

Q. What estimates of the equity market risk premium have been reported in the more recent literature for the U.S. and other developed countries?

A review of this literature is presented in Appendix C. Two recent studies estimate realized and expected equity risk premia for 15 countries over a 101-year period. They find that the expected equity risk premium, when measured **against short-term** government bonds over the 101-year period, is 4.0% and 3.5% for the U.S. and a sample of 15 developed countries including the U.S., respectively. All of the studies reviewed in Appendix C conclude that the U.S. equity risk premium has narrowed substantially, and is expected to be lower in the future. The U.S. forward-looking equity risk premium estimates vary from zero or slightly negative to about 4 %. Interestingly, at an equity risk premium forum in November 2001, Dr. Ibbotson made a long-term 4 percent (400 bps) equity risk premium forecast (i.e., geometric return in excess of the long-term government bond yield), under the assumption that today's market is fairly valued.[36]

A. According to the legendary Warren Buffet in December 2001:[37]

> "I would expect now to see long-run returns (in stocks) in the neighbourhood of 7% after costs. Not bad at all – that is, unless you're still deriving your expectations from the 1990s."

In his 2001 letter to shareholders, Warren Buffet reiterates his expectations as follows:[38]

> "Our restrained enthusiasm for these securities is matched by decidedly lukewarm feelings about the prospects for stocks in general over the next decade or so.… Charlie and I believe that American business will do fine over time but think that today's equity prices presage only moderate returns for investors. The market outperformed business for a very long period, and that phenomenon had to end. A market that no more than parallels business progress, however, is likely to leave many investors disappointed, particularly those relatively new to the game."

Equity market risk premium estimate: Relative risk of equity versus bonds

---

[36] Roger Ibbotson, Summary comments, *Equity Risk Premium Forum*, November 8, 2001, p. 108.
[37] As reported in Douglas Porter and David Watt, Returning to equity returns, *Focus*, Economic Research, BMO Nesbitt Burns, February 22, 2002, p. 4.
[38] Warren E. Buffett, Warren Buffett's Letters to Berkshire Shareholders 2001, February 28, 2002, p. 15. Available at: http://www.berkshirehathaway.com/letters/2001pdf.pdf.

Q. How can some market professionals estimate that the required equity risk premium going forward is zero or negative given the belief that equities are more risky than bonds?

A. In terms of investment risk, some market professionals believe that equities may not be more risky than bonds. Many studies find that the ratio of the standard deviations of return on equities to bonds is above one, approaches one, and goes below one as the measurement period over which returns are measured gets longer. The ratio would remain constant, as the measurement period over which returns are measured gets longer, if stock and bond returns did not exhibit mean reversion. A decrease in the ratio as the measurement periods lengthens indicates that the mean reversion in stock returns exceeds that in bond returns.

In a 2001 study, W.M. Mercer evaluated the investment riskiness of Canadian stocks, bonds and cash over varying time horizons.[39] These results confirm existing U.S. results that:[40]

- Stocks are riskier than both bonds and cash over shorter time horizons, such as one year;
- Stock returns exhibit decreasing variability (measured by the standard deviation of returns) over time;[41]
- For 20-year rolling time periods, stocks outperform bonds in terms of returns, and both asset classes have about the same risk;

[39] William M. Mercer Limited, Are stocks riskier than bonds? New Mercer research indicates that stocks become less risky in the long run, news release, February 15, 2001. Available at www.wmmercer.com/Canada/english/resource/resource_news02152001.html.

[40] The historical results reported by the CIA suggest that the standard deviation results are obtainable for periods as short as 5 years. Over 5-year periods, they report standard deviations of returns of 6.75%, 5.69% and 3.53% for stocks, long Canadas and 91-day T-bills, respectively. Over 10-year periods, the corresponding standard deviations are 2.98%, 4.59% and 3.26%. Canadian Institute of Actuaries, *Report on Canadian Economic Statistics*, 1924-2000, September 2001, Table 2A, p. 8.

[41] This is consistent with mean reversion in stock returns.

- For 30-year rolling time periods, stocks outperform both bonds and cash, and stocks are less risky than both bonds and cash.

Thus, based on the long-run perspective underlying rate of return rate setting, equities may in fact not be more risky than traditional debt instruments from an investment risk perspective. Since the equity risk premium is based on the notion that stocks are riskier than bonds, these results attack the validity of a fundamental notion behind the existence and magnitude of an equity risk premium.

Equity market risk premium estimate: Use of non-Canadian estimates

Q. Do you use any explicit or implicit weighting scheme when you consider the equity market risk premia in Canada and in foreign countries, such as the United States?

A. We use no explicit or implicit weighting scheme. Our approach is to use this additional information on foreign equity risk premia to subjectively adjust the initial point estimate of the Canadian equity risk premium in its range (or distribution) of possible equity risk premia.

As we have noted in Appendix E, the use of an explicit or implicit weighting scheme ignores the fact that, if the subject utility traded in the foreign market, its beta is likely to be different than it is in the Canadian market. For example, in Appendix E, we argued that if the equity market risk premium is higher in the foreign than Canadian market, the subject utility is likely to have a lower beta in that foreign market than in the Canadian market.

Fortunately, we can test this argument. Four of the utilities in our sample of ten utilities are cross-listed on the Toronto Stock Exchange and the New York Stock Exchange. They are (with their NYSE ticker symbol in parentheses): Enbridge Inc. (ENB), TransCanada Pipelines Ltd. (TRP), Westcoast Energy Inc. (WE) and Transalta Corp. (TAC)[42]. We eliminate TAC because it does not have at least five years of monthly data on the NYSE, and we note that the trading in ENB is quite thin. Thus, we examine the average results for the sample of TRP and WE with/without ENB.

This is a particularly “clean” test because we can examine the beta estimates and own utility risk premia in both markets for exactly the same companies in terms of business and financial risk. Shares in both markets for the same company need to provide the required risk-adjusted return for investors in both markets to hold the shares. Furthermore, any contemporaneous price differences in both markets will be small because of arbitrageurs.

Our beta estimates for the three cross-listed utilities are reported in Schedule 11 for eight rolling five-year periods over the period 1990-2001 for the TSE and the NYSE, and over the full period 1990-2001. As expected, the beta estimates are lower for the same firm using NYSE data compared to using TSE data. To illustrate, the mean NYSE beta for the three utilities is 0.374 compared to its mean TSE beta of 0.220 based on the eight rolling five-year periods. The corresponding values are 0.183 and 0.073 based on the full period 1990-2001. The betas based on the rolling five-year periods are higher because they overweight the periods over which the beta estimates are higher.

[42] Westcoast Energy traded through the end of 2001 and, hence, we include it in our sample for beta estimation.

To show the implications of these different betas, let us assume for argument purposes that the appropriate equity risk premia for the Canadian and U.S. markets are 3.5% and 6%, respectively. If we then use the higher mean beta estimates for the sample of three utilities of 0.374 and 0.220 for Canada and the U.S., respectively, we obtain the same rounded-off mean own utility sample risk premia of 1.3% for the Canadian and U.S. markets. If we repeat this calculation without the utility with the thin trading problem (namely, Enbridge), we still obtain quite similar own utility sample risk premia of 1.4% and 1.8%, respectively. These results are what one would expect given the high level of integration between the Canadian and U.S. markets.[43]

Equity market risk premium estimate: Biases and their impact

Q. Are there any biases in the various estimates of the equity risk premium that you refer to above?

A. Yes, there are a number of biases. All of them suggest that the various estimates are likely to be upwardly biased. We discuss four such biases.

The first bias is caused by survivorship bias. Some examples follow. First, when a new index is introduced, the index sponsor generally provides historic data on that index. For example, when the S&P/TSX Composite index was introduced in January 1977, historic ("back-fill") data was provided dating back to January 1956. The historic data was for firms in existence as of the date of the index introduction. Second, as proposed by Brown, Goetzmann and Ross (1995),[44] financial economists concentrate on the performance of surviving markets and

[43] For a study dealing with integration of the Canadian and U.S. markets, see Lawrence Kryzanowski and Hao Zhang, 2002, Intraday market price integration for shares cross-listed internationally, *Journal of Financial and Quantitative Analysis*.

[44] S. Brown, W. Goetzmann and S. Ross, Survival, *Journal of Finance* 50 (1995), pp. 853-873. The following examples are drawn from Brown et al (1995).

so-called “winner” markets like the U.S. stock market. Financial economists ignore other markets that have done poorly or even disappeared. Examples given by Brown et al. include the Argentine market that is considered a comparatively less important emerging market because of long history of poor performance, and the Russian market where investors at one point had all their wealth expropriated during the last 100 years.

The second bias is caused by selection bias. Various studies argue that the historic returns for index additions or deletions (and indexes) are not representative of returns in general since S&P500 and S&P/TSX Composite replacement selection decisions use historical price information to select stocks for replacement. For example, Chung and Kryzanowski (1998)[45] find that deletions are drawn from stocks (so-called losers) that have performed abnormally poorly relative to the market prior to their removal from the index, and additions are drawn from stocks (so-called winners) that have performed abnormally well relative to the market prior to their addition to the index. This is not surprising because the major criterion for index deletion and addition for the former S&P/TSX Composite was relative capitalization (i.e., market price per share times the number of shares of float). Thus, relative losers are replaced with relative winners in terms of market price.

The third bias is caused by differences in index construction. For example, while the S&P/TSX Composite and S&P500 indexes are currently both value-weighted indexes, they used to differ in how the weights are calculated. The S&P500 index now also uses the public float when calculating a firm’s weight for index construction purposes. For much of the past, differences in index construction

[45] R. Chung and L. Kryzanowski, Are the market effects associated with revisions to the TSE300 Index robust, *Multinational Finance Journal* 2 (March 1998), pp. 1-36.

made the S&P/TSX Composite more representative than the S&P500 of the actual investment opportunities that were available to public investors.

The fourth bias is caused by data recording problems. The price of the last trade is used to value firms in financial difficulty that have their trading suspended. If these firms later fail and are delisted, they are removed from the index using the last traded price and not their current price.

Q. Have you made any adjustments for these biases?

A. No, we have not made any adjustments for these biases. However, by not accounting for these biases, the equity risk premium estimates reported earlier are conservatively high.

Q. Have you made any adjustments for globalization, increasing wealth of Canadians and a perceived desire of Canadians to be more heavily involved in equities?

A. No, we have not although all of the factors suggest that the risk premium will decrease in the future. As we discussed more fully in this and the next major section of our evidence, all of these factors suggest that the market's tolerance for bearing risk can be expected to increase in the future. In turn, this leads to a decrease (not increase) in the risk premium, everything else held constant.

Equity market risk premium estimate: Based on the DCF Test

Q. Please provide a brief discussion of why you generate DCF estimates of the equity market risk premium?

A. As is discussed in more detail in Section V of our evidence, Discounted Cash Flow (DCF) Tests have a number of disadvantages that make them unreliable for estimating the required rate of return or risk premium on equity, particularly for individual companies. Nevertheless, because the DCF approach represents an alternative method of estimating market risk premia, it is useful as a check on the reasonableness of our ERP tests. With this in mind, we conduct DCF Tests using the constant growth and the two-stage growth versions of the Dividend Discount Model or DDM for the U.S. market as proxied by the S&P500 Index, and for the Canadian Market as proxied by the S&P/TSX Composite Index. We use both historical estimates of dividend growth and strategist forecasts of future earnings growth. The output of these DCF tests consists of various estimates of the equity market risk premium.

Q. Would you please describe the constant growth and two-stage versions of the DDM?

A. The required rate of return in the constant growth DDM or Gordon model is given by:

$$k = \frac{D_1}{P_0} + g$$

where D_1 is the expected dividend in the next period, or D_0 (1 + g);
P_0 is the current price or level of the stock or index; and
g is the growth rate in dividends, which is assumed to be constant until the end of time.

In this version of the model, the growth rates in dividends, earnings, book value and share price are all assumed to be equal.

In the two-stage DDM, dividends are assumed to grow at a fixed rate g_1 for an initial period (herein deemed to be the first five years), and then to grow at a different fixed rate g_2 thereafter. In this version of the DDM, the implied required rate of return is found by solving for k in:

$$P_0 = \sum_{t=1}^{5} \frac{D_0(1+g_1)^t}{(1+k)^t} + \left(\frac{D_6}{k-g_2} \right)$$

where $D_6 = D_0(1+g_1)^5(1+g_2)$.

The implied risk premium or IRP is then obtained by subtracting the current yield on long-term government bonds from the estimate of k derived from the above models.

Q. Would you please first discuss the DCF Test results that use historical estimates of future expected growth rates?

A. The DCF Test results for the S&P/TSX Composite Index and the S&P500 Index are reported in Schedules 12 and 13, respectively, for each of the years over the period, 1971-2001. All of these tests use growth rates based on the last ten years of data ending in the year indicated that are smoothed by equally weighting each data point. The tests use the historical 10-year annual growth rate in either dividends (adjusted or unadjusted for other cash flow distributions to shareholders) or nominal GNP. Since the highest implied risk premia or IRPs are obtained using GNP growth, we confine our discussion to those results.

For the S&P/TSX Index, the mean IRP from the single-stage DDM declines from 3.19% for the full 31-year period, 1971-2001, to 2.87% and 1.20% for the more recent 20 and 10 year periods, respectively. Similarly, the mean IRP from the two-stage DDM declines from 5.13% for the full 31-year period, 1971-2001, to 2.91% and 0.53% for the more recent 20 and 10 year periods, respectively.

These results suggest that our forward-looking estimate of the IRP for the S&P/TSX of 4.7% is conservatively high.

For the S&P500 Index, the mean IRP from the single-stage DDM declines from 3.50% for the full 31-year period, 1971-2001, to 2.61% and 1.78% for the more recent 20 and 10 year periods, respectively. Similarly, the mean IRP from the two-stage DDM declines from 5.77% for the full 31-year period, 1971-2001, to 4.61% and 2.77% for the more recent 20 and 10 year periods, respectively. These results also, once again, suggest that our forward-looking estimate of the IRP for the S&P/TSX of 4.7% is conservatively high.

Q. Is there any support for the notion that earning's growth cannot exceed GNP growth long-term?

A. Yes, this is a commonly held position. In fact, in the summary comments at a recent equity risk premium forum, Dr. Leibowitz summarized his viewpoint as follows:[46]

> I'm very impressed by the level of consensus on the view that earnings can grow only at a somewhat slower rate than GDP per capita and that no one seems to feel it can grow much more – except Roger Ibbotson…

Q. Would you please now discuss the DCF Test results that use strategist estimates of future expected growth rates?

A. These results are summarized in Schedule 14. Although they are only indicative due to the poor quality of the data, they suggest that even if we use the earnings growth rate of strategist without adjusting for their known optimism bias, that the

[46] Marin Leibowitz, Summary comments, *Equity Risk Premium Forum*, November 8, 2001, p. 109.

forward-looking implied risk premia or IRP are 3.91% and 4.57% for the S&P/TSX and S&P500 indexes, respectively. If we reduce the forecasted growth rates by the average historical estimated strategist optimism bias of about 15%, the IRPs drop to 2.71% and 3.37% for the S&P/TSX and S&P500 indexes, respectively.

Q. What inference do you draw from your estimates of the implied risk premia using the earnings forecasts of strategists for US and Canadian equity markets?

A. The conclusion that we draw is that our forward-looking estimate of the IRP for the S&P/TSX of 4.7% is conservatively high.

The final Canadian equity market risk premium estimate (final input #2)

Q. What equity market risk premium are you forecasting to be used to calculate the risk premium for HQ DIST for 2003?

A. We determine that our estimate of the Canadian equity market risk premium of 4.7% discussed above needs no further upward adjustment since it is already on the high side. This latter observation reflects the recent evidence that the use of realized equity market risk premia results in an over-estimate of the risk premia required historically, and the consensus conclusion in recent studies that the required risk premium going forward will be low, if not nil or negative. On balance, weighing all these factors leads to our Canadian market risk premium forecast of 4.7%. Our “generous” point estimate is substantially higher than the forecasted range of 2.0% to 2.5% calculated for internal use by W.M. Mercer for Canada, the consensus forecast of 3.5% reported for Canada in the *2002 Fearless Forecast*, and the “consensus” forecast of academic and professional scholars of a low, nil or negative equity risk premium for the U.S. going forward. It is also substantially higher than the BMO Nesbitt Burns' forecast of a maximum of less than 2% for Canada presented earlier.

Relative investment risk of HQ DIST (input #3)

Q. How does the overall riskiness of HQ DIST compare with the typical firm contained in the S&P/TSX Composite?

A. The overall (investment) riskiness of a firm is typically determined by measuring its contribution to the risk of a well-diversified portfolio. In a CAPM world where the only factor affecting returns is the market, this contribution is measured by the firm's market beta.

Since market betas vary over time, investment professionals prefer to use only the most recent data in order to capture the firm's current risk even for firms with long trading histories. However, to ensure reasonable statistical precision, beta estimations typically are based on approximately 5 years of monthly observations. The betas used herein are based on 60 months of data, and are only calculated if almost all months have returns based on actual market transactions.

It is not possible to estimate a reliable beta for HQ DIST directly. HQ DIST does not trade publicly. However, it is possible to make an approximation. We use the same sample of nine utilities that we used in our capital structure discussion in Section III. We present the rationale for the sample selection there. Here we add Westcoast Energy as this company traded throughout 2001. As shown in Schedule 15, the average beta for a group of ten utilities is 0.194 for 1997-2001, a sizeable decrease from 0.583 for 1990-1994. The mean of the mean cross-sectional beta for each of the eight rolling five-year periods is 0.439. The means of the mean cross-sectional betas for the first four and the last four rolling five-year periods are 0.541 and 0.337, respectively. Although we believe that the downward trend in the betas will not change direction in the future due to the changing nature of the Canadian equity market, we estimate the beta for HQ DIST at 0.50, slightly above the grand average of the average rolling-betas for the eight periods.[47] We believe that this estimate is upwardly biased ("generous"), and provides sufficient coverage for any estimation errors.

Q. What other risk-related factors did you consider that could affect the cost of equity capital for HQ DIST?

A. We also examined whether an average utility was becoming a more desirable investment because of an increase in its potential to diversify investor portfolios. In modern portfolio theory, an asset becomes more desirable for portfolio diversification purposes if its correlations with all the other assets decrease, everything else held constant. This important contribution led to the awarding of a Nobel Prize in Economics to Dr. Harry Markowitz.

Thus, we calculate moving average correlations for our sample of utilities with the S&P/TSX Composite index. These results are summarized in Schedule 16. We find that the average correlation between a utility in our sample and the S&P/TSX Composite is substantially lower for the most recent five-year periods relative to the more distant five-year periods (0.177 versus 0.495), and is quite low at 0.395 across all eight rolling five-year periods. This suggests that an average utility is now more desirable as an investment because of its enhanced potential for portfolio risk reduction. A greater potential for risk reduction leads to a reduction in an asset's risk premium. Furthermore, during the most recent five-year period,

[47] Betas of 0 and 1 correspond to no market risk and a market risk equal to a well diversified portfolio such as the S&P/TSX Composite index, respectively. Thus, a beta of 0.50 for HQ DIST indicates that HQ DIST has 50% of the investment risk of the S&P/TSX Composite.

1997-2001, four of the ten utilities have a correlation with the market of less than 0.1. In other words, four of these utilities behave almost as if they were market neutral.

This reduction in the correlations between the returns of the utilities and the market also contributes to the reduction in the betas of the sample of utilities since the beta coefficient is given by:

$$\beta_i = \frac{\sigma_i \rho_{im}}{\sigma_m}$$

where σ_i and σ_m are the standard deviation of returns for utility *i* and the market *m*, respectively; and

ρ_{im} is the correlation between the returns for utility *i* and the market *m*, respectively.

Thus, if the relative risks of the utility and market remain constant, the beta decreases as the correlation between their returns moves from 1 to 0.

As a check of whether or not everything else is held equal, we also calculate and report the average overall risk of the sample of utilities relative to the S&P/TSX Composite index. We find that the average overall risk of the sample of utilities relative to the S&P/TSX Composite index has been above one for most of the eight rolling five-year periods as seen in Schedule 16. This suggests that the relative total riskiness (i.e., diversifiable plus nondiversifiable risk) of utilities exceeds that of the market, which only has nondiversifiable risk from a domestic-only perspective. However, it is important to remember that the market does not reward investors for holding diversifiable risk in their portfolios.

Our results in Schedule 16 vividly illustrate what happens to the relative risk of a sample of utilities when it includes a utility (in this case, TransCanada Pipelines) that has gone through a diversification program that has failed and the subsequent restructuring from downsizing. Specifically, the average overall risk of the sample of utilities without TransCanada relative to the S&P/TSX Composite index for the last two rolling periods of 1996-2000 and 1997-2001 (i.e., the ones that include 2000) are 1.097 and 1.108, respectively. In contrast, this relative measure of total risk with TransCanada included in the sample is dramatically higher at 1.719 and 1.672 for the 1996-2000 and 1997-2001 periods, respectively. While this relative measure of total risk for TransCanada itself ranged between 1.017 and 1.291 for the first six rolling five-year periods, it jumped to 7.325 and went down to 6.747 for the 1996-2000 and 1997-2001 time periods, respectively.

Q. What conclusion do you derive from this analysis?

A. We conclude that the required equity risk premium for HQ DIST should be reduced to reflect the trend that indicates the greater desirability of holding utilities for investor portfolio diversification over time. This is due to the downward trend in the lower average correlation of utilities with the market over time, although we make no such reduction.

Relative investment risk of HQ DIST*: The use of the adjusted beta method*

Q. What is your opinion on the practice by other witnesses of adjusting the betas used in calculating the required rate of return on equity?

A. There are two primary rationales that have been given for using the adjusted beta method when calculating the required rate of return on equity. Both rationales are flawed.

Q. Would you please explain what the first rationale for using the adjusted beta method for utilities is and why it is flawed?

A. The first rationale is based on the empirical finding by Blume (1975) that the betas of individual U.S. equities, for a large sample that is representative of the overall market, tend to regress over the long run towards the mean beta for the sample.[48]

Blume regresses the beta estimates obtained over the period 1955-1961 against the beta estimates obtained over the period 1948-1954 for common shares traded on the NYSE. Blume finds that the betas of firms with betas less than one subsequently tend to increase towards the sample beta of one, and firms with betas of more than one tend to subsequently decrease towards the market beta of one. The relationship estimated by Blume suggests that the quality of beta forecasts can be improved, and that a higher quality predictor of an individual firm's beta may be a weighted average of the sample beta and the firm's current beta where the weights are approximately one-third and two-thirds, respectively.[49]

There are at least five substantive reasons for not adjusting betas for utilities based on this rationale.

First, Harrington (1983)[50] shows that the betas that are supplied by commercial vendors that use this adjustment have little predictive accuracy. Her conclusion is based on a comparison of the actual beta forecasts supplied by a number of commercial investment vendors (such as Value Line) with their corresponding benchmark estimates for four forecast horizons.

---

[48] M.E. Blume, Betas and their regression tendencies, *Journal of Finance* 30 (June 1975), pp. 785-796.
[49] Also, see O.A. Vasicek, A note on using cross-sectional information vs. Bayesian estimation of security betas, *Journal of Finance* 28 (September 1973), pp. 1233-1239.
[50] D.R. Harrington, Whose beta is best?, *Financial Analysts Journal* (July-August 1983), pp. 67-73.

Second, there appears to be no evidence that the relationship estimated by Blume applies to other markets, such as the Canadian market, or more recent time periods. In other words, there appears to be no empirical evidence that the betas of Canadian stocks revert to the sample mean.

Third, if the sample average is consistently lower than the market beta, as is the case for the samples of utilities studied herein, the use of the market beta of one will result in an over-prediction of the mean beta in the next period for the sample. This is easily shown by taking a portfolio that is invested 40% in risk-free assets and 60% in the market, and thus, has a constant beta of 0.60 by construction. Its adjusted beta would consistently be 0.73 (i.e., two-thirds of 0.6 + one-third of 1), although its actual or true beta is substantially lower at 0.6.

Fourth, the previous point has already been documented in the published literature. Kryzanowski and Jalilvand (1986)[51] test the relative accuracy of six beta predictors for a sample of fifty U.S. utilities from 1969-1979. They find that the best predictors differ only in that they use different weighted combinations of the average beta of their sample of utilities, and that, not unexpectedly, the worst predictor is to use a beta of one or the so-called "long-term tendency of betas towards 1.00".

Fifth, adjusting the beta towards one assumes that the "true" beta for the utility is one. In other words, this adjustment method is based on the implicit assumption that the "true" beta for the utility is the same as that of the market index.

[51] L. Kryzanowski and A. Jalilvand, Statistical tests of the accuracy of alternative forecasts: Some results for U.S. utility betas, *The Financial Review* (1986), pp. 319-335.

Q. Would you please explain what the second rationale for using the adjusted beta method is and why it is flawed?

The second rationale for using a variant of the adjusted beta method for utilities is that raw utility betas need to be adjusted upward due to their sensitivity to interest rate changes, and that the appropriate adjustment is one that is intermediate between the raw and adjusted betas. We provide a detailed criticism of this rationale in Appendix D. This detailed criticism will now be summarized.

As is the case for the S&P/TSX Composite index, the returns of utilities are sensitive to changes in both market and bond returns. This suggests that utility returns may be better modeled using these two potential return determinants or factors. However, one should not confuse the sensitivity of utility returns to the returns of each of these factors with the premium required by investors to bear market and interest rate risk when investing in utility equities.

When there is only one determinant of utility returns (namely, the market), the theoretically justified approach is to use the traditional one-factor CAPM to implement the Market Risk Premium Method. The method is implemented by first estimating the utility's beta by running a regression of the returns on the utility against the returns on the market proxy (S&P/TSX Composite index). The utility's required equity risk premium is obtained by multiplying the equity risk premium estimate for the market by the utility's beta estimate. The cost of equity for the utility is obtained by adding the equity risk premium estimate for the utility to the estimate of the risk-free rate (as proxied by the yield on long Canada's).

When there are two possible determinants of utility returns (in this case, equity market risk and interest rate risk), the theoretically justified approach is to use a two-factor CAPM to implement the Market Risk Premium Method. The Equity

Risk Premium Method now is implemented by first estimating the utility's two betas by running a regression of the returns on the utility against the returns on the equity market proxy (S&P/TSX Composite index) and on the bond market proxy (long Canada's). The first component of the utility's required equity risk premium is obtained by multiplying the equity risk premium estimate for the market by the utility's market beta estimate, and the second component of the utility's required equity risk premium is obtained by multiplying the bond risk premium estimate by the utility's bond beta estimate. The utility's required equity risk premium is the sum of these two components. The cost of equity for the utility then is obtained by adding the equity risk premium estimate appropriate for the level of relative risk for the utility to the estimate of the risk-free rate (as proxied by the yield on long Canada's).

While one would expect the estimates of the return on the S&P/TSX Composite index, of the return on long Canada's, and of the return on the S&P/TSX Composite index over the yield on long Canada's to be positive and significant, such is not the case for the return on long Canada's over the yield on long Canada's. Over the long run, we would expect the average return on long Canada's to be equal to the yield on long Canada's (the proxy for the risk-free rate in rate of return settings). This is because our expectation is that rates would fluctuate randomly so that returns would be above yields to maturity in some periods and below them in others. Thus, while it is true that utility returns are sensitive to interest rates, it is not true that interest rate risk will have a positive risk premium over the long run.

To examine the nature of bond market risk premia, we calculate the bond market risk premia over various time periods that correspond to those used previously to calculate the equity market risk premia. These results are reported in Schedule D-2. As expected, over long periods, such as 1948-2001 or 1957-2001, the bond market risk premium is less than 60 basis points. While it is much larger over the 1980-2001 period at 3.676%, this is offset by the low equity market risk premium of 1.570%. Furthermore, if we use the median equity and bond betas of 0.350 and 0.438, respectively, for the utilities reported in Schedule D-1, we find that the combined equity and bond market risk premium for the average utility ranges from 1.245% for the 1957-2001 period to 2.191% for the 1980-2001 period.

Looking forward we expect equity market risk premia to be low, and we do not expect the bond market risk premium to be material (on the positive side) since interest rates are now at or near historic lows.

The initial cost of equity capital recommendation

Q. What cost of equity capital are you recommending for HQ DIST based on this Equity Risk Premium Test?

A. Based on a market risk premium estimate of 4.70% and at a relative risk factor of 50% of the S&P/TSX Composite index, the equity risk premium required for HQ DIST (i.e., our final estimate of input #2 multiplied by our final estimate of input #3) is calculated to be 2.35%. Given our point forecast of a long-term Government of Canada bond rate of 6.00% (our final estimate of input #1), our cost of equity capital point estimate is 8.35%.

Adjustment to the Initial Cost of Equity Capital Recommendation for HQ DIST

Q. What adjustment is required to this “bare bones” figure to make it suitable for a cost of equity estimate for purposes of regulation?

A. Past practice in varous regulatory jurisdictions considers the need to adjust from a market-value based rate of return to an accounting-based rate of return in order to preserve the financial integrity and financing flexibility of a utility such as HQ DIST. The idea is that HQ DIST should be allowed to maintain its market-to-book value ratio sufficiently above unity (the value of one) in order to attract investment and to recoup flotation costs associated with issuing new equity financing instruments.[52] The notion that each Company should maintain market value above book value is somewhat contradictory as it suggests that each Company should plan to earn a return on new investments above the allowed rate of return.

Also, as was discussed earlier, the use of a weighted average of the arithmetic and geometric means in determining the market risk premium already provides generous protection to ensure the financial integrity and financing flexibility of HQ DIST.

For these reasons, we only consider flotation costs as a justification for making an adjustment to the “bares bones” cost. However, given the high dividend payout ratios paid by utility firms, no compelling justification exists for making an adjustment for equity flotation costs. Since all ongoing equity needs should be able to be totally funded internally, no flotation costs should be incurred for public equity offerings. Furthermore, neither HQ DIST nor its owners have or are expected to incur public equity offerings. Nevertheless, we make an adjustment to the “bare bones” cost to compensate HQ DIST for potential equity flotation costs.

Q. What adjustment to the “bare bones” cost do you make to compensate UNCA DISCO for potential equity flotation costs?

[52] For example, see G.R. Schink and R.S. Bower, Application of the Fama-French model to utility stocks, in *Financial Markets, Institutions and Instruments; Estimating the Cost of Capital: Methods and Practice* 3:3 (1994), pp. 74-95.

A. Despite the fact that we do not expect HQ DIST to require any new equity injection, in the interests of conservatism, we make an allowance for equity flotation costs. When firms issue or sell new equity to the market, they incur underwriting fees paid for marketing the issue, and other underwriting and issue expenses for legal and accounting services, printing of issuing documents, and applicable registration fees. Research on flotation or issuance costs for new equity issues for utilities in Canada over the past five years finds that the median fee is 4% of gross proceeds for equity offerings (see Schedule 17). When the equity offering fees are amortized over a 50-year period, the annual adjustment needed to compensate HQ DIST for potential equity flotation costs is about 8 basis points annually, which we round up to 10 basis points to cover other issue costs.

<u>The Final Recommended Cost of Equity Capital for HQ DIST</u>

Q. What cost of equity capital are you recommending for HQ DIST based on this Equity Risk Premium Test?

A. As noted earlier, our Equity Risk Premium or Equity Risk Premium Test used the following inputs:

1. the yield forecasted for 2003 for long Canada's (input #1);
2. the forecast of the implied risk premium for the S&P/TSX Composite (input #2);
3. the investment riskiness (market beta) of HQ DIST relative to the market portfolio as proxied by the S&P/TSX Composite Index (input #3); and
4. an adjustment to preserve the financing flexibility of HQ DIST and to cover fees involved with potential equity offerings or issues (input #4).

We also stated that the recommended rate of return on equity for HQ DIST is obtained by combining our final estimates of these four inputs as follows:

(Input #1) + [(Input #2) *x* (Input #3)] + (Input #4)

Based on a market risk premium estimate of 4.70% and a relative risk factor of 50% of the S&P/TSX Composite index, the equity risk premium required for HQ DIST (i.e., our final estimate of input #2 multiplied by our final estimate of input #3) is calculated to be 2.35%. Given our point forecast of a long-term Government of Canada bond rate of 6.00% (our final estimate of input #1) and adding 0.10% for equity flotation costs (our final estimate of input #4), our point estimate of the cost of equity capital for HQ DIST is 8.45%.

Thus, we are recommending a return of equity of 8.45%. Our return on equity recommendation allows HQ DIST a risk premium (with the inclusion of the equity flotation adjustment) of 245 basis points over our forecast for long Canada yields.

V. CRITIQUE OF EVIDENCE SUBMITTED BY DR. MORIN

Introduction

Q. What is the primary purpose of your critique of the evidence submitted by Dr. Morin?

A. The primary purpose of this critique is three-fold. First, it is to present the similarities and the differences between the recommendations made by Dr. Morin and us for the forecast of the 30-year Canada yield, the equity ratio and the rate of return on equity. Second, it is to show which adjustments made or not made to various standard methodologies by Dr. Morin result in his equity ratio and return on equity recommendations being higher than ours. We show that these adjustments or non-adjustments consistently inflate his recommended values for the equity ratio and the return on equity compared to our recommendations. Third, it is to compare the two recommendations for the return on equity for HQ DIST against that which would be obtained by using the various adjustment formulas presently in use by a number of Canadian regulators.

Q. How is this section of your evidence organized?

A. We begin by highlighting that there is no disagreement between Dr. Morin's and ours 2003 forecast of the 30-year Canada yield. Next we examine Dr. Morin's recommended range for the common equity ratio for HQ DIST and show that it is overly generous when viewed in the context of recent awards by the Régie. We then proceed to the major area of disagreement; namely, the rate of return on equity. We show that Dr. Morin's implementation of various standard methodologies for estimating the rate of return on equity consistently leads to inflated rates of return on equity estimates. After we demonstrate the impact of introducing or not dealing with known biases in the evidence of Dr. Morin, we find that with the correction for all of these biases the fair rate of return estimate made by Dr. Morin is quite close to our own recommended rate. We end this section with a comparison of the two recommendations for the return on equity for HQ DIST by Dr. Morin and ourselves against the estimate that would be obtained if it was calculated using the various adjustment formulas presently in use by some Canadian regulators. Our recommendation reflects the relatively lower risk of HQ DIST and the current trend towards a lower equity risk premium. The comparison indicates that our own recommendation represents a reasonable choice should the Régie wish to embrace our argument and adjust to the new market regime. However, if the Régie wishes to move more cautiously, it could choose to set the allowed equity return for HQ DIST in the range between our recommendation and the average of the regulatory formulas. Either way, our examination of the regulatory formulas and other evidence suggests that the Régie should attach little weight to the rate of return recommendation of Dr. Morin.

Economic and Capital Market Trends

Q. What comments do you have on Dr. Morin's forecast of the 30-year Canada yield?

A. We have no quarrel with Dr. Morin's conclusion that 6% is a reasonable forecast of the long-Canada rate for ratemaking purposes. We do note, however, that Dr. Morin's forecast draws on two sources:

> "As a proxy for the risk-free rate, I examined the actual level of long-term Canada (LTC) bond yields prevailing at the end of May 2002 and the consensus forecast of LTC bond yields. The current yield on long-term Canada bonds stood at approximately 6.0%. The April 2002 issue of Consensus Forecasts shows a LTC 10-year bond of 5.9% in three months

and 6.1% in twelve months, or about the same yield on 30-year bonds, given the unusually very narrow spread of nearly zero between 30-year and 10-year bonds at this time."[53]

Our methodology for forecasting the long-term Canada rate is consistent with the second part of Dr. Morin's approach using consensus forecasts. Since our evidence is filed after his, we take advantage of consensus figures available in December 2002 to reach a consensus forecast for 30-year Canada's of 6.0%. Consistent with our understanding of ratemaking practice in Canadian jurisdictions and in contrast with Dr. Morin's approach we do not formally consider the currently prevailing rate on 10- or 30-year Canada's.

This difference in methodology does not lead to any disagreement with Dr. Morin's forecast. We note, however, that this unanimity may vanish should Dr. Morin update his forecast applying the same technique. In late November and December 2002, the rate on 30-year Canada's was approximately 5.5% as confirmed by Dr. Morin.[54] This actual rate was 50 basis points lower than the forecast in Dr. Morin's evidence. Should this rate continue to prevail at the time of the hearing in March 2003, the logic of Dr. Morin's methodology would suggest a downward revision to his forecast.

<u>Common Equity Ratio</u>

Q. Please provide your comments on Dr. Morin's recommendation of 35 – 40% as the appropriate common equity ratio for HQ DIST.

[53] Dr. Morin, page 40, of evidence.
[54] Dr. Morin, response to FCEI/UMQ&OptionConsommateurs-HQDIST(RET.).26.

A. In arriving at his recommended capital structure Dr. Morin assesses the business risk of HQ DIST and proceeds to examine two benchmarks: allowed equity ratios for a sample of distribution utilities in Canada and actual capital structures of a sample of utilities. We have no quarrel with these standard techniques and employ similar methods in our own analysis in Section III of this evidence. For both techniques, however, we note that Dr. Morin's application leads to an unwarranted upward bias in the estimate of the appropriate common equity ratio.

Q. Starting with the first technique, assessment of HQ DIST's business risk, kindly explain the bias you detected in Dr. Morin's analysis.

A. On page 17 of his evidence, Dr. Morin states: "It is safe to conclude that 1) the distribution segment's business risk…is comparable to that of traditional energy distribution utilities, such as natural gas and electricity distributors". In Section III of our evidence we identified and documented a number of factors underlying a more accurate assessment of the business risk faced by HQ DIST as somewhat lower than that faced by the average electricity distribution company in Canada. These include the relative lack of competition, mature Québec market, controlled supply and input price and the deliberate pace of deregulation in the province. Further, we documented how HQ DIST's guaranteed supply protects the company from the price forecasting risk faced by gas distributors like Gaz Métropolitain. As a result, it would be more accurate to characterize the business risk of HQ DIST as lower than that of a gas distributor like Gaz Métropolitain.

Q. How must Dr. Morin's recommendation on capital structure be adjusted to correct this bias?

Logic demands that a downward adjustment to Dr. Morin's assessment of HQ DIST's business risk relative to that of Gaz Métropolitain necessitates a similar downward adjustment to his range of appropriate common equity ratios. We can quantify this adjustment by comparing Dr. Morin's recommended range of 35% - 40% common equity with the Régie's decision setting the common equity ratio at 38.5% for Gaz Métropolitain. Taking the Régie's decision as a benchmark of an appropriate common equity ratio for a gas distributor, Dr. Morin's range would be appropriate for HQ DIST if the risk faced by the company were equivalent to that of Gaz Métropolitain. Given the lower relative risk of HQ DIST, it follows that, to be consistent with the Régie's decision, that the common equity ratio for HQ DIST must be set below 35%, the bottom of Dr. Morin's range for gas distributors.

Q. Please discuss your comments on the second technique employed by Dr. Morin in his determination of the common equity ratio for HQ DIST.

A. Dr. Morin's second technique consists of examining allowed equity ratios for a sample of distribution utilities in Canada and actual capital structures of a sample of utilities. On page 45 of his evidence, he concludes that the Grand Average (across all his samples) is 38.9% equity while the averages for gas distributors and electric distributors are 37.9% and 40.7%, respectively. In contrast, in Schedule 7 of our evidence we establish an average of five benchmarks at 36 – 37%. Of particular interest, given the comparisons with Gaz Métropolitain earlier, we find that the three benchmarks for gas utilities also fall into the same range.

Close comparison of Dr. Morin's average for gas distributors and ours reveals that the higher average for gas distributors in his evidence is entirely due to his inclusion of a U.S. sample. If we drop the U.S. sample on page 45 of his evidence and recompute the average equity ratio for gas distributors, we arrive at 36.9%, a figure virtually identical to our estimate. Given differences between the two countries in the pace of deregulation and, consequently, the level of business risk, the U.S. data are not representative of the required equity ratios in Canada.

Fair Rate of Return Estimates Based on the Equity Risk Premium Methodology

Q. Please describe how your equity risk premium estimate differs from that submitted by Dr. Morin?

A. We obtain equity risk premia above long Canada's that are substantially lower than those entered into evidence by Dr. Morin. Dr. Morin arrives at overly generous estimates of both the beta for HQ DIST, and of the magnitude or size of the risk premium required to adequately compensate equity investors for bearing that level of risk. Basically, we find that Dr. Morin adjusts his beta estimate when he should not, and does not adjust his beta estimate when he should.

Beta Estimation Problems:

1. Use of Value Line betas:

Q. Please discuss the validity of the beta estimate that Dr. Morin uses to calculate the own risk premium for HQ DIST?

A. Dr. Morin uses Value Line or so-called adjusted betas to obtain the beta proxy for HQ DIST. The beta adjustment procedure used by Value Line is quite simple in that it is a weighted average of the firm's raw or unadjusted beta and the market beta of 1, where the weight placed on each is two-thirds and one-third, respectively. Since regulated utilities almost always have raw betas less that one, a Value Line type of adjustment almost always results in an adjusted beta that is higher than its corresponding raw or unadjusted beta.

Adjusted betas were discussed in Section IV of our evidence, and shown to be inappropriate for Canadian utilities. In Appendix C of his evidence, Dr. Morin attempts to justify his use of this method by arguing that utility betas tend to revert to the mean market beta of one. In section IV of our evidence, we provide five substantive reasons why this is not the case, including evidence that using an adjusted beta to forecast future betas results in a substantial over-estimate of actual realized betas. Value Line betas are based on a dated empirical study that found that the average U.S. equity beta for a sample of all the stocks in the U.S. market regresses towards the market beta of 1. In contrast, utility-specific studies find that a forecast of a U.S. equity utility beta is improved by reflecting the tendency of utility-specific betas to regress to the sample average for utilities. Mean reversion implies that the mean will be reached at some point in time, and fairly quickly given an assumed reversion rate of one-third. In fact, we showed that the rolling five-year average beta was moving towards zero and not one for our sample of utilities. This is hardly the behavior that would occur if the average sample beta had a tendency to regress towards the market beta of one.

Since Dr. Morin basically uses the sample average utility beta as his estimate of the beta for HQ DIST, no adjustment is needed to adjust the tendency of the beta of HQ DIST to regress to that same sample average utility beta. Dr. Morin should not have adjusted the raw beta of HQ DIST. Undoing his adjusted beta estimate for HQ DIST yields a beta estimate of 0.51, which is almost identical to our beta estimate of 0.50 for HQ DIST.[55] Thus, Dr. Morin used a beta estimate that was upwardly biased by about 31% [i.e., $(0.67-0.51)/0.51$]. Furthermore, as we have shown in Section IV of our evidence, Dr. Morin's beta estimate of 0.67 is higher

[55] This is obtained by solving: [(0.67*3) – 1] / 2 to get 0.505.

than the five-year mean beta of 0.583 for our sample of utilities for the 1991-1995 period, and is substantially higher than the five-year mean beta of 0.194 for our sample of utilities for the 1997-2001 period.

Q. What impact did the use of this inflated beta estimate have on Dr. Morin's calculated CAPM Risk Premium estimate?

A. Dr. Morin's CAPM risk premium estimate is obtained by multiplying his adjusted beta estimate of 0.67 times his market risk premium estimate of 6.7% to obtain his CAPM estimate of HQ DIST's own equity risk premium of 4.5%.[56] Using the corresponding unadjusted or raw beta estimate for HQ DIST of 0.51 yields a revised CAPM estimate of HQ DIST's own equity risk premium of 3.4%, or a reduction of almost 24.4% from his estimate using this estimation method. This is assuming, for the moment, that Dr. Morin's estimate of the market risk premium is not similarly too high. We will return to this point later.

Further, the rolling beta estimates that we present in Schedule 15 suggest that the beta value proposed by Dr. Morin is beyond the upper end of the range of possible beta values. In contrast, we have chosen to use a beta value as our point estimate that is somewhat above the longer-term mean of that range, and substantially above the shorter-term mean of that range.

Q. Dr. Morin provides numerous references that support the use of adjusted betas. Do you agree with his interpretation of these studies?

A. No. The study that is best known to us is the paper by Kryzanowski and Jalilvand, whose conclusions are misinterpreted by Dr. Morin.[57] Basically, like the

---

[56] Dr. Morin, page 33, of evidence.
[57] Dr. Morin, page 2, Appendix C, of evidence.

Gombola and Kahl study that Dr. Morin refers to, the Kryzanowski and Jalilvand study provides support for the regression tendency for betas to regress toward their grand utility mean and not toward the grand or market average of 1.0.[58] However, since Dr. Morin already effectively uses the grand utility mean for HQ DIST, properly accounting for the tendency to regress to itself would not change the raw or unadjusted beta estimate for HQ DIST.

Dr. Morin dismisses the result found by Gombola and Kahl by arguing that the "risks of electric utility stocks have escalated substantially after the period of study used in these studies because of restructuring, deregulation, and risk competition and, therefore, the true electric utility betas have escalated toward 1.0".[59] There are at least three problems with his argument on this point. First, any increase in investment risk due to restructuring, deregulation and risk competition will be reflected in the raw betas for specific utilities and the grand utility mean. Thus, if the raw beta for the grand utility mean is effectively being used, then no further adjustment towards that grand utility mean is required. Second, our evidence for Canadian raw betas suggests that the raw betas are moving away from and not towards one. Third, we are estimating the beta for HQ DIST and not for a utility that is currently or will in the near future, be exposed to material restructuring, deregulation and/or rising competition.

Dr. Morin states that Dr. Damodaran recommends the use of adjusted betas.[60] Dr. Damodaran states that "it can be argued that the beta looking forward will be different from the historical beta" even if the latter is well estimated if the firm has changed in terms of business and financial risk. He states that "[o]ne simplistic way of adjusting historical betas is to assume that betas will move towards one in the long term and adjust beta estimates towards one", and then provides more

[58] Dr. Morin, page 2, Appendix C, of evidence.
[59] Dr. Morin, page 3, Appendix C, of evidence.
[60] Dr. Morin, response to FCEI/UMQ&OptionConsommateurs-HQDIST(RET.).15.

accurate ways of estimating forward looking betas than using historically estimated betas.[61] Once again, it is important to emphasize that this is only for the case where the business and financial risks of the firm have materially changed. It also is important to emphasize that, by extension, Dr. Damodaran would suggest a reduction in the historically estimated beta if the firm has undergone a material lowering of its business and financial risks. Thus, using a Value Line adjusted beta in this case would knowingly move the historically estimated beta in the wrong direction. This is the case for the post-deregulation betas that Dr. Morin examines. Specifically, he states:[62]

> "Electric utility stocks have become increasingly driven by industry-specific factors, including corporate restructurings, mergers, asset divestitures, and regulatory change while the overall equity market is volatile and largely driven by technology stocks. The net result of this "distancing" between the electric utility industry and the overall equity market is a downward effect on utility betas, as utility stocks increasingly reflect factors unique to the industry during the transition to a competitive environment."

Q. Dr. Morin states that "[m]ost of the empirical studies cited thus far utilize raw betas rather than Value Line adjusted betas because the latter were not available over most of the time periods covered in these studies." Would you please comment on this statement by Dr. Morin?

[61] A.. Damodaran, Discussion issues and derivations, under his section 4. Available at: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/AppldCF/derivn/ch4deriv.html#ch4.3, and accessed on December 11, 2002.
[62] Dr. Morin, response to FCEI/UMQ&OptionConsommateurs-HQDIST(RET.).17.

A. If Value Line adjusted betas are superior to raw betas, then these studies would have been replicated using such betas, since such betas are easy to calculate. Furthermore, many studies on the CAPM have appeared since Value Line adjusted betas appeared, and most (if not all) of the published studies use raw betas. This includes numerous studies by Fama and French, amongst others, about whether or not the traditional CAPM is empirically supported.[63]

2. Further upward beta adjustment in the ECAPM:

Q. Are there any other cases where Dr. Morin further adjusted his beta estimate for HQ DIST upwards when he should not have?

A. Yes, there are. In what he calls the Empirical CAPM Risk Premium Method, Dr. Morin calculates the cost of equity capital using the following expression:[64]

$$K = R_F + 0.25(R_M - R_F) + 0.75\beta_{HQ\ DIST}(R_M - R_F) \qquad (4)$$

Inserting his adjusted beta estimate of 0.67 for HQ DIST and his estimate of the market risk premium of 6.7% into his equation (4), he obtains the following estimate for the own equity risk premium for HQ DIST of:

$$K - R_F = 11.0\% - 6\% = (0.25 - 6.7\%) + (0.75) \times (0.67) \times 6.7\% = 5.0\%$$

Q. Why can this be viewed as a further upward beta adjustment?

A. It is easy to show that this is merely an additional upward adjustment to the beta estimate for HQ DIST. An implicit term in the second term on the right-hand side

[63] Eugene F. Fama and Kenneth R. French, 1996, The CAPM is wanted, dead or alive, *Journal of Finance* 51:5(December), pp. 1947-1958; Eugene F. Fama and Kenneth R. French, 1995, Size and book-to-market factors in earnings and returns, *Journal of Finance* 50:1, pp. 131-155; Eugene F. Fama and Kenneth R. French, 1996, Multifactor explanation of asset pricing anomalies, *Journal of Finance* 51:1 (March), pp. 55-84; and James L. Davis, Eugene F. Fama and Kenneth R. French, 2000, Characteristics, covariances, and average returns: 1929 To 1997, *Journal of Finance* 55:1 (February), pp. 389-406.

[64] Dr. Morin, page 34, of evidence. Also, see his Appendix C for more detail on the ECAPM.

of his equation (4) is the market beta or β_m of one. Inserting that in the second term, the two risk premium terms in equation (4) can be writtern as:

$$0.25\beta_M(R_M - R_F) + 0.75\beta_{HQ\ DIST}(R_M - R_F)$$

This can be rewritten as:

$$(0.25\beta_M + 0.75\beta_{HQ\ DIST})(R_M - R_F)\text{, or}$$

$$[(0.25x1.0) + 0.75\beta_{HQ\ DIST}](R_M - R_F)\text{ since }\beta_m = 1.$$

Stated simply, the ECAPM is merely another method to further inflate an already inflated beta estimate for HQ DIST. By placing a 75% weight on the adjusted beta of 0.67 for HQ DIST and a 25% weight on the market beta of one, the ECAPM arrives at a super-adjusted or inflated beta for HQ DIST of 0.75. In other words, a raw beta of 0.51 has become 0.75 in the ECAPM.

Q. Why is this additional adjustment to the already adjusted beta of HQ DIST inappropriate?

A. The rationale presented for the ECAPM by Dr. Morin is that the "statistical evidence indicates that the risk-return relationship is flatter than that predicted by the CAPM". If true, this implies that the CAPM would understate the return requirements of utilities with betas less than one.

While most recent studies do not support the traditional or unconditional CAPM, the empirical evidence for multifactor or conditional CAPMs is stronger. The earlier studies that Dr. Morin refers to have typically used U.S. 90-day Treasury bills as a proxy for the risk-free rate.[65] These studies do find that the estimated intercept of the Security Market Line or SML is above the risk-free rate, and that the estimated slope of the SML is smaller than the difference between the mean return on the market proxy and the mean return on T-bills (i.e., the market risk

[65] Dr. Morin, response to FCEI/UMQ&OptionConsommateurs-HQDIST(RET.).1.

premium measured relative to the T-bill rate). More recent studies find evidence against the traditional form of the CAPM, and find strong support for the zero-beta version of the CAPM where the estimated intercept is the return on the zero-beta portfolio. The expectation of the CAPM is that the return on the zero-beta portfolio should exceed the return on T-bills.[66] The use of the higher long Canada rate as the proxy for the risk-free rate is consistent with these empirical findings.

Using the higher long Canada rate when constructing the SML already increases the intercept of the SML and flattens the slope of the SML. Thus, making a further adjustment to beta to account for a flatter-than-expected SML results in an over or double adjustment for the same empirical phenomenon. Thus, this represents another case where Dr. Morin further adjusted his beta estimate for HQ DIST upwards when he should not have.

Q Are there any regulatory commissions, boards or régies that have reached a similar conclusion to the use of the ECAPM?

A. Yes, the Public Utilities Commission of the State of California in "D.99-06-057 rejected the ECAPM financial model because it artificially raises the ROE requirement".[67]

3. No downward beta adjustment with the use of U.S. market risk premia:

[66] Robert F. Stambaugh, 1982, On the exclusion of assets from tests of the two-parameter model: A sensitivity analysis, *Journal of Financial Economics*, November, pp. 237-268.

[67] As noted on pages 24 and 33 in the Proposed decision of A.L.J. Galvin (mailed 10/8/2002), Interim opinion on rates of return on equity for test year 2003 before the Public Utilities Commission of the State of California, Application of Pacific Gas and Electric Company for authority to establish its authorized rates of return on common equity for electric utility operations and gas distribution for test year 2003. (U39M), application 02-05-022, filed May 8, 2002. Available at: http://www.cpuc.ca.gov/published/comment_decision/19761.htm.

Q. You stated earlier that Dr. Morin not only adjusted betas when he should not have but he also did not adjust betas when he should have. Would you please provide an example of the latter?

A. Dr. Morin first equally weighted six market risk premium estimates, four of which were for the Canadian market and two of which were for the U.S. market, to obtain his final estimate of 6.7% for the market risk premium. He then applied his beta estimate of 0.67 for HQ DIST to his final market risk premium estimate to obtain the own equity risk premium estimate for HQ DIST. Thus, he effectively used the same beta estimate for HQ DIST for both his Canadian risk premium estimates and his U.S. risk premium estimates. Thus, Dr. Morin's use of an explicit scheme for weighting market risk premia from the U.S. and Canadian markets ignores the fact that the beta of a utility is different for each market proxy, and differs in a domestic-only context from that in an international context. Although Dr. Morin is aware that a different beta value is obtained for each chosen market proxy,[68] he makes no adjustment for this known fact. Furthermore, as noted by Dr. René Stulz, a former editor of the *Journal of Finance*, "globalization reduces the beta of all companies whose profits and values are more strongly correlated with their local economies than with the global economy", as one would expect to be the case for a regulated Canadian electricity distribution unit like HQ DIST.[69]

In Section IV of our evidence, we demonstrate for Canadian utilities interlisted in the U.S. that their beta estimates based on the U.S. index are lower than those based on the Canadian stock market index. In Appendix E, we argued that the subject utility will most likely have a lower beta in the foreign market than in the Canadian market if the equity market risk premium is higher in the foreign than

[68] Dr. Morin, response to FCEI/UMQ&OptionConsommateurs-HQDIST(RET.).18.
[69] René M. Stulz, 1999. Globalization, corporate finance, and the cost of capital, *Journal of Applied Corporate Finance* 12:3 (Fall), p. 12.

the Canadian market. This is the case for the market risk premium estimates from the six studies used by Dr. Morin to arrive at his final market risk premium estimates. The two U.S. risk premium estimates are higher. By averaging in these two higher risk premium estimates without reducing his beta estimate to reflect the fact that the corresponding appropriate beta for these two estimates should be adjusted downwards, Dr. Morin has artificially inflated his final equity risk premium estimate for HQ DIST.

Market Risk Premium Estimation Problems:

1. Use of arithmetic mean returns

Q. Would you please comment on the validity of using arithmetic means when calculating the historical market risk premium?

A. Dr. Morin only uses the arithmetic mean throughout his analysis to calculate the historical market risk premium. In contrast, we use a conservative approach in which we equally weight the arithmetic and geometric means. We do this because there are advocates for three possible approaches; namely, the use of the arithmetic mean only, the use of the geometric mean only, and the use of a weighted average of the arithmetic mean and the geometric mean with the weight placed on the geometric mean increasing with the length of the time horizon being considered and with the amount of mean reversion in asset prices, all else held equal.

Q. Would you please discuss the references that Dr. Morin cites in terms of the use of the arithmetic mean only?

A. Dr. Morin cites chapter 11 of his own book, the Brealey and Myers' basic finance textbook, *Principles of Corporate Finance*, and the Ibbotson Associates publication. He then goes on to make the following very strong statement:[70]

> "Dr. Morin is not aware of any textbook on finance or scientific journal article which advocates the use of the geometric mean <u>as a measure of the appropriate discount rate in computing the cost of capital or in computing present values</u>." [Dr. Morin's emphasis and not ours.]

As Dr. Ritter notes in the first paragraph of his article published in a scientific journal:[71]

> "When I started teaching at the University of Pennsylvania's Wharton School over twenty years ago, I used the very first edition of the Brealey and Myers textbook. The book had some mistakes in it, as almost all books do. For example, the first two editions had an incorrect formula for the valuation of warrants."

Dr. Ritter then goes on to focus on some on the conceptual mistakes that need to be corrected in what academics teach in introductory finance courses, including the use of arithmetic rather than geometric returns. He concludes that the correct average return will be closer to the geometric (compounded) average than the arithmetic (simple) average if there is mean reversion or mean aversion in stock or bond returns.[72] Furthermore, since the difference between the arithmetic and geometric averages usually is higher for stocks than bonds, this inflates estimates of risk premia based on historical data.

---

[70] Dr. Morin, response to FCEI/UMQ&OptionConsommateurs-HQDIST(RET.).21.
[71] Jay R. Ritter, 2002, The biggest mistakes we teach, *The Journal of Financial Research* 25:2 (Summer), p. 159.
[72] Jay R. Ritter, 2002, The biggest mistakes we teach, *The Journal of Financial Research* 25:2 (Summer), p. 160.

In appendix B of our evidence, we provide numerous other reasons why the historical risk premium should not be measured using only the arithmetic mean return. We provide a multitude of evidence that concludes that a weighted average of the arithmetic and geometric means should be used, and that the preponderance of the weight should be placed on the geometric mean for decisions involving the long run of thirty years or longer. Counter to the strong statement made by Dr. Morin, our evidence includes the more advanced textbook by Drs. Campbell, Lo and MacKinlay, *The Econometrics of Financial Markets* (1997), articles published in major finance peer-reviewed journals, such as the Journal of Finance, Journal of Financial Research, and the Journal of the American Statistical Association, by Drs. Fama, French, Ritter, Blume, Indro, Lee, amongst others; and support or non-objection by the participants at the recent *AIMR Risk Forum* by Drs. Campbell, Siegel, Ibbotson, amongst others. Nevertheless, we opt for a very conservative position where we estimate the historical risk premium using an equally weighted average of the arithmetic and geometric annual mean returns.

Q. What impact would this have on the market risk premium used by Dr. Morin?

We illustrate the impact of using our equally weighted average of the geometric and arithmetic mean returns for the Historical Cdn. Inst. Actuaries Canada return series compared to the use of only the arithmetic mean return by Dr. Morin. Dr. Morin reports a historical arithmetic mean return of 5.7% (5.38% according to our calculations) for this series,[73] and we report an equally weighted average of the arithmetic and geometric mean returns of 4.8% (rounded up) for the same series. Thus, by not using an average of the two types of means, Dr. Morin has inflated this component or upwardly biased his market risk premium by 0.9%. Since the geometric mean always exceeds its arithmetic counterpart, we would expect

[73] Dr. Morin, page 30, of evidence.

similar upward biases to occur for the three other historical return series used by Dr. Morin.

2. Choice of return series for determining the market risk premium

Dr. Morin uses an equally weighted average of six studies to arrive at his final estimate of 6.7% for the market risk premium.[74] Before commenting on each of these studies, we would like to point out that the impact of the realized returns for 2002 should be reflected in each of the first four studies. We now proceed to a discussion of each of the six studies.

The Hatch-White study covers the period 1950 to 1987, and results in a risk premium over long-term Canada bonds of 6.9%. The first obvious question is why did Dr. Morin not extend this study to include the years from 1988 through 2001? Doing such by using the CIA data over the 1950-2001 period yields an arithmetic mean of 5.3%, and an equally weighted average of the two types of means of 4.9%. The difference between the 6.9% used by Dr. Morin and the two means of 5.3% and 4.9% for the extended time period is 1.6% and 2.0%, respectively. Thus, by not extending the Hatch-White study forward in time, Dr. Morin has inflated this component by at least 1.6%. Removing this 1.6% reduces his final estimate of the market risk premium from 6.7% to 6.43% [i.e., 6.7% - ((1/6) x 1.6%)]. This is a reduction by itself of 27 basis points. This is without making any further adjustment for the sole use of the arithmetic mean and not some weighted-average of the arithmetic and geometric mean as we do.

The Historical Cdn. Inst. Actuaries Canada study covers the period 1924-2001. According to Dr. Morin, the arithmetic mean return using this data is 5.7%. As noted above, we estimate the arithmetic mean return using this same data series to be 5.38%, or 32 basis points lower, and the weighted average of the arithmetic

[74] These studies are described on pages 27 through 30 of the evidence of Dr. Morin.

and geometric mean returns to be 4.76%, or 94 basis points lower than Dr. Morin's uncorrected (or reported) arithmetic mean return. The difference is 62 basis points using our correction of Dr. Morin's arithmetic mean return. Only removing the 32 basis point error in Dr. Morin's reported arithmetic mean return reduces his final estimate by a further 5 basis points. The combined effect of the arithmetic mean problems for these first two series of 32 basis points by themselves reduces Dr. Morin's final estimate of the market risk premium from 6.7% to 6.38%. This is without making any further adjustment for the sole use of the arithmetic mean and not some weighted-average of the arithmetic and geometric mean as we do. Furthermore, if we add the -23.1% realized risk premium for 2002 to the time period to obtain the 1924-2002 time period for this data series, the realized annual arithmetic risk premium declines by 36 basis points from 5.38 to 5.02%.

The Historical Ibbotson Associates Canada study covers the period 1936-1999. The first obvious question is why did Dr. Morin not extend this study to include the years 2000 and 2001? The next obvious question is why does the study begin with the year 1936? Using the CIA data over the 1936-2001 period yields an arithmetic mean of 5.1%, and an equally weighted average of the two types of means of 4.7%. The differences between the 5.5% used by Dr. Morin and the two means of 5.1% and 4.7% for the extended time period are 0.4% and 0.8%, respectively. Thus, by not extending the Historical Ibbotson Associates Canada study forward in time, Dr. Morin has inflated this component by at least 0.4% (higher than 0.4% if 2002 also is included). Only removing this 40 basis point from Dr. Morin's reported arithmetic mean return reduces his final estimate by a further 7 basis points. The combined effect of the arithmetic mean problems for these first three series of about 39 basis points by themselves reduces Dr. Morin's final estimate of the market risk premium from 6.7% to 6.31%. This is without making any further adjustment for his use of the arithmetic mean instead of a weighted-average of the arithmetic and geometric mean.

The Historical Ibbotson Associates U.S. study covers the period 1926-2001. Unlike the previous study, this study uses the most recent data available to Dr. Morin. Our first observation with this series is that, while Dr. Morin reports an arithmetic mean risk premium for the U.S. for the 1926 to 2001 period of 7.5%,[75] Dr. Siegel reports a considerably lower arithmetic mean risk premium for the U.S. for the same period of 6.2% (please see our schedule 10). If the values reported by Dr. Siegel are for a more representative sample of U.S. securities, then this would further reduce Dr. Morin's final estimate of the market risk premium downward. Furthermore, if we add the -37.9% realized risk premium for 2002 to the time period to obtain the 1926-2002 time period, the realized arithmetic risk premium declines by 57 basis points from 6.2% to 5.63%.

Dr. Morin provides the following rationale for not using a longer time series for the U.S.:[76]

> "Dr. Morin did not rely on historical studies that reach back prior to 1926. Dr. Morin's major concern with historical data reaching back that far is the questionable reliability of the data. The stock market of the early 1800's, for example, was severely limited, embryonic in scope, with very few issues trading, and few industries represented. Dividend data were unavailable over most of this early period and stock prices were based on wide bid-ask spreads rather than on actual transaction prices. The difficulties inherent in stock market data prior to the Great

[75] Dr. Morin, page 30, of evidence.
[76] Dr. Morin, response to FCEI/UMQ&OptionConsommateurs-HQDIST(RET.).20.

Depression are discussed in Schwert, G. W., "Indexes of U.S. Stock Prices from 1802 to 1987," Journal of Business, 1990, Vol. 63, no. 3."

We find this rationale rather puzzling as Dr. Morin did use Canadian data back to 1924 which is subject to much of the same types of problems, as we have detailed in Section IV of our evidence.

If Dr. Morin had used the total time series for the U.S., that is, for the 1802-2001 period, he would have obtained a considerably lower arithmetic mean market risk premium of 4.5% instead of his much higher value of 7.5%. The corresponding weighted average of the arithmetic and geometric mean risk premia for this approximately two hundred year period is 4.0%. Mr. William Bernstein, editor of an online journal of practical asset allocation, believes that the much lower equity risk premium of the low inflation 19th century provides a much better guide to equity risk premium expectations in the 21st century than does the much higher equity risk premium of the much higher inflation 20th century.[77] His conclusion is consistent with the evidence on the forward-looking risk premia that we reviewed in Appendix C of our evidence.

The fifth and sixth studies conducted by Dr. Morin involve a DCF analysis on the Canadian and U.S. equity markets using the VLIS software. While we discuss the problems associated with DCF analysis below, we believe that using a DCF analysis is least problem-free at the market level as has been implemented by Dr. Morin. Nevertheless, in our opinion, his two studies are extremely unreliable for the following reasons:

[77] William Bernstein, 2002, Only two centuries of data, An online journal of practical asset allocation (Summer). Available at: http://www.efficientfrontier.com/ef/402/2cent.htm.

- The calculation methods for the Canadian and U.S. markets are inconsistent. The quarterly timing of dividends rather than the annual timing of dividends is reflected for only the Canadian market study.
- Although Dr. Morin uses a valuation approach that assumes that the growth of dividends, earnings, book values, and stock prices are all equal and constant forever, he obtains his growth rate for the DCF model for both the Canadian and the U.S. markets by averaging significantly different growth rate forecasts for dividends and earnings. Specifically:
  - He obtains the growth rate for Canadian dividends of 10.3% by averaging the projected dividend growth rate of 5.4% and the projected earnings growth rate of 15.1%.[78]
  - Similarly, he obtains the growth rate for U.S. dividends of 9.6% by averaging the projected dividend growth rate of 5.3% and the projected earnings growth rate of 13.8%.
- The five-year expected growth rates of earnings make no adjustment for the fact that earnings are at a historic low in Canada. For example, as of the end of December 2001, earnings for the S&P/TSX Composite were negative.
- The five-year expected growth rates of earnings make no adjustment for the belief that the earnings growth rate for the S&P500 is artificially high because of the active management of the S&P500. According to Mr. Kevin Terhaar, a director of risk management and specialized investments at Brinson Partners, the “managers at Standard & Poor’s have a habit of adding “hot” stocks”, which “have effects on the per share earnings and the growth rate that would not be present in a broader index”. According to Dr. Siegel, “my calculations show that the bias could be 1–2 percent a

[78] Dr. Morin, response to FCEI/UMQ&OptionConsommateurs-HQDIST(RET.).22.

year in recent years as companies with extraordinarily high P/Es were added". [79]

- The calculation of the expected growth rate of dividends and of earnings is an equally weighted average of the growth rates of each stock in the Value Line universe instead of a market-weighted average. This tends to place relatively more weight on smaller firms that are expected to have higher growth rates.
- Since the forecasts are bottom-up, they are known to contain substantial optimism bias of 20% or more for one-year out, and an increasing percentage thereafter. If we just merely make a *very modest* adjustment of 20% for optimism bias in the forecasted growth rate, the 6.8% and 5.7% implied risk premia calculated by Dr. Morin using the constant growth model become 4.7% and 5.1% for the Canadian and U.S. markets, respectively.
- The implied annual average price appreciation of 12.5% in the companies that make up the Value Line Composite Index, or the total annual return of 14.1% when dividends are added in, is totally inconsistent with the much lower forecasts by investment professionals and academics for total stock returns.
- The implied growth rates of dividends, earnings and stock price (which are assumed to be equal in the constant growth DCF model used by Dr. Morin) of 10.3% for Canada, and of either 9.6% or 12.5% for the U.S. greatly exceed expectations for the growth rates in the underlying economies for both Canada and the U.S. In other words, the corporate growth rate is expected to substantially exceed that for the underlying economy forever. To illustrate, if the long-run annual rate of inflation is assumed to be 3% in both Canada and the U.S., then Dr. Morin's

[79] Comments made by the respective individuals. See: Historical results: Discussion, *Equity Risk Premium Forum*, November 8, 2001, p. 50.

estimates assume that his samples of Canadian and U.S. firms are expected to grow annually and forever at the astonishing real rate of 7.3% and either 6.6% or 9.5%, respectively.

According to Dr. Asness, President of AQR Capital Management, based on an analysis of the trailing 20-year real S&P earnings growth plotted for the past 110 years: [80]

> "Those people who actually still assume 10 percent nominal returns on stocks should recognize that such a return would require 5–6 percent real earnings growth over the next 10–20 years. Such growth has happened only a few times in history, and it has happened only after very depressed market conditions, which we are not really experiencing now, certainly based on the last 10 years. With a 2 percent real earnings growth forecasted, a long-term buy-and-hold investor in the S&P 500 can expect to earn 6–7 percent nominal returns."

3. Validity of using a weighting formula of the risk premia from various country markets

Q. Would you please comment on the validity of using a scheme that equally weights various Canadian and U.S. risk premia in order to estimate the required market equity risk premium for calculating the required own market risk premium for HQ DIST.[81]

A. There are at least two serious problems with this approach.

[80] Clifford S. Asness, Theoretical Foundations II, *Equity Risk Premium Forum*, November 8, 2001, p. 10.
[81] Dr. Morin, page 30, of evidence.

First, this approach ignores the benefits from international diversification, which reduce the required equity risk premium, as we discussed in Section IV of our evidence.

Second, this approach makes no adjustment for the differences in the non-diversifiable risks of the two market proxies used in this process. In other words, the non-diversifiable risks of the S&P/TSX Composite and S&P500 differ. Studies find that the correlation of annual total equity returns with world total equities for Canada is a little more than 70% of that for the U.S.[82] Thus, the reduction in total risk from international diversification is substantially higher for the Canadian market proxy than for the U.S. market proxy.

Q. Please explain your criticism of the evidence of Dr. Morin based on the use of the U.S. market risk premium method.

A. Dr. Morin uses the Historical Ibbotson Associates study for the historical rates of return on U.S. shares and historical rates of return on long-term U. S. treasury bonds, and a Prospective Value Line U.S. study. We have a number of major criticisms of this evidence.

First, Dr. Morin ignores all of the evidence that we presented earlier in Section IV of our evidence that the U.S. equity risk premium has narrowed substantially, and is expected to be lower in the future. The U.S. forward-looking equity risk premium estimates vary from zero or slightly negative to about 4%. The 2001 keynote speaker at the annual *Canadian Risk Management Conference*, Burton

[82] William F. Sharpe, Gordon J. Alexander and David J. Fowler, 1993, *Investments* (Prentice Hall Canada Inc.), p. 772. Adapted from Roger G. Ibbotson, Richard C. Carr and Anthony W. Robinson, 1982, International equity and bond returns, *Financial Analyst Journal*, July/August, p. 71.

Malkiel from Princeton University, agrees with the consensus view "that the equity risk premium investors will realize in the future is likely to be very small".[83]

Second, Dr. Morin ignores the adjustments that have to be made when conducting a Market Risk Premium Test when one moves from a Canada-only perspective to an international perspective. When viewed from a Canada-only perspective, the market risk premium can be measured using a domestic market proxy such as the S&P/TSX Composite, which is assumed to be a reasonably well-diversified domestic portfolio. However, when viewed from an international perspective, domestic markets (and their market proxies) are no longer well diversified. This is especially true for very small markets like the Canadian equity market that represents less than 3% of the world market. When viewed from an international perspective, a significant portion of domestic equity market risk becomes diversifiable and is not rewarded.

Thus, we cannot just combine or average equity risk premia from different markets because they may represent different non-diversifiable risks. We can demonstrate this by calculating the investment risk or beta of each of the S&P/TSX Composite and S&P500 indexes in a global context using the following relationship:

$Beta_D = Corr_{D,W} \times (Sig_D / Sig_W)$

where $Beta_D$ is the estimated beta for the domestic market,

$Corr_{D,W}$ is the correlation between the returns for the domestic and world markets, and

Sig_D and Sig_W are the standard deviations of returns for the domestic and world markets, respectively.

[83] Risk Management 2001: Managing risk in a future of single-digit returns, *Canadian Investment Review*, Winter 2001.

Using the data provided by Mr. Robert Auger and Mr. Denis Parisien,[84] for illustrative purposes only, yields:

$$Beta_{S\&P/TSX} = 0.5 \times (0.22 / 0.193) = 0.570$$

$$Beta_{S\&P500} = 0.8 \times (0.185 / 0.193) = 0.767$$

If we scale up the betas so that the S&P500 beta is represented by 1, we obtain a S&P/TSX Composite beta of 0.743 or approximately 0.74.

This shows the fallacy of assuming that the risk premium should be the same for the S&P/TSX Composite and the S&P500 because their standard deviations are the same. This is much like assuming that the market risk premium for a utility should be the same as that for the S&P/TSX Composite because the utility and the index have the same standard deviations.

Third, Dr. Morin's method is based on the premise that the risk premium in the U.S. is higher than it is in Canada, and that investment risk for the same investment is equivalent in both markets. In turn, this implies that the cost of capital is higher for shares sold by Canadian firms in the U.S. market than they are when the firms sell shares in the Canadian market. This conforms neither to the beliefs nor the experiences of Canadian firms who generally believe and have found that the cost of equity capital is lower in the U.S. markets than in the Canadian markets. This is often attributed to U.S. investors being more risk tolerant than Canadian investors.

Q. How does ignoring differences in the systematic risks of the various market indexes affect the evidence presented by Dr. Morin?

---

[84] Robert Auger and Denis Parisien, 1989, The risks and rewards of global investing, *Canadian Investment Review* 2:1 (Spring).

A. It tends to inflate the final market risk premium estimate. To illustrate, we use the arithmetic mean market risk premium for the S&P/TSX Composite and the S&P500 over their respective long bond yields of 2.85% and 5.63%, respectively, for the 1957-2001 period.

We then adjust for the lower beta for the S&P/TSX Composite versus the S&P500 and we adjust for the Canadian/US bond differential. This risk-adjusted market risk premium (RMRP) difference between the S&P500 and the S&P/TSX Composite that accounts for bond return differences is given by:

RMRP = Risk-adjusted U.S. market premium - Canadian market risk premium – Bond return difference

RMRP = (0.74 x 5.627%) – 2.854% - 1.275% = 4.164% – 2.854% – 1.275% = 0.035% or 3.5 basis points

Properly accounting for systematic risk differences now leads to the conclusion that the Canadian and U.S. markets had similar performances over the 1957-2001 period.

4. Optimism bias in forecasts of analysts

Q. Dr. Morin uses the forecasts of Value Line analysts in his DCF analyses of the aggregate Canadian and U.S. equity markets. Would you comment on the accuracy of such forecasts?

A. Dr. Morin argues that the relevance of the forecasts is whether they are a better proxy for investor expectations than history. He refers to a number of dated studies that find that the forecasts of analysts are better than the use of time-series methods to forecast future growth rates. While the forecasts of analysts have been better than time-series forecasting methods, both do a “poor job” in forecasting changes in earnings per share. Whether or not the forecasts of analysts are still somewhat better than the pure use of time-series forecasting methods is very debatable. First, the information disclosure playing field is quickly being leveled in both the U.S. and Canada as companies are being restricted from disclosing information first to financial analysts and then to the general public. Second, as has been discussed at length in the press, analysts have become increasingly optimistic in their forecasts to facilitate the underwriting side of their business. Third, forecasting accuracy has not been a criteria in retaining analysts, at least in recent years where the emphasis has been on the revenue they generate for their employers.[85] Fourth, as is discussed next, the optimism bias in analyst forecasts has increased significantly over time, and there is no evidence that it has moderated recently.

It is well documented in the published literature that the bottom-up market forecasts of financial analysts and top-down market forecasts of market strategists contain a large optimism bias. We discuss two representative studies next. Chopra (1998)[86] finds that the average consensus earnings per share growth forecasts made by analysts for the S&P500 index over the 1985-1997 time period is almost twice the actual growth rate. Chung and Kryzanowski (2000)[87] find a significant optimism bias in bottom-up and top-down forecasts of earnings per share by analysts for the S&P500 index for the current fiscal year (FY1) and subsequent fiscal year (FY2).[88] They find that the optimism bias is significantly higher in the bottom-up forecasts compared to the top-down

[85] In contrast, Dr. Morin argues, “analysts with poor track records are replaced by more competent analysts”. See Dr. Morin, response to FCEI/UMQ&OptionConsommateurs-HQDIST(RET.).22.
[86] V. K. Chopra, Why so much error in analysts earning forecasts? *Financial Analysts Journal*, 54:6 (1998), pp. 35-42.
[87] R. Chung and L. Kryzanowski, Market timing using strategists’ and analysts’ forecasts of S&P500 earnings, *Financial Services Review*, 8:3 (2000).
[88] Similarly, Chung and Kryzanowski (1999) find that the quarterly EPS forecasts for the S&P400 and S&P500 are, on average, optimistically biased for the top-down forecasts of market strategists that are reported to I/B/E/S. R. Chung and L. Kryzanowski, Accuracy of consensus expectations for top-down earnings per share forecasts for two S&P indexes, *Applied Financial Economics* 9 (1999), pp. 233-238.

forecasts on average. They examine the 218 months of such annual forecasts over the period from January 1982 through February 2000. The bottom-up forecasts of financial analysts exhibit a statistically significant mean optimism bias of 17.5% and 30.5% for the next and subsequent fiscal years (FY1 and FY2), respectively. They also find that these average biases grew substantially when the period from November 1995 through February 2000 was added to the January 1982 through October 1995 period. Furthermore, for the past two years, analysts have been criticized for the aggressive "hyping" of stocks. The research director of the world's largest securities firm told its analysts to be more critical.[89]

Dr. Morin argues that "in any event, analysts working for large brokerage firms and financial institutions typically have a following, and investors who heed to a particular analyst's recommendations do exert an influence on the market".[90] However, even if these recommendations influence market prices, this does not mean that investors do not make decisions after removing some or a great part of the bias inherent in such forecasts. Furthermore, the following question comes to mind: Why use earnings growth forecasts of investment analysts to generate extremely noisy estimates of future return expectations when you can directly obtain the future return expectations of investment professionals?

Q. Would you please comment on the quality of earnings reported in the recent past and those to be reported in the near future against which the forecast accuracy of financial analysts are judged?

A. The quality of reported earnings during at least the past few years appears not to be very high. As we discussed earlier, more recent reported earnings were

[89] Dave Ebner, Merrill Lynch tells analysts to be more critical, *Globe and Mail*, March 7, 2002, p. B18.
[90] Dr. Morin, response to FCEI/UMQ&OptionConsommateurs-HQDIST(RET.).22.

inflated due to the use of aggressive accounting practices by firms. Other problems that affect reported earnings include:

- Pension fund accounting where many companies projected higher returns on their pension assets during the bull market of the late 1990s, which allowed firms to reduce corporate contributions and increase company earnings. For example, General Electric now assumes that its pension fund will earn 9.5%. If this actuarial assumption is reduced downwards as one would expect given future return prospects, this will adversely affect corporate profits.
- Stock options have become a substitute for salary and other forms of remuneration, especially in the high-tech sector more recently. However, they have not historically been costed under Canadian or U.S. GAAP. A Merrill Lynch study estimates that 2000 profits would be 61% lower if technology companies had to account for these options as a cost of doing business.[91]
- Under Canadian GAAP, companies can write off good will in one "big bath" quarter. They can record it as a special, one-time charge outside of operating income. A 2000 amendment to U.S. GAAP now allows this practice in the United States. According to estimates by Prudential Financial and Bear Stearns, such write offs in 2002 are expected to raise U.S. corporate profits by 4.4% for large cap firms and 14.6% for small cap firms, and raise corporate profits for the computer-services sector by 14.6%.[92]

Q. What is your opinion on the use of forecasts by analysts to estimate the cost of capital?

[91] As reported in Larry MacDonald, More fallout from Enron, *The Gazette*, February 27, 2002, p. D-3.
[92] As reported in Larry MacDonald, More fallout from Enron, *The Gazette*, February 27, 2002, p. D-3.

A. We are reluctant to use these forecasts because they tend to be optimistic, sometimes excessively optimistic, and the amount of the bias varies in an unknown fashion over time. Some illustrations are:[93]

- Eleven of the 17 leading analysts who followed Enron still rated the stock as a “buy” or “stong buy” as late as November 8, 2001. This was after Enron restated $1 billion in profit as a loss, fired its chief financial officer and was under investigation by the U.S. SEC.
- Charles Hill, director of research at Thomson Financial/First Call noted that only 1.8% of all current stock recommendations are “sells”, even in this bear market. He went on to complain that the compensation packages of many analysts are tied too closely to the performance of the lucrative investment banking operations of the major brokers.
- Mr. Clément Gignac, chief economist and strategist at National Bank Financial cautioned that the bottom-up consensus expecting S&P 500 earnings growth of 14 per cent in 2003 could turn out to be unrealistic again, and “would be more encouraging had not last year’s similar projections been followed by a 22-per-cent decline in the [Standard & Poor’s 500-stock index]”.[94]
- Lehman Brothers maintained its “strong buy” rating on Enron as its stock price went from $80 a share to less than one dollar last year.

It is important to note that the performance of the rating agencies is often not better, and was not better in the case of Enron.

Q. What conclusion do you draw from this analysis?

[93] Barrie McKenna, Enron analyst bristles at hoax, *The Globe and Mail*, February 28, 2002, p. B1 and B2; and Marilyn Geewax, We were duped: analysts, *The Gazette*, February 28, 2002, p. E4.
[94] Crystal balls, *The Globe and Mail*, December 24, 2002, p. B12.

A. We conclude that the estimates obtained using the prospective market risk premium method result in market risk premium estimates that are too unreliable to be used as a proxy for the fair required return on equity capital. If the optimism bias is removed, such market risk premium estimates provide some very noisy indicative (or secondary) information about the fair required return on equity capital.

5. Use of DCF Estimates of Fair Return as a Check of ROE Recommendations

Q. Dr. Morin also generates DCF estimates of a fair return on equity for a group consisting of investment-grade U.S. combination gas & electricity utility companies, which he uses as a proxy for HQ DIST. Please provide a brief discussion of why you do not provide similar DCF estimates of a fair return on equity for a sample of utility firms?

A. Discounted cash flow (DCF) tests have a number of disadvantages that make them unreliable when applied to specific firms in the same industry. First, the DCF test depends critically on estimating the expected growth rate. Error in capturing the growth rate impacts directly on DCF estimates. Because estimates of the growth rate depend on past growth and/or analyst opinion, it is difficult to achieve any measure of precision. Furthermore, if firms are drawn from the same or similar industries, the growth rate errors will tend to be correlated, and the benefits in terms of forecast precision from an increasing sample size will be greatly reduced. Highly correlated forecast errors across individual firms in the same or similar industries arise due to the fact that the same industry analysts will make such forecasts.

Second, circularity also causes a problem in applying the DCF approach to individual firms in regulated industries. Analysts base their analysis of the future growth in earnings and dividends on the rate of return allowed by regulatory bodies, which translates into a market for the shares. If we, in turn, rely solely on the market price and dividend growth rate for our required return on equity, then we are being influenced by the market, which, in turn, is being influenced by the regulator's decision. Thus, by employing the DCF method, we would, in effect, be anticipating what the market is expecting the regulator to do thus introducing circularity. The same problem occurs if we use analyst forecasts.

Third, the DCF model assumes that returns are set competitively, and that no excess returns or "free lunches" are possible. If investors are on average overcompensated for the investment risk they bear for investing in regulated utility stocks, then the DCF model will generate implied returns that are too high. We provide evidence of such excess returns to utility investors in the next section of our evidence.

6. Ex Post Performance of Equity Investment in Utilities

Q. Have the investors in Canadian gas and electric firms earned a return that is commensurate with the investment risk borne by such an investment?

A. Yes, and in fact, they have earned a premium return from such investments, or what investment people refer to as a positive alpha or "free lunch".

Q. What is the basis for your conclusion?

A. We used a standard portfolio performance metric, a portfolio's alpha, to evaluate the performance of holding the Gas/Electric sub-group index of the TSE300 over the periods, 1980-2000 and 1991-2000. This performance measure is the estimated intercept from a regression of the returns in excess of the risk-free rate for both the sub-index and the market index. In other words, we ran a regression of the excess returns on the Gas/Electric sub-group total return index against those for the TSE 300 total return index.

The results are summarized in Schedule 18. Based on these results, we find that the Gas/Electric sub-group outperformed the TSE 300 by 2.7% annually over the 1980-2000 period, and by 6.16% annually over the ten-year period 1991-2000. Thus, investors that invested in a portfolio that mimicked this sub-group achieved an excess return or free lunch of over 6% on an annual basis over the 1991-2000 period. These results suggest that investors in these groups of utilities have achieved results significantly higher than that intended by regulators when they determined the allowed returns on equity, and additionally that the allowed returns exceeded what investors required to bear the investment risk of this group of utilities.

In other words, providing generous rates of return allowances to enhance the financial integrity and flexibility of these utilities without requiring these utilities to establish a reserve to account for these insurance premiums, may just over-compensate investors given the high dividend payout rate practices of Canadian utilities.

Q. Does any evidence exist that investors in U.S. utilities had a similar superior investment performance where they experienced excess returns from utility investment?

A. Yes, there is similar but not as rigorously conducted evidence for the U.S. market. In a study that has received much media coverage, Mr. Richard Bernstein and Ms. Lisa Kirschner, two prominent strategists at Merrill Lynch in New York, find that the S&P Utility Index outperformed the NASDAQ Index since

NASDAQ's inception in 1971.[95] The Utilities outperformed NASDAQ over the 30-year period while incurring less risk. From NASDAQ's inception through the end of September 2001, NASDAQ returned a compound annualized rate of return of 11.2% per year, whereas the S&P Utility Index returned a compound annualized rate of return of 12.0% per year. The authors of this report measure risk using both the standard deviation of rolling 12-month returns (about 26% for NASDAQ versus about 16% for the S&P), and alternatively as the percent of the returns that were negative over a 12-month time horizon (over 23% for NASDAQ versus over 15% for the S&P).[96]

Comparison of Witnesses' Rate of Return Evidence Against Adjustment Formulas

Q. Did you conduct any further analysis of the equity rate of return evidence submitted by Dr. Morin?

A. Yes, we compared his recommendations for the equity risk premium of HQ DIST against the generic formulas used for groups of utilities by Canadian regulators including the National Energy Board, The British Columbia Utilities Commission, The Ontario Energy Board, ,the Manitoba Public Utilities Board and the Newfoundland Public Utilities Board. We do not include the formula adopted by the Régie for Gaz Métropolitain as this formula applies only to one company.

Q. Please explain the rationale for making these comparisons.

---

[95] Richard Bernstein and Lisa Kirschner, 2001, Believe it or not: Utilities have outperformed NASDAQ since '71, *Quantitative Strategy Update*, October 25.
[96] This is based on a visual estimation of the values depicted on page 2 of Richard Bernstein and Lisa Kirschner, 2001, Believe it or not: Utilities have outperformed NASDAQ since '71, *Quantitative Strategy Update*, October 25.

A. In its RH-2-94 Multi-Pipeline Cost of Capital Decision issued in March 1995, the National Energy Board adopted a formula to compute an equity risk premium over the consensus forecast of the long-Canada rate. While this formula was adopted as an administrative convenience, it has been used by the NEB since 1995 and reaffirmed in June 2002 in the NEB's RH-4-2001 decision on TransCanada Pipelines. The formula has been adopted, in modified form, by a number of provincial regulatory boards. Thus, these formulas provide benchmarks of the levels of equity risk premiums that regulators have previously regarded as reasonable. With these benchmarks, we can assess the extent to which recommendations offered by particular witnesses lie within or beyond a reasonable range.

We begin with the NEB formula. This procedure takes the average 3-month out and 12-month out forecasts of 10-year Government of Canada bond yields as reported in the November issue of *Consensus Forecasts* (Consensus Economics, Inc., London, England.) To this is added the average daily spread between 10-year and 30-year Government of Canada bonds as reported in the *National Post* for October. An equity risk premium of 300 basis points was determined to be appropriate for the particular group of pipeline companies in 1995. This equity risk premium is added to the determined 30-year Canada rate to give a final allowed return on equity.

In order to acknowledge the NEB's belief that equity risk premiums decrease when rates are rising and increase when rates are falling, an adjustment mechanism allows for the cost of capital to be adjusted upwards or downwards by 75% of the increase in the long Canada rate occurring after 1995. The NEB decision also notes that the adjustment mechanism is not restricted to the range of rates in its table.

However, it should be noted that the NEB acknowledged that the adjustment mechanism which it had approved "... should produce fair results and prove durable during the target period *for at least three years*."[97] [Emphasis added]. As we note earlier, the NEB reaffirmed its formula in June 2002. The only variable reflected in the adjustment mechanism relates to changes in forecast long-term Government of Canada bond yields. It does not reflect changes in the level of risk premiums and, in particular, the lower levels currently being experienced and forecast into the future.

We can illustrate the workings of the NEB formula using our forecast of 6.0% for Long Canada's. The forecasted long-Canada rate for 1995 was 9.25%, resulting in an allowed return on equity of 12.25%. For our forecast of 6.0%, the new rate is 9.81%.[98] Put into words, the NEB formula states that as rates fall from 9.25% to 6.0% (a drop of 325 basis points), 75% of that drop is reflected by lowering the new rate, and the remaining 25% of the drop is added to the risk premium. In this case, the risk premium increases by 81 basis points (.25 *x* (9.25 – 6.0)). These figures appear in Schedule 19.

The formula provides an upwardly biased estimate of the allowed return on equity of 9.81 using our forecast of 6.0%. The reason is that not only has the forecasted long-Canada rate dropped by 325 basis points since 1995 but the current and future expected risk premiums are considerably lower (not higher) than they were in 1995.

Following similar logic, we calculate the recommended equity returns and risk premiums for the other regulatory bodies. The Ontario Energy Board formula for Consumers Gas provided for a risk premium of 340 basis points when the long

[97] RH-2-94, p. 31.
[98] 9. 81% = 6.0 + 3.00 + .25 (9.25 – 6.0).

Canada rate was at 7.25%. The OEB formula follows the NEB in employing a 75% adjustment for changes in interest rates. Using a similar formula, the Public Utility Board of Manitoba set a risk premium of 300 basis points at a long Canada yield of 9.12% with an 80% adjustment factor. Further, the most recent position of the BC Utilities Commission calls for an equity risk premium of 350 basis points to accompany a forecasted long Canada rate of 6.0%. The Commission applies an 80% adjustment factor when rates rise and no adjustment for falling rates. For our forecast of 6.0%, the risk premium remains at 350 basis points. Similarly, the Newfoundland Public Utilities Board set its equity risk premium at 350 basis points for long-Canada rate of 5.75% with an 80% adjustment factor in both directions. Based on this formula, at our 6.0% forecast rate, the risk premium in 345 basis points.

In summary, Schedule 19 shows that applying the five adjustment formulas using our forecasted rate of 6.0% produces an average equity risk premium of 362 basis points with a relatively narrow range of 345 – 381 basis points.

Q. What does your summary of regulatory formulas tell us about the reasonableness of the recommendations of Dr. Morin for HQ DIST?

A. In order to draw on the results of the regulatory formulas, we must first establish that the risk of the utilities for which the formulas were designed is comparable to or greater than the risk of HQ DIST. We believe that this is the case for reasons discussed at length in other parts of our evidence. Therefore, if these formulas are to be considered at all, their results must be adjusted downward to reflect the relatively lower risk of HQ DIST.

Turning to the numbers in Schedule 19, it is apparent that the risk premium numbers recommended by the witnesses in this hearing and those resulting from regulatory formulas vary significantly. That said, Schedule 19 reveals that the numbers fall into three distinct sets. At the high end is the recommendation of Dr.Morin, which is clearly substantially higher than the results of regulatory formulas. In the middle, lie the regulatory formulas. Below them are our own recommendations.

Q. What do you conclude from this comparison?

A. The regulatory formulas are drawn from the era of significantly higher risk premiums. Our earlier evidence presented a large body of argument showing that the equity risk premium is expected to be considerably lower in the future. Because they do not take this important trend into account, recommended returns drawn from regulatory formulas should be regarded as a generous upper bound. Our own recommendation reflects not only the relatively lower risk of HQ DIST but also the current trend towards a lower equity risk premium. Our recommendation represents a reasonable choice should the Régie wish to embrace our argument and adjust to the new market regime. If, however, should the Régie wish to move more cautiously, it could choose to set the allowed equity return for HQ DIST in the range between our recommendation and the average of the regulatory formulas. Either way, our examination of the regulatory formulas and other evidence suggests that the Régie should attach little weight to the rate of return recommendation of Dr. Morin.

APPENDICES A - E

APPENDIX A

BRIEF CURRICULUM VITAE FOR LAWRENCE KRYZANOWSKI

Dr. Lawrence Kryzanowski is currently a Full Professor of Finance and Ned Goodman Chair in Investment Finance at Concordia University. He also was until June 2002 the Co-Director of the Concordia-McGill-Xiamen (CMX) Project of the Canada-China University-Industry Partnership Program in Financial Services. He is currently a Fellow at CIRANO, a member of CREPÉE, a Principal Researcher at ÉNE at HEC, and a scientific committee member of Institut de Finance Mathématique de Montréal. He has been a visiting scholar at the University of British Columbia, a research associate at the University of Rochester, and a resident consultant at the Federal Department of Finance.

Dr. Kryzanowski has extensive experience teaching undergraduates, MBA, MSC and Ph.D. students, and executives for the Institute of Canadian Bankers, Shanghai Banking Institute, CMX, Concordia University, McGill University and Dalhousie University. Dr. Kryzanowski has extensive experience in developing or managing the development of instructional textbooks for the Institute of Canadian Bankers (ICB) and the Canadian Securities Institute (CSI), which includes the *Investment and Portfolio Management* text for the ICB, and the *Canadian Securities Course* text for the CSI.

Dr. Kryzanowski is an active educator, mentor, consultant and expert witness in financial economics, including investment management, risk pricing and management, and regulation and operations of global financial markets, institutions and participants. He is author or co-author of over 80 refereed journal articles and seven books or monographs. Dr. Kryzanowski is the first recipient of Prix ACFAS/Caisse de dépôt et placement du Québec, which recognizes an exceptional contribution to research in finance. During the past few years, Dr. Kryzanowski was inaugural recipient, with co-authors, of the BGI Canada Award and OSFI Award (latter with Dr. Roberts) for excellence in research on capital markets and on regulation of financial institutions, respectively. His eleven other paper awards for co-authored work are from the *Multinational Finance Journal* and various North American academic conferences. Dr. Kryzanowski is a former co-editor of finance with Dr. Roberts at the *Canadian Journal of Administrative Studies*, and founding chairperson of the Northern Finance Association. Dr. Kryzanowski is currently an Editor of the *Multinational Finance Journal*, an Associate Editor of the *International Review of Financial Analysis*, and is on the editorial boards of the *Canadian Investment Review* and *Finance India*.

Dr. Kryzanowski has experience in preparing evidence as an expert witness in utility rate of return applications, stock market insider trading court proceedings, and confidential final offer arbitration hearings for setting of fair rates for the movement of various products by rail. Together with Dr. Roberts, he prepared a report and briefed counsel on rate of return considerations in the pipeline application in 1997 of Maritimes and Northeast, and prepared evidence on the fair return on equity and the recommended capital structure for the 2001/2002 Distribution Tariff Application (DTA) of Atco Electric and the 2001/2002 DTA and the 2002 DTA (No. 1250392) of Utilicorp Networks Canada (Alberta) Ltd. before the Alberta Energy and Utilities Board. Together with Dr. Roberts, and on behalf of the Province of Nova Scotia, he provided evidence and testified before the Nova Scotia Utility and Review Board in the matter of Nova Scotia Power Inc. in 2002.

Dr. Kryzanowski is often sought for his technical ability and advice on various matters in financial economics. He has consulted for the Superintendent of Financial Institutions, Federal Department of Finance, CMHC, CDIC, External Affairs Canada, Canada Investment and Savings, Hydro Quebec, National Bank, Bombardier, and others.

Dr. Kryzanowski received a B.A. in Economics and Mathematics from the University of Calgary and earned his Ph.D. in Finance at the University of British Columbia.

BRIEF CURRICULUM VITAE FOR GORDON S. ROBERTS

Dr. Gordon S. Roberts is currently CIBC Professor of Financial Services and Area Coordinator, Finance Area, at York University's Schulich School of Business. Prior to joining York University, he was Bank of Montreal Professor of Finance at the School of Business, Dalhousie University. Dr. Roberts has held positions as Visiting Professor and Visiting Scholar at Tilburg University (the Netherlands), Deakin University (Melbourne, Australia), University of Toronto, University of Arizona, Xiamen University (China) and the University of Zimbabwe.

In addition to teaching undergraduates, MBA and Ph.D. students at these universities, Dr. Roberts has extensive experience in executive teaching for the Institute of Canadian Bankers and in the Pension Investment Management School sponsored by the Schulich School jointly with pension consulting firms William Mercer Inc. and Frank Russell.

An active researcher in the areas of corporate finance, bond investments and financial institutions, Dr. Roberts is author or co-author of over forty journal articles and three corporate finance textbooks. In 2000, he shared with Dr. Kryzanowski the OSFI award for excellence in research on the regulation of financial institutions. Dr. Roberts is a former co-editor of finance with Dr. Kryzanowski of the *Canadian Journal of Administrative Studies*. He is currently an Associate Editor of the *Journal of Banking and Finance*, and serves on the editorial boards of *FINECO* and the *Banking and Finance Law Review*.

Dr. Roberts is experienced in preparing evidence for utility rate of return hearings. From 1995–1997 he submitted prefiled testimony as a Board witness in rate hearings for Consumers' Gas. In 1996, he served as an expert advisor to the Ontario Energy Board in its Diversification Workshop. In 1997, he co-prepared (with Dr. Kryzanowski) a report for the Calgary law firm, MacLeod Dixon, on rate of return considerations in the pipeline application by Maritimes and Northeast. With Dr. Kryzanowski, he filed evidence on three electricity regulatory matters in Alberta in 2001, and evidence on regulatory matters before the Alberta Energy and Utilities Board and the Nova Scotia Utility and Review Board in 2002.

Often sought for his advice on financial policy, Dr. Roberts has consulted for the Superintendent of Financial Institutions, the federal Department of Finance, Canada Investment and Savings, Canada Mortgage and Housing Corporation, and Canada Deposit Insurance Corporation, among others.

Dr. Roberts received a B.A. in Economics from Oberlin College and earned his Ph.D. at Boston College. He has been listed in the Canadian Who's Who since 1990.

APPENDIX B

SHOULD THE ARITHMETIC OR GEOMETRIC MEAN BE USED TO ESTIMATE IMPLIED RISK PREMIA USING HISTORICAL REALIZED RETURNS?

1. The Choice:

It is preferable to use the geometric average (mean) historical risk premium when measuring historical holding period performance. The reason is that the geometric mean exactly represents the constant rate of return that is needed in each year to exactly match actual performance over that past investment period.[99] This is the reason why Canadian mutual funds are required to disclose compound rates of return, which is just a different name for a geometric mean return. Similarly, the annual yield-to-maturity quoted on a long-term bond is an annual geometric return.

It is preferable to use the arithmetic mean historical market risk premium when making investment decisions for a one-period investment horizon when the investment horizon is identical to the interval of time over which the historical returns are measured. The reason is that the arithmetic mean is an unbiased estimate of an investment's expected future risk premium for a single period investment horizon. Thus, if historical market risk premia are measured using annual returns, then the future investment horizon should be one year.

The arithmetic mean also is preferred when historical returns are normal IID or independently and identically distributed over the estimation period. Unfortunately, the

[99] The superiority of the geometric mean over the arithmetic mean is easily shown using an example drawn from L. Kryzanowski, *Investment and Portfolio Management* (Montreal: Institute of Canadian Bankers, 1996), p. 82. The example concerns the investment portfolio of Mr. John Velco whose investment portfolio increases from $200,000 to $400,000 during the first year for an annual return of 100%, and then returns to its original $200,000 value during the second year for an annual return of –50%. The arithmetic and geometric mean annual returns are 25% and 0%. Of course, the correct constant annual return has to be 0% since the beginning and ending portfolio values are identical.

normal IID assumption is not appropriate for asset returns over long estimation periods. This assumption suffers from various important drawbacks. First, even if single-period returns are assumed to be normal, then multiperiod returns can not also be normal since they are products (not sums) of the single-period returns. Second, several studies using longer-horizon or multi-year returns conclude that there is substantial mean-reversion (i.e., negative serial correlation) in stock market prices at longer horizons.[100] Third, the plausibility of the assumption that returns are IID diminishes as the estimation time period gets longer. Drs. Campbell, Lo and MacKinlay state this as follows:[101]

> "…the assumption of identically distributed increments is not plausible for financial asset prices over long time spans. For example, over the two-hundred-year history of the New York Stock Exchange, there have been countless changes in the economic, social, technological, institutional, and regulatory environment in which stock prices are determined. The assertion that the probability law of daily stock returns has remained the same over this two-hundred period is simple implausible."

The geometric mean or some weighted-average of the geometric and arithmetic mean are preferred when returns are not normal IID due to, for example, long-run mean reversion in asset returns, as has been found for stocks. Dr. Siegel notes that his work on the risk premium using data for the period 1802-2001 provides support for mean reversion for a 30-year horizon (i.e., the horizon used for Long Canada's in rate of return regulation).[102]

---

[100] For examples, see E. Fama and K. French, 1988, Permanent and Temporary Components of Stock Prices, *Journal of Political Economy* 96, pp. 246-273; and J. Poterba and L. Summers, 1986, Mean reversion in stock returns: Evidence and implications, *Journal of Financial Economics* 22, pp. 27-60.
[101] John Y. Campbell, Andrew W. Lo and A. Craig MacKinlay, 1997, *The Econometrics of Financial Markets* (Princeton, New Jersey: Princeton University Press), pp. 32-33.
[102] Jeremy J. Siegel, Historical results: Discussion, *Equity Risk Premium Forum*, November 8, 2001, p. 46.

Dr. John Campbell at a recent *Equity Risk Forum* has aptly stated this argument as follows:[103]

> "Which is the right concept, arithmetic or geometric? Well, if you believe that the world is identically and independently distributed and that returns are drawn from the same distribution every period, the theoretically correct answer is that you should use the arithmetic average. Even if you're interested in a long-term forecast, take the arithmetic average and compound it over the appropriate horizon. However, if you think the world isn't i.i.d., the arithmetic average may not be the right answer.
>
> I think that the world has some mean reversion. It isn't as extreme as in the highway example, but whenever any mean reversion is observed, using the arithmetic average makes you too optimistic. Thus, a measure somewhere between the geometric and the arithmetic averages would be the appropriate measure."

Similarly, Dr. Damordaran, author of numerous books on valuation, states:[104]

> "The conventional wisdom is that the arithmetic mean is the better estimate. This is true if
> (1) you consider each year to be a period (and the CAPM to be a one-period model)
> (2) annual returns in the stock and bond markets are serially uncorrelated
> As we move to longer time horizons, and as returns become more serially correlated (and empirical evidence suggests that they are), it is far better to use the geometric risk premium. In particular, when we use the risk premium to estimate the cost of equity to discount a cash flow in ten years, the single period in the CAPM is really ten years, and the appropriate returns are defined in

[103] John Campbell, Historical results: Discussion, Equity Risk Premium Forum, November 8, 2001, p. 45.
[104] Aswath Damodaran, Discussion issues and derivatives, found on his website at: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/AppldCF/derivn/ch4deriv.html#ch4.3.

> geometric terms.
>
> In summary, the arithmetic mean is more appropriate to use if you are using the Treasury bill rate as your riskfree rate, have a short time horizon and want to estimate expected returns over that horizon.
>
> The geometric mean is more appropriate if you are using the Treasury bond rate as your riskfree rate, have a long time horizon and want to estimate the expected return over that long time horizon."

Dr. Jay Ritter in his keynote address at the 2001 meetings of the Southern Finance Association states that "with mean reversion, the multiperiod arithmetic return will be closer to the geometric return".[105] He notes that stock returns show a tendency towards mean reversion and bond returns show a tendency towards mean aversion in the U.S. In turn, based on the standard deviations of returns for data starting in 1802 (the Siegel data set), he shows that stocks are twice as risky as bonds for one-year holding periods, and stocks are less risky than bonds for holding periods of twenty or more years.

The use of the geometric mean is supported empirically. Fama and French estimate the nominal cost of capital for U.S. nonfinancial corporations for 1950-1996 as 10.72%. Since this is smaller than the nominal return on investment of 12.11%, average corporate investment has been profitable.[106] If the arithmetic mean of the simple annual returns is used instead to obtain an estimate of the nominal cost of capital, the resulting value of 12.12% is about the same as the return of investment of 12.11%. This implies that average investment by corporate U.S. has added no value over the 1950-1996

[105] Jay R. Ritter, The biggest mistakes we teach, *The Journal of Financial Research* 25:2, Summer 2002, pp. 159-168.

[106] These two values are the IRRs on value and on cost, respectively. The geometric mean of simple annual returns on cost is almost identical. Eugene F. Fama and Kenneth R. French, 1999, The corporate cost of capital and the return on corporate investment, *The Journal of Finance* December, pp. 1939-1967. As in Copeland et al. (1990), the return on value is an estimate of the cost of capital when the cost of capital is taken to be an expected compound return. Tom Copeland, Tim Koller and Jack Murrin, 1990, *Valuation in measuring and managing the value of companies* (John Wiley and Sons, New York).

period, which seems unreasonable to Fama and French and ourselves given stock market performance over this period of time. Thus, Fama and French conclude that the geometric mean estimate of the cost of capital is more consistent with the data than the arithmetic mean estimate of the cost of capital over this period of time.

The expected one-period simple return (i.e., the arithmetic mean of the one-period simple return) is only an appropriate return concept for the cost of equity capital for a short future time horizon of one period (usually a year).[107] For multiple-period horizons, expected return estimates enter the present value expressions in a nonlinear manner. Thus, numerous articles have documented the biases in using arithmetic or geometric means of one-period returns or risk premia to assess long-run expected rates of return or risk premia.

Other studies have documented the biases in using arithmetic or geometric means of one-period returns or risk premia to assess long-run expected rates of return or risk premia, without any reference to mean-reversion. To illustrate, Blume (1974) and Indro and Lee (1997) show mathematically that for long-run expected returns and risk premia, the arithmetic average produces an estimate that is upwardly biased, and that the geometric average produces an estimate that is downwardly biased.[108] The simulation results of Indro and Lee (1997) support the use of a horizon-weighted average of the arithmetic and geometric averages proposed by Blume (1974). In the Blume average, the arithmetic average receives all the weight when the time horizon or project life (denoted by N) is one period, and the geometric average receives all the weight when the time horizon is equal to the number of time periods (denoted by T) used to obtain a historical estimate of average returns or risk premia.

[107] Eugene F. Fama, 1996, Discounting under uncertainty, *Journal of Business* 69, pp. 415-428.
[108] M.E. Blume, Unbiased estimators of long-run expected rates of return, *Journal of the American Statistical Association* 69:347 (September 1974), pp. 634-638; and D.C. Indro and W.Y. Lee, Biases in arithmetic and geometric averages as estimates of long-run expected returns and risk premia, *Financial Management* 26:4 (Winter 1997), pp. 81-90.

To illustrate, if we deem that 30 years constitutes the long-run as is assumed for the cost of debt and we use the longest available time period without serious measurement errors to estimate the market risk premium in Canada (namely, the 45 year period, 1957-2001), the weight placed on the geometric average, w_G, is:

$$w_G = (N - 1) / (T - 1) = (30 - 1) / (45 - 1) = 29 / 44 = .66 \text{ or } 66\%.$$

Similarly, if we use the longest available time period for which we have data in Canada to estimate the market risk premium (namely, the 78 year period, 1924—2001), the weight placed on the geometric average, w_G, is:

$$w_G = (N - 1) / (T - 1) = (30 - 1) / (78 - 1) = 29 / 77 = .38 \text{ or } 38\%.$$

Of course, the long run is longer than 30 years, and we would use it for bonds if such maturities were available.

Thus, until the issue is resolved, a weighted-average of the arithmetic and geometric means is best. To err on the side of being conservative, an equally weighted average of these two means appears to be most reasonable.

2. The Choice and Financial Integrity:

Although we do not believe that any additional return needs to be added to ensure the financial integrity of a utility, the use of an equally weighted average of the geometric and arithmetic mean historical market risk premia does provide some unspecified premium to that effect because the equally weighted average is still likely to be somewhat optimistic.

A further benefit of using the equally weighted average, or what equivalently is equal to adding one-half of the differences in the two averages to the geometric mean, is that it provides a premium that increases or decreases with the level of investment risk as measured by the standard deviation of the market. When the market has no risk, the two means are identical. Thus, for the extreme case of no market risk, the use of the weighted average instead of the annual geometric market risk premium provides no extra risk premium that will ensure financial integrity, as none is needed. When market risk is present, one-half of the positive numerical difference between the arithmetic mean market risk premium and the geometric mean market risk premium grows with higher levels of risk. Thus, the use of the annual geometric mean market risk premium plus one-half of the difference between the annual arithmetic and geometric mean market risk premia provides more risk premium coverage for ensuring financial integrity for greater levels of market risk.

This is best illustrated by referring to the example in Schedule B1. In this example, we show what happens to the final wealth position of two typical investors who each invest $6,592.58 in two different utilities at the end of 1989. For ease of presentation, we assume that each utility is well diversified and has the same investment risk and return as the market. The first investor invests in the first utility whose value compounds at the annual geometric mean return for the S&P/TSX Composite over the ten-year period 1990-1999. As expected, the terminal value of the investment in the first utility by the first investor is equal to the ending value of $17,960.99 for the S&P/TSX Composite index for 1999. Thus, the first investor receives the same return as given by the market on his utility investment. In contrast, the second investor invests in the second utility whose value compounds at the annual arithmetic mean return for the S&P/TSX Composite over the ten-year period 1990-1999. As expected, the terminal value of the investment in the second utility by the second investor of $19,759.06 is now greater than the terminal value of $17,960.99 for the S&P/TSX Composite index at year-end 1999. Thus, this second investor has achieved what finance professionals refer to as an abnormal return or “free lunch”, and investment professionals refer to as a positive alpha. In fact, the second investor has achieved an above market return per dollar of initial investment without incurring any additional risk when performance is benchmarked against the performance of the market.

From the perspective of the second utility, the difference between the annual geometric and arithmetic mean returns of approximately 106 basis points represents the amount of return that it can forego before it begins to disappoint its equity investors. In a rating setting forum, the full 106 basis would represent a very expensive insurance premium to pay annually to ensure that a utility is guaranteed financial integrity.

Schedule B1

This table contains a comparison of the wealth implications for equity investors of using arithmetic versus geometric mean returns based on an assumed investment of $6592.58 by two different investors in two different utilities. For ease of exposition, the two utilities are assumed to have the same investment risk as the market (i.e. their betas are one) and to be well diversified.

Year end	For the total return S&P/TSX Composite index:			Portfolio value when promised annual return is:	
	Index value	Annual return	Annual return relative	Geometric mean	Arithmetic mean
1989	6592.58			6592.58	6592.58
1990	5617.01	-0.14798	0.85202	7287.57	7357.44
1991	6291.90	0.120151	1.120151	8055.83	8211.03
1992	6201.72	-0.014333	0.985667	8905.08	9163.65
1993	8220.23	0.325476	1.325476	9843.86	10226.80
1994	8205.73	-0.001764	0.998236	10881.60	11413.29
1995	9397.97	0.145294	1.145294	12028.75	12737.43
1996	12061.95	0.283463	1.283463	13296.82	14215.20
1997	13868.54	0.149776	1.149776	14698.58	15864.41
1998	13648.84	-0.015842	0.984158	16248.11	17704.97
1999	17960.99	0.315935	1.315935	17960.99	19759.06

The annual arithmetic and geometric mean returns are 0.116018 and 0.10542, respectively.

APPENDIX C

RECENT THINKING AND ESTIMATES OF U.S. AND OTHER COUNTRY EQUITY RISK PREMIA

1. Estimates on a Point-forward Basis:

There are three approaches to estimating the equity risk premium on a point-forward basis. The first approach extrapolates historical returns based on the premise that realized and expected returns are equivalent, and that the future will be like the past. The second approach uses a theoretical model to determine what the equity premium should be based on plausible assumptions about investor risk tolerance. The third approach uses forward-looking information on current dividend yields and interest rates to forecast expected risk premia.

Reichenstein (2001) summarizes the predictions of several academic and professional scholars that long-run real stock returns will be below historical standards and that the equity risk premium will be well below historical standards, and even negative according to some scholars.[109] The academic studies are by Jagannathan, McGrattan and Scherbina (2000), Siegel (1999) and Fama and French (2001). The practitioner studies are by Brown (2000) and by Arnott and Ryan (2001). The real stock return estimates are 2.9% to 4.4% for Fama and French, 3.2% for Arnott and Ryan, 3.3% for Siegel, 4.8% for Jagannathan et al, and 5.2% for Brown.

Fama and French (2001) obtain estimates of the U.S. equity risk premium of 2.55% and 4.32% for 1951-2000 when they use rates of dividend and earnings growth to measure the expected rate of capital gain. These equity risk premium estimates are much lower than the 7.43% estimate produced by using the average stock return over this period of time. They conclude that their evidence shows that the high average

[109] Cited articles in this appendix are listed in the references found between the text and the tables to this appendix.

realized return for 1951-2000 is due to a decline in discount rates that produces large unexpected capital gains. Their main conclusion is that the stock returns (and realized equity risk premia) of the last half-century is a lot higher than what was expected by investors ex ante. The lower estimates of expected stock returns are less than the income return on investment that suggests that investment by corporate U.S. is on average profitable. In contrast, the much higher estimates of expected stock returns from using the traditional time-series means suggests that investment by corporate U.S. is on average unprofitable (its expected return is less than its cost of capital).

According to Fama and French (2001), "many papers suggest that the decline in the expected stock return is in part permanent, the result of (i) wider equity market participation by individuals and institutions and (ii) lower costs of obtaining diversified equity portfolios from mutual funds (Diamond, 1999; Heaton and Lucas, 1999; Siegel, 1999)".

Jagannathan et al (2000) demonstrate that the U.S. equity risk premium has declined significantly during the last three decades. They calculate the equity premium using a variation of a formula in the classic Gordon stock valuation model. While the premium averaged about 7 percentage points during 1926-70, it only averaged about 0.7 of a percentage point after that. They support this result by demonstrating that investments in stocks and consol bonds of the same duration would have earned about the same return between 1982 and 1999, a period over which the equity risk premium estimate is about zero.

There are a number of studies not reviewed by Reichenstein (2001). These are reviewed next.

In a conference presentation on October 15, 2001, Mr. Robert A. Arnott of First Quadrant estimates the U.S. equity risk premium for the 75 years from December 1925 to be 4.7%, and to have oscillated around zero beginning in the early 1980s.[110] He estimates the forward-looking U.S. equity risk premium from October 2001 to be 0.3%±.

In a study (undated) by Deutsche Asset Management, the expected long-run equity risk premia are 2.5% over government bonds or 3.0% over cash for the U.S., Euroland, Japan and the U.K. (see Schedule C-1). These equity risk premia are based on two approaches, where the first estimates what equities can return based on free cash flows that they generate, and the second estimates what equities need to return to get investors to hold them instead of less risky assets.

Based on reasonable priors and allowing for structural breaks, Drs. Pastor and Stambaugh (2002) obtain estimates of the equity risk premium of between 3.9 and 6.0 percent over the period from January 1834 through June 1999. The estimated premium rises through much of the nineteenth century and the first few decades of the twentieth century. It declines fairly steadily after the 1930's except for a brief period in the mid 1970's. The estimated premium exhibits its sharpest decline to 4.8% during the decade of the 1990's.

Drs. Ibbotson and Chen (2001) forecast the equity risk premium through supply side models using historical information. They conclude that “contrary to several recent studies on equity risk premium that declare the forward looking equity risk premium to be close to zero or negative, we find the long-term supply of equity risk premium is only slightly lower than the straight historical estimate”. Based on his co-authored paper with Dr. Chen, Dr. Ibbotson concluded that:[111]

> “My estimate of the average geometric equity risk premium is about 4 percent relative to the long-term bond yield. It is, however, 1.25 percent lower than the pure

[110] Specifically, Exhibit 4a on page 21 of Arnott (2001).
[111] Roger Ibbotson, Moderator, Implications for asset allocation, portfolio management, and future research: Discussion, Equity Risk Premium Forum, November 8, 2001, p. 103.

sample geometric mean from the risk premium of the Ibbotson and Sinquefield study (Ibbotson Associates 2001)."

Dr. Ibbotson goes on to state:[112]

"The 4 percent (400 bps) equity risk premium forecast that I have presented here today is a geometric return in excess of the long-term government bond yield. It is a long-term forecast, under the assumption that today's market is fairly valued."

Using the third approach to estimating equity risk premia, Dr. Ritter estimates that the risk premium is only about 0.7% or 1 percent rounded up. He points out that lower future real stock returns have squeezed the equity premium from the top and a higher real return on bonds has squeezed the equity premium from the bottom.[113]

2. Actual versus Expected Equity Risk Premia:

A few studies examine whether or not actual or realized equity risk premia are a good proxy for expected or required equity risk premia. The findings of two of these studies are summarized in Schedule C-2. The study (undated) by Deutsche Asset Management aptly summarizes these findings as follows:

"In sum, a wealth of theoretical and empirical evidence suggests that the historical, realized equity premium (5% - 7%) exceeded what equities were expected to deliver in the past, and very likely exaggerates what they should be expected to deliver in the future. An equity premium of 3% - 4% may have been closer to the true, ex-ante premium in the past, and the lower end of that range seems the most that we should anticipate (and that investors will require) now

[112] Roger Ibbotson, Summary comments, *Equity Risk Premium Forum*, November 8, 2001, p. 108.
[113] Jay R. Ritter, The biggest mistakes we teach, *The Journal of Financial Research* 25: 2, Summer 2002, p. 163.

that economic/political conditions are more stable and people are more 'plugged in' to the benefits of equity investing. So we take 3% as an upper bound for the equity premium going forward."

It should also be kept in mind that these equity risk premia are calculated in reference to short-term government bonds (such as T-bills) and **not long-term government bonds**.

3. Synthesis:

All of the studies conclude that the U.S. equity risk premium has narrowed (most conclude substantially), and is expected to be lower in the future. The U.S. equity risk premium estimates vary from zero or slightly negative (Jagannathan et al, 2000) to about 6 % (Ibbotson and Chen, 2001). These studies strongly suggest that any forecast **for the U.S.** over 5% based on T-bills is in the optimistic tail of the distribution of possible equity risk premium estimates.

The two studies dealing with realized and expected equity risk premium find that the expected equity risk premium when measured **against short-term** government bonds in the U.S. has ranged between 3.4% and 4.2% depending on the time period considered, and has averaged 3.5% over 101 years for a sample of 15 developed countries.

References:

Arnott, Robert D., 2001, Is the risk premium still dead?, Microsoft PowerPoint Presentation, YMG Conference, October 15. Available at: http://www.ymg.ca/news/Conferences/Conference2001/Rob%20Arnott%20-%20First%20Quadrant.pdf.

Arnott, Robert D. and Ronald J. Ryan, 2001, The death of the risk premium, *Journal of Portfolio Management*, Summer, pp. 61-74.

Brown, Anthony, 2000, What's next for the S&P 500?, *Journal of Investing*, Winter, pp. 60-66.

Deutsche Asset Management, undated, What can we expect for asset returns in the long term? *Deutsche Asset Management's view*.

Diamond, Peter A., 1999, *What stock market returns to expect for the future?* Center of Retirement Research at Boston College, September, Number 2.

Dimson, Elroy, Paul Marsh, and Mike Staunton, 2000, *Millennium Book II: 101 Years of Investment Returns*, London Business School and ABN-AMRO.

Fama, Eugene F. and Kenneth R. French, 2001, The equity premium, Working Paper no. 522, The Center for Research in Security Prices, Graduate School of Business, University of Chicago, April.

Heaton, John, and Deborah Lucas, 1999, Stock prices and fundamentals, In: *Macroeconomics Annual 1999*, Ben Bernanke and Julio Rotemberg (eds.), National Bureau of Economic Research, MIT Press, Cambridge, MA, pp. 213-242.

Ibbotson, Roger G. and Peng Chen, 2001, The supply of stock market returns, working paper, June.

Jagannathan, Ravi, Ellen R. McGrattan and Anna Scherbina, 2000, The declining U.S. equity premium, *Quarterly Review of Federal Reserve Bank of Minneapolis*, Fall, pp. 3-19.

Pastor, Lubos and Robert F. Stambaugh, 2002, The equity premium and structural breaks, Forthcoming *Journal of Financial Economics*.

Reichenstein, William, 2001, The investment implications of lower stock return prospects, *AAII Journal*, October, pp. 4-7.

Siegel, Jeremy J., 1999, The shrinking equity premium, *Journal of Portfolio Management*, Fall, pp. 10-17.

Schedule C-1. Expected long-run returns in local currency terms (annualized, percent)

	Cash		Gov't Bonds		Equities	
	Nominal	Real	Nominal	Real	Nominal	Real
U.S.	4.50	2.00	5.00	2.50	7.50	5.00
Euroland	3.75	2.00	4.25	2.50	6.75	5.00
Japan	3.00	2.00	3.50	2.50	6.00	5.00
U.K.	4.50	2.00	5.00	2.50	7.50	5.00

Source: Deutsche Asset Management, undated, 2.

Schedule C-2. Actual versus 'expected' equity risk premium in %[a]

Study	Country	Dates	Actual	Expected
Fama & French (2001)	U.S.	1872-2000	5.6	3.5
Fama & French (2001)	U.S.	1872-1950	4.4	4.2
Fama & French (2001)	U.S.	1951-2000	7.4	3.4
Dimson et al. (2000)	U.S.	1900-2000	5.6	4.0
Dimson et al. (2000)	15 countries[b]	1900-2000	5.1	3.5

[a]The actual premium is the compound, annualized rate of return less the compound, annualized return on short-term government debt. The expected premium uses dividend growth and earnings growth models to estimate equity returns.
[b]Australia, Belgium, Canada, Denmark (from 1915), France, Germany (ex. 1922/23), Ireland, Italy, Japan, Netherlands, Spain, Sweden, Switzerland (from 1911), U.K. and U.S.

Source: Deutsche Asset Management, undated.

APPENDIX D

Beta Adjustment to Reflect Sensitivity to Interest Rate Changes

One of the mainly flawed rationales for using a variant of the adjusted beta method for utilities is that raw utility betas need to be adjusted upward due to their sensitivity to interest rate changes, and that the appropriate adjustment is one that is intermediate between the raw and adjusted betas.

As is the case for the S&P/TSX Composite index, the returns of utilities are sensitive to changes in both market and bond returns. This suggests that utility returns may be better modeled using these two potential return determinants or factors. However, one should not confuse the sensitivity of utility returns with the premium required by investors to bear market and interest rate risk when investing in utility equities.

In the traditional one-factor CAPM, where the only factor is the market, one measures relative risk by estimating the utility's beta by running the following regression:

$$r_i = a_i + b_i R_m + e_i$$

where r_i and R_m are the return on utility *i* and the market *m*, respectively; and

b_i is the beta coefficient of utility *i*.

The utility's required rate of return then is given by:

$$\bar{r}_i = r_f + b_i(\bar{R}_m - r_f)$$

where r_f is the risk-free rate, which is proxied here by the yield on a long-term Canada;

$(\bar{R}_m - r_f)$ is the so-called equity market risk premium; and

all the other terms are defined as before.

In a two-factor CAPM, one obtains the relative priced risks for utility *i* by estimating the utility's betas by running the following regression:[114]

$$r_i = a_i + b_{1i} R_m + b_{2i} R_b + e_i$$

where r_i, R_m and R_b are the return on utility *i*, the equity market *m*, and long Canada's, respectively; and

b_{1i} and b_{2i} are the beta coefficients of utility *i* (i.e., the sensitivities to market and interest rate risk, respectively).

The utility's required rate of return then is given by:

$$\bar{r}_i = r_f + b_i(\bar{R}_m - r_f) + b_i(\bar{R}_b - r_f)$$

where r_f is the risk-free rate, which is proxied here by the yield on a long-term Canada;

$(\bar{R}_m - r_f)$ is the so-called equity market risk premium;

$(\bar{R}_b - r_f)$ is the so-called interest rate risk (bond market) premium; and

all the other terms are defined as before.

While one would expect the estimates of R_m, R_b and $(\bar{R}_m - r_f)$ to be positive and significant, such is not the case for $(\bar{R}_b - r_f)$. Over the long run, we would expect the average return on long Canada's to be equal to the yield on long Canada's (the proxy for the risk-free rate in rate of return settings). This is because our expectation is that interest rates would fluctuate randomly so that bond returns would be above yields to maturity in some periods and below them in other periods. Thus, while it is true that utility equity returns are sensitive to interest rate changes, it is not true that interest rate risk will have a materially positive equity risk premium over the long run.

[114] This two-step procedure for testing asset pricing models, such as the CAPM, originates with Eugene Fama and James MacBeth, Risk, return, and equilibrium: Empirical tests, *Journal of Political Economy* 71 (1973), pp. 607-636.

We now illustrate the above by first calculating the betas for the two-factor CAPM for our sample of seven utilities over the 1990-2001 period. In doing so, we use correct econometric procedures by using the orthogonalized long Canada bond returns. When this correct econometric procedure is used, the market betas are the same as those obtained using the single-factor CAPM for each utility, and the interest rate betas are the same as those obtained using the two-factor CAPM (without orthogonalization) for each utility. These results are reported in Schedule D-1. As expected, the beta estimates for each factor are positive (and generally) statistical significant at conventional levels.

Next, we calculate the bond market risk premia over various time periods that correspond to those used previously to calculate the equity market risk premia. These results are reported in Schedule D-2. As expected, over long periods, such as 1948-2001 or 1957-2001, the bond market risk premia is less than 60 basis points. While it is much larger over the 1980-2001 period at 3.676%, this is offset by the low equity market risk premium of 1.570%. Furthermore, if we use the median betas (equity market and bond market) for the utilities from Schedule D-1, we find that the combined equity and bond market risk premia for the average utility ranges from 1.245% for the 1957-2001 period to 2.191% for the 1980-2001 period.

Schedule D-1

This table provides the market and bond return betas for our sample for seven utilities based on the estimation of a two-factor CAPM over the period, 1990-2000. The two utilities that do not have data for the full time period are eliminated from the sample. They are Pacific Northern Gas and Enbridge. All betas are calculated using monthly total returns for the utility and the S&P/TSX Composite index. The year 2001 was not included because monthly long Canada returns were not available for 2001.

Variable	BC Gas	Canadian Utilities	TransAlta Corp.	TransCanada Pipelines	Westcoast Energy	Atco Ltd.	Fortis Inc.	Mean	Median
Market beta	0.363	0.433	0.231	0.350	0.268	0.500	0.294	0.349	0.350
Orthogonalized bond return beta	0.344	0.438	0.651	0.472	0.387	0.475	0.360	0.447	0.438

Schedule D-2

This table provides the equity and bond market premia over yields on long Canada's for various time periods.

Time Period	Equity market risk premia	Bond market risk premia	Total risk premia[a]
1948-2001	5.469	0.156	1.978
1951-2000	4.237	0.273	1.601
1957-2001	2.856	0.556	1.245
1980-2001	1.570	3.676	2.191

[a]This is calculated using the mean betas for the utility sample given in Schedule D-1. For example, 1.978 = (.350x0.05469)+(0.438x0.00156).

APPENDIX E

The Impact of Fundamental Changes Including Globalization on Expected Equity Market Risk Premia

1. The Basic Relationship"

In a CAPM economy, the risk premium on the market portfolio is related to its variance by the average degree of risk aversion.[115] This can be stated as:

$$\bar{r}_m - r_f = \bar{A}\sigma_m^2$$

where $\bar{r}_m - r_f$ is the market risk premium;

$\bar{A}$ is the average degree of risk aversion in the market; and

σ_m^2 is the risk of the market.

2. Canadian Market is Totally Segmented:

If the Canadian market was totally segmented from other international markets, then all of its risk, σ_m^2, would be non-diversifiable. Thus, investors would require compensation for all of σ_m^2.

3. Relationship Between Risk Premia and Risk Tolerance:

Let us now use Question 2 from "Concept Check" in Bodie et al. (2000) to illustrate what happens when the risk tolerance of investors increases, and so forth. This question is as follows:

[115] This relationship is found in a number of sources. Please see equation (7.2) in the following investment textbook: Zvi Bodie, Alex Kane, Alan J. Marcus, Stylianos Perrakis and Peter J. Ryan, *Investments* (McGraw-Hill Ryerson, 3rd Canadian edition, 2000), p. 244.

> "Question 2 · Data from the period 1957-1998 for the TSE 300 index yield the following statistics: Average excess return, 3.60 percent; standard deviation, 16.08 percent.
>
> i. To the extent that these averages approximated investor expectations for the period, what must have been the average coefficient of risk aversion?
> ii. If the coefficient of risk aversion were actually 1.5, what risk premium would have been consistent with the market's historical standard deviation?"[116]

We begin with the answer to part *i* using the equation given above. We first calculate the variance of return on the market by multiplying 16.08% by 16.08% to get 2.59%. The average coefficient of risk aversion is then equal to: 3.60% divided by 2.59% to get 1.39.

We now provide the answer to part *ii* where market risk aversion is higher at 1.5 instead of 1.39. In this case, the market risk premium is equal to 1.5 times 2.59%, or 3.88%. In other words, everything else held constant, an increase in the risk aversion (decrease in risk tolerance) from 1.39 to 1.5, increases the equity market risk premium from 3.60% to 3.88%.

We now extend the question by introducing a utility with the same standard deviation of return of 16.08% as the market and a correlation with the market of 0.5. Thus, this utility's beta or relative risk is equal to its standard deviation of return of 16.08% times its correlation with the market of 0.5, all divided by the standard deviation of return for the market of 16.08%. This yields a beta of 0.5. Thus, this utility is one-half as risky as the market in terms of their non-diversifiable risks. In part *i*, the utility's own relative market risk premium would be 0.5 times 3.60%, or 1.80%. In part *ii*, the utility's own relative market risk premium would be 0.5 times 3.88%, or 1.94%. Thus, if the beta of the utility does not change as one would expect given that only risk aversion has

[116] Zvi Bodie, Alex Kane, Alan J. Marcus, Stylianos Perrakis and Peter J. Ryan, *Investments* (McGraw-Hill Ryerson, 3rd Canadian edition, 2000), pp. 244-245.

changed, its relative market risk premium increases when market risk aversion increases (risk tolerance decreases), and its relative market risk premium decreases when market risk aversion decreases (risk tolerance increases).

4. Relationship Between Risk Premia and Market Portfolio with Changing Risk:

We now extend the question by assuming that the composition of the market shifts to more risky industries, such as high-technology, bio-technology, and so forth. Thus, we assume that the coefficient of average risk aversion is still 1.5, and the standard deviation of the market increases from 16.08% to 20%. We have no reason to expect the standard deviation of the utility would change from its 16.08%, and we would expect that the correlation of returns between the utility and the market would decrease, assumed for the moment to be about 0.4. What are the new risk premia for the market and the utility?

We first calculate the new variance of return for the market by multiplying 20% by 20% to get 4%. We then get the new market risk premium by multiplying 1.5 times 4% to get 6%. We obtain the new beta for the utility by multiplying the utility's own unchanged standard deviation of return of 16.08% by the utility's own new correlation with the market of 0.4, and then divide this by the now higher standard deviation of return for the market of 20%. We get a new (and lower) beta for the utility of .32. The utility's relative risk premium is now equal to its beta of 0.32 times the new market risk premium of 6, or 1.92% (i.e., about the same as before except for rounding error). Thus, the utility's relative risk premium will increase if the correlation does not drop from 0.5 to 0.4, will remain unchanged if the correlation drops from 0.5 to 0.4, and will actually decrease if the correlation drops from 0.5 to below 0.4. The evidence that we presented earlier on the rolling betas and correlations lead to the conclusion that the correlation would drop below 0.4.

These results are not surprising, since while the total market risk premium has increased from 3.80% to 6%, the risk premium per unit of risk has remained constant at 1.5. Thus, unlike the case where the coefficient of risk aversion changes, increased market risk due to a changing market composition into risky assets that are less correlated with existing assets will lower the relative risk premium for the utility, and is likely to lower it enough that the utility's own relative risk premium will decrease.

5. Relationship Between Risk Premia and Market Integration/Globalization:

Suppose now that the Canadian market is integrated with world markets. What is the proper risk premium for the Canadian market?

To answer this question, let us assume as above that the standard deviation of the Canadian market remains at 16.08%%, that the average risk aversion is 1.5 both within and outside of Canada, that the risk-free rate is the same in Canada as it is internationally, and that there are benefits from international diversification. The benefits from international diversification are such that the risk premium for an internationally diversified portfolio with the same standard deviation of return as the Canadian market is higher (say, 6%) than the previous value calculated for Canada-only investment of 3.88%.

Does this mean that the appropriate risk premium to be used for the TSE is now 6% instead of 3.88%? The answer is definitely no. While the internationally diversified portfolio and the Canadian market portfolio have the same standard deviation of return, they do not have the same level of non-diversifiable risk. While all of the total risk of the internationally diversified portfolio is non-diversifiable, much of the total risk of the Canadian market portfolio is now diversifiable, according to the theory and empirical evidence on international portfolio diversification. Thus, if 50% of the risk of the Canadian market portfolio is diversifiable when this portfolio is included in a well-diversified international portfolio, then the appropriate risk premium is not 6% or 3.88%, but it is one-half of 6% or 3%. This is why the theory and empirical evidence finds that globalization decreases the cost of capital for firms.

Schedule 1

Forecasts for Interest Rates for June 30, 2003. The table sets out data from Consensus Economics and from three banks: BMO, BNS and TD. Our forecast is simply the average.

Source	10-year Canada's	30-Year Canada's
Consensus Economics	5.70%	--
Bank of Montreal	5.70	6.00%
Bank of Nova Scotia	5.30	--
Toronto Dominion Bank	5.55	5.90
Kryzanowski and Roberts	**5.56**	**5.95**

Sources: Consensus Economics, September 2002, www.bmo.com/economic, http://www.scotiacapital.com/English/bns_econ/forecast.pdf, and http://www.td.com/economics.

Schedule 2

Debt Ratings for the Sample of Canadian Utilities and UNCA 2002

Corporate Issuer	DBRS		Standard & Poor's Rating
	Rating	Debt Rated	
Atco Ltd.	A (low)	Corporate	A+
BC Gas	A (low)	Corporate MTN and Debentures	BBB+
Canadian Utilities	A	Corporate	A+
Emera Incorporated	BBB (high)	MTN	BBB+
Enbridge Inc.	A	MTN and Debentures	A-
Fortis Inc.	BBB (high)	Unsecured Debentures	A-
Pacific Northern Gas	BB (high)	Secured Debentures	NR
TransAlta Corp.	A (low)	Unsecured Debentures	BBB+
TransCanada Pipelines	A	Unsecured Debentures & Notes	A-
Average	A (low)		A-
Hydro Quebec	**A**	**Long-term debt**	N/R

Sources: Dominion Bond Rating Service website: www.dbrs.com, Standard & Poor's website: www.standardandpoors.com, December 2, 2002.

Schedule 3

Capital Structures for Utilities 1999-2001 (percentage of long-term capital)

Utility:	Long-term debt & debentures			Preferred Shares			Common Equity		
	2001	2000	1999	2001	2000	1999	2001	2000	1999
ATCO LTD.	71.42%	77.04%	77.58%	4.03%	0.00%	0.00%	24.54%	22.96%	22.42%
B C GAS INC.	75.22%	68.16%	64.70%	0.00%	5.45%	0.00%	24.78%	26.39%	35.30%
CANADIAN UTILITIES LIMITED	56.14%	56.50%	56.31%	7.45%	7.85%	8.05%	36.41%	35.66%	35.64%
EMERA INCORPORATED	54.03%	54.16%	57.22%	0.00%	0.00%	0.00%	45.97%	45.84%	42.78%
ENBRIDGE INC.	67.80%	68.61%	69.63%	1.43%	1.53%	1.65%	30.77%	29.86%	28.73%
FORTIS INC.	64.22%	63.93%	60.95%	0.00%	0.00%	0.00%	35.78%	36.07%	39.05%
PACIFIC NORTHERN GAS LIMITED	50.75%	53.36%	55.37%	3.19%	3.25%	4.34%	46.06%	43.39%	40.28%
TRANSALTA CORPORATION	54.50%	53.15%	54.44%	0.00%	0.00%	0.00%	45.50%	46.85%	45.56%
TRANS CANADA PIPELINES LTD.	66.25%	68.22%	70.93%	2.37%	2.31%	3.88%	31.38%	29.47%	25.19%
Average	**62.26%**	**62.57%**	**63.01%**	**2.05%**	**2.27%**	**1.99%**	**35.69%**	**35.17%**	**34.99%**

Source: Calculated with data from *Stock Guide*.

Schedule 4

Total Debt to Total Assets Ratio for selected utilities 1999-2001.

Utility	Total Debt/Total Assets		
	2001	2000	1999
ATCO LTD.	56.01%	62.76%	60.13%
B C GAS INC.	74.67%	75.35%	68.93%
CANADIAN UTILITIES LIMITED	56.28%	60.42%	56.09%
EMERA INCORPORATED	58.52%	57.39%	58.89%
ENBRIDGE INC.	68.17%	62.81%	66.35%
FORTIS INC.	65.82%	61.11%	59.38%
PACIFIC NORTHERN GAS LIMITED	49.20%	60.54%	60.83%
TRANSALTA CORPORATION	52.86%	55.51%	51.98%
TRANS CANADA PIPELINES LTD.	62.97%	51.53%	62.79%
Average	**60.50%**	**60.83%**	**60.60%**

Source: Calculated with data from *Stock Guide*.

Schedule 5

Coverage ratios, allowed and earned ROEs for selected utilities 1999-2001

Utility	Interest Coverage			Cash Flow to Debt			ROE		
	2001	2000	1999	2001	2000	1999	2001	2000	1999
ATCO LTD.	3.05	2.98	2.88	0.20	0.18	0.19	14.35	14.39	14.13
B C GAS INC.	1.99	2.07	2.1	0.08	0.09	0.11	12.09	16.6	13.35
CANADIAN UTILITIES LIMITED	3.11	3.15	3.05	0.19	0.18	0.2	14.96	15.44	14.54
EMERA INCORPORATED	2.14	1.94	1.86	0.11	0.15	0.14	10.58	10.88	10.83
ENBRIDGE INC.	2.15	1.96	2.02	0.09	0.1	0.11	18.85	18.11	14.5
FORTIS INC.	2.27	1.96	2.22	0.13	0.1	0.11	12.41	9.73	8.55
PACIFIC NORTHERN GAS LIMITED	2.31	2.33	2.42	0.17	0.16	0.13	7.50	9.75	10.79
TRANSALTA CORPORATION	4.33	3.42	2.55	0.20	0.22	0.18	10.87	25.81	9.22
TRANS CANADA PIPELINES LTD.	2.21	1.79	1.63	0.12	0.09	0.07	11.31	13.99	-1.56
Average	**2.62**	**2.40**	**2.30**	**0.14**	**0.14**	**0.14**	**12.55**	**14.97**	**10.48**

Source: *Stock Guide*.

Schedule 6

Allowed Common Equity Ratios 2002

Utility	Allowed	Decision
ATCO LTD.		
ATCO ELECTRIC	35.70%	U97065
ATCO GAS AND PIPELINES	39.23%	2001-96
B C GAS INC.	33.00%	L62-01
CANADIAN UTILITIES LIMITED		
ENBRIDGE INC.	35.00%	RP-2000
EMERA	35.00%	NSUARB-P-875
FORTIS INC.		
PACIFIC NORTHERN GAS LIMITED	36.00%	LP62-01
TRANSALTA CORPORATION	41.00%	U99099
TRANS CANADA PIPELINES LTD.	33.00%	RH-4-2001
Average	35.99%	

Source: Board decisions.

Schedule 7

Four Benchmarks for HQ DIST Common Equity Ratio

1. Average of actual equity ratios for 9 utilities (Schedule 3)	35.69%
2. Average allowed equity ratio for sample (Schedule 6)	35.99%
3. Average allowed equity ratio for 4 gas utilities (From Schedule 6)	35.81%
4. Average allowed equity ratio for 2 alternative gas utilities	36.75%
5. Average of actual equity ratios for 2 alternative gas utilities	37.11%
Range of benchmarks (rounded)	**36 – 37%**

Schedule 8

This table contains various estimates of the historical annual risk premia of stocks over the risk-free rate for various time periods. Stocks are proxied by the returns on the S&P/TSX Composite index or its counterpart for more distant time periods. The risk-free rate is proxied by the returns on Long Canada's.

Time Period	Arithmetic Mean			Geometric mean			Weighted Risk Premium[a]
	Stock Returns	Long Canada Returns	Risk Premium	Stock Returns	Long Canada Returns	Risk Premium	
1924-2001 (78 yrs)	11.73	6.35	5.38	10.12	5.99	4.13	4.76
1951-2001 (51 yrs)	11.60	7.19	4.41	10.42	6.72	3.70	4.06
1957-2001 (45 yrs)	10.80	7.96	2.84	9.60	7.46	2.14	2.49
1965-2001 (37 yrs)	10.87	8.95	1.92	9.74	8.39	1.34	1.63
1977-2001 (25 yrs)	13.08	11.09	2.00	11.97	10.46	1.51	1.75

Source: Canadian Institute of Actuaries, Report on Canadian Economic Statistics, 1924-2001.

[a]The weighed risk premium is found by taking 50% of the arithmetic mean risk premium plus 50% of the geometric mean risk premium.

Schedule 9 (page 1 of 4)

This table contains some quotes describing the behavior of high-tech stock prices as being a bubble or mania in panel A, and some quotes describing examples of "aggressive" accounting by firms when reporting their financial performance in panel B.

Panel A: Quotes dealing with high-tech stock prices as being a bubble or mania

"Educated observers have been confidently predicting the end of the go-go market for years, only to wind up like roadkill at Pamplona: run over by the charging bulls. But the seemingly tireless market has created a paradox. The more it rises, the more people think it can continue rising, a belief that becomes more implausible with each upward tick. As a result, the market has never looked so dangerous and investors have rarely appeared so overconfident, inviting comparisons to the stock market crashes of 1929 and 1987. ``People have the feeling right now that they can't lose in the market,'' says Robert Shiller, professor of economics at Yale University and author of the forthcoming book *Irrational Exuberance*. ``The typical thing people will say is: `Sure it will go down, of course there will be a correction, but if you hold on for the long term you can't lose.' And that's really a mistake to think that you can't lose.'' ….

Is this a rational market, or is it beginning to resemble some sort of pyramid scheme? ``The name we have for that, and we've had it for quite a long time, is the `greater fool theory,''' says Lawrence Kryzanowski, professor of finance at Concordia University in Montreal. ``It's okay to buy one of these stocks as long as there is a greater fool in the line behind you.' ….

What does it all mean? For many observers, it spells big trouble. ``Most experienced investors fully understand that the tech stocks are in a bubble, but they are hoping that they will be able to reach the exits early enough to avoid major pain when the inevitable burst occurs,'' says a recent report from Martin Barnes, managing editor of Montreal-based *The Bank Credit Analyst*. ``Of course, history tells us that very few will reach the exits in time and most will get trampled underfoot.'' This is why Greenspan commented in January that the market could turn into one of history's ``euphoric speculative bubbles,'' making an implicit connection to the heady days of 1929….

By most opinions, Research In Motion has great potential and its earnings are indeed soaring, but that sort of growth may be an awful lot to expect. ``People are not mad,'' says Shiller. ``But history shows that there are times of excessive optimism.'' Says Kryzanowski: ``Every time we have a period of a hot market, people say `It's different.' And every time it corrects, you never hear from these people again.'' [David Berman, 2000, Market overboard: we're living through history's greatest stock market boom, but investors are getting jittery. What happens when the party's over?, *National Post Business*, April, pp. 54-60.]

Schedule 9 cont'd (page 2 of 4)

"The global high-tech stock markets ran up from the summer of 1998 to an apex in March, 2000, and then had a spectacular fall to an apparent nadir on Sept. 21, 2001. This wild swing in valuations, representing the seeming creation and then destruction of hundreds of billions of dollars of wealth, seems like yet another bubble, the most recent in the long history of *Extraordinary Popular Delusions and the Madness of Crowds* as depicted by Charles MacKay in his seminal 1841 book of that title. [Duncan Stewart, We have a habit of blowing bubbles, *National Post*, February 2002, p. SM1.]

"Jeremy Siegel, author of the best-selling book *Stocks For The Long Run* and a strong advocate of equity investing, says this decade will not be a replay of the 90's, as some people think. The bubble bursting and the end of the bull market was no "little hiccup" and it is "manifestly ridiculous" to believe that earnings growth – which drives stock prices – can average 8% to 12% this decade." [William Hanley, Bear market shakes our faith in stocks, *National Post*, February 2002, p. SM11].

"The Triple Waterfall collapse of technology stocks was history's most egregious financial mania. [Donald Coxe, Chairman and Chief Strategist, Harris Investment Management Inc., in: BMO Nesbitt Burns, *Basic Points*, February 8, 2002, p. 1.]

"What makes the business cycle unique is that it created the most extraordinary asset bubble in history. Perhaps not unique but nonetheless worth noting is that the Federal Reserve did little to stop it. True, Mr. Greenspan famously warned of irrational exuberance (that, hard as it is to believe, was five years ago). Yet interest rates were left unchanged for three months and even then he took only a feeble shot, tightening credit supply by a thin 25 basis points." [Vox, 2002, Where was the Fed as bubble grew?, *The Globe and Mail*, March 8, p. B10.]

Panel B: Quotes dealing with examples of "aggressive" accounting by firms when reporting their financial performance

"Another short-selection technique is to doggedly analyze financial statements with an eye toward companies that may be using aggressive accounting." [Gary Weiss, How to soar with falling stocks, *Business Week*, December 29, 1997.]

""Aggressive accounting practices are a problem in most industries, but the high tech industry is particularly vulnerable," says Michael Young, partner at Willkie, Farr & Gallagher in New York, who represents companies sued by shareholders after accounting restatements." [Brendan Barrett, Time for show-and-tell, *Techway*, July 24, 2000.]

Schedule 9 cont'd (page 3 of 4)

"Fourthly, there are concerns about aggressive accounting practices, both here and in the US, indeed perhaps more so in the US. I am talking of circumstances where the financial performance of a company is presented in an unrealistically favourable light in an attempt to meet market expectation, reduce tax liabilities, comply with loan covenants or meet legal or regulatory thresholds. This can lead to the market being misled about a company's profitability or performance. The Auditing Practices Board issued a consultation paper on aggressive accounting practices just a couple of weeks ago which recognises both the potential significance of the problem and the role auditors can play in managing it. I am sure we can all think of examples of companies which have engaged in somewhat imaginative accounting, capitalising R & D expenditure one year and reclassifying it the next, recognising contracts in a year where heads of agreement only have been signed and minimising disclosure relating to financial instruments, thereby failing to give shareholders sufficient information about financial risk." [Howard Davies, Chairman, Financial Services Authority (FSA), Information and market regulation, presentation at Investor Relations Conference, Kensington, England, July 9, 2001. FSA is the regulator of financial institutions in the United Kingdom.]

"Investors are jaded as the hype of the late nineties gives way to reality. 'We're in a post-bubble era,' says Jeremy Batstone, head of research at Natwest Stockbrokers. 'In the Nineties a huge amount of money was invested as people bought into the idea of the new paradigm. There was the idea of the Goldilocks economy, where everything was not too hot and not too cold. Companies thought they could expand and there would always be demand.' But the increase in capacity became overcapacity, which led to falling prices. As a result, firms were forced to embark on reckless acquisition sprees or use 'aggressive accounting' tactics to meet their massively optimistic earnings forecasts." [Jamie Doward, The enemy within USA Inc., *The Observer*, February 3, 2002.]

"The FBI and federal prosecutors … have opened a preliminary inquiry into …software company's books… Former employees have said that Computer Associates began using pro forma accounting, a practice that can make profits seem larger, because it ran out of ways to inflate its results under standard accounting rules and had to find a new method…. Computer Associates…has reported its financial results on a pro forma basis since October, 2000." [Associated Press, Computer Associates falls on inquiry news, *The Globe and Mail*, February 21, 2002, p. B26.]

Schedule 9 cont'd (page 4 of 4)

"The global association that oversees equity analysts [AIMR] is calling for major changes in accounting practices and the end to political and corporate interference with bodies that set accounting standards…. It described Enron's failure as "a deplorable but all-too-natural consequence of the erosion of the financial reporting system in the U.S."" [Richard Blackwell, Group pushes greater independence for accounting, *The Globe and Mail*, February 23, 2002, p. B3.]

"The Ontario Securities Commission will use its powers to override accounting principles set by self-regulatory organizations if they do not makes changes to ensure an Enron-style collapse doesn't happen in Canada, OSC chairman David Brown said yesterday. There needs to be a much more "robust" set of accounting rules that gives investors an accurate picture of the financial condition of every company, Mr. Brown said. … Accounting rules have drifted from a general statement of principles, to a more rules-based approach, Mr. Brown said. Particularly in the United States, this had allowed auditors to approve financial reports that comply with the rules, but don't necessarily reflect reality." [Richard Blackwell, 2002, OSC warns on accounting principles, *The Globe and Mail*, March 8, p. B4.]

"Lots of accounting issues will continue to surface," Mr. Graham [investment director at Guardian Group of Funds in Toronto] said. "Most of this is not fraud but companies were aggressive in their reporting . . ." [Luciw, Roma, Key stock indexes fall as techs retreat, *Globe and Mail*, March 13, 2002, p. B14. Our insert in brackets.]

Schedule 10

This schedule reports historical real returns and equity risk premia for the period, 1802-September 2001. “Comp.” refers to the compound or geometric mean annual rate of return; “Arith.” refers to the arithmetic mean annual rate of return; and “Weighted” refers to our equally weighted average of the geometric and arithmetic mean annual rates of return. The data are drawn from Table 1 in Jeremy J. Siegel, Historical results I, *Equity Risk Premium Forum*, November 8, 2001, 31, available on the AIMR website.

	Real Return				Equity Risk Premium Over Bonds		
	Stocks		Bonds				
Period	Comp.	Arith.	Comp.	Arith.	Comp.	Arith.	Weighted
1802-2001	6.8	8.4	3.5	3.9	3.4	4.5	4.0
1871-2001	6.8	8.5	2.8	3.2	3.9	5.3	4.6
Major Subperiods							
1802-1870	7.0	8.3	4.8	5.1	2.2	3.2	2.7
1871-1925	6.6	7.9	3.7	3.9	2.9	4.0	3.5
1926-2001	6.9	8.9	2.2	2.7	4.7	6.2	5.5
Post World War II							
1946-2001	7.0	8.5	1.3	1.9	5.7	6.6	6.2
1946-1965	10.0	11.4	-1.2	-1.0	11.2	12.3	11.8
1966-1981	-0.4	1.4	-4.2	-3.9	3.8	5.2	4.5
1982-1999	13.6	14.3	8.4	9.3	5.2	5.0	5.1
1982-2001	10.2	11.2	8.5	9.4	1.7	1.9	1.8

Schedule 11

This table provides the rolling five-year betas for our sample of three utilities that are cross-listed in the TSE and in the NYSE, and have at least five years of data for each market. We do not calculate the rolling betas for the first two rolling five-year periods for Enbridge to conform to our later treatment of these periods for this utility. All betas are calculated using monthly total returns for the utility (from the TSE or NYSE) and the S&P/TSEX Composite or the S&P500 indexes.

Five-year period	Canadian market (TSE)				U.S market (NYSE)			
	TransCanada Pipelines	Westcoast Energy	Enbridge Inc.	Mean	TransCanada Pipelines	Westcoast Energy	Enbridge Inc.	Mean
1990-1994	0.574	0.571			0.393	0.312		
1991-1995	0.540	0.557			0.394	0.255		
1992-1996	0.489	0.611	0.498		0.409	0.300	0.136	
1993-1997	0.338	0.531	0.440		0.350	0.347	0.151	
1994-1998	0.544	0.453	0.478		0.540	0.485	0.129	
1995-1999	0.239	0.261	0.237		0.179	0.426	0.081	
1996-2000	0.580	0.134	0.046		0.119	0.194	-0.001	
1997-2001	0.130	0.072	0.065		0.014	0.040	-0.096	
1990-2001[a]	0.222	0.065	0.261	0.183	0.122	0.146	-0.048	0.073
Mean of eight rolling 5-year periods	0.429	0.399	0.294	0.374	0.300	0.295	0.066	0.220

[a]The shorter period of 1992-2001 is used for Enbridge.

Schedule 12

This schedule reports the implied risk premia for the S&P/TSX Composite index using various growth rates and both the one- and two-stage dividend growth models. The implied Risk Premium or IRP is found by subtracting the then Long Canada rate from the implied rate of return generated from solving the specific DDM. g(D) and g(GNP) are the trailing annual growth rates in index dividends and in nominal GNP, which are smoothed by using a 10-year equally-weighted average. g_1(D) and g_2(GNP) are the growth rates for the first and second stage of the DDM, respectively. D/P adj. is equal to 1.5 times the dividend yield to adjust for nondividend cash distributions. L10yrs and L20yrs refer to the most recent 10 and 20 years of IRPs.

	1-stage DDM			2-stage DDM		1-stage DDM			2-stage DDM
	Using g(D) & No	Using g(GNP)		Using g_1(D) & g_2(GNP)		Using g(D) & No D/P	Using g(GNP)		Using g_1(D) & g_2(GNP)
Year	D/Padj.	No D/P adj.	D/P adj.	No D/P adj.	Year	adj.	D/P adj.	No D/P adj.	No D/P adj.
1971	1.33	5.76	7.34	7.33	1989	-0.21	2.41	4.04	4.50
1972	-0.30	4.97	6.27	6.10	1990	-2.26	1.25	3.16	3.15
1973	0.63	5.94	7.52	7.65	1991	-2.99	0.89	2.48	1.94
1974	3.03	8.22	10.99	12.21	1992	-2.53	0.85	2.38	1.79
1975	0.76	7.12	9.58	10.17	1993	-2.76	0.99	2.12	1.45
1976	0.94	8.19	10.53	10.81	1994	-5.16	-1.24	-0.05	-0.83
1977	0.88	8.21	10.57	10.96	1995	-3.15	0.08	1.22	0.54
1978	1.05	7.09	9.30	10.21	1996	-2.89	0.12	1.04	0.47
1979	1.17	5.37	7.37	9.01	1997	-2.60	0.54	1.36	0.78
1980	1.05	4.20	6.03	8.13	1998	-3.76	0.67	1.50	0.71
1981	0.38	2.87	5.11	8.40	1999	-6.37	-0.81	-0.15	-0.87
1982	2.30	5.33	7.35	9.65	2000	-5.22	0.45	1.08	0.42
1983	-0.19	3.36	4.97	6.22	2001	-3.53	0.70	1.47	0.86
1984	-0.86	3.17	5.02	5.95					
1985	0.26	3.75	5.31	6.05	Mean, full	-0.96	3.19	4.77	5.13
1986	0.98	3.47	4.96	5.65	Mean, L20 yrs	-2.03	1.54	2.87	2.91
1987	-0.02	2.37	3.91	4.64	Mean, L10 yrs	-3.80	0.24	1.20	0.53
1988	0.40	2.54	4.22	5.10					

Schedule 13

This schedule reports the implied risk premia for the S&P500 index using various growth rates and both the one- and two-stage dividend growth models. The implied Risk Premium or IRP is found by subtracting the then Long bond rate from the implied rate of return generated from solving the specific DDM. g(D) and g(GNP) are the trailing annual growth rates in index dividends and in nominal GNP, which are smoothed by using a 10-year equally-weighted average. g_1(D) and g_2(GNP) are the growth rates for the first and second stage of the DDM, respectively. D/P adj. is equal to 1.5 times the dividend yield to adjust for nondividend cash distributions. L10yrs and L20yrs refer to the most recent 10 and 20 years of IRPs.

	1-stage DDM			2-stage DDM		1-stage DDM			2-stage DDM
	Using g(D) & No D/Padj.	Using g(GNP)		Using g_1(D) & g_2(GNP)		Using g(D) & No D/P adj.	Using g(GNP)		Using g_1(D) & g_2(GNP)
Year		No D/P adj.	D/P adj.	No D/P adj.	Year		D/P adj.	No D/P adj.	No D/P adj.
1971	1.74	4.61	6.16	6.10	1989	2.57	3.09	4.75	5.51
1972	0.46	4.40	5.75	5.56	1990	2.50	2.85	4.72	5.54
1973	1.46	5.52	7.37	7.37	1991	2.75	2.58	4.14	4.69
1974	1.81	6.70	9.42	9.40	1992	2.45	2.99	4.44	4.84
1975	-0.97	4.81	6.88	6.39	1993	3.03	3.17	4.53	4.79
1976	1.07	5.95	7.92	7.80	1994	0.73	1.04	2.49	2.68
1977	2.60	6.94	9.50	10.07	1995	2.35	2.28	3.43	3.54
1978	2.01	6.39	9.08	9.96	1996	1.99	1.53	2.53	2.70
1979	1.64	5.49	8.26	9.64	1997	1.30	1.42	2.22	2.21
1980	-0.65	2.68	5.05	6.57	1998	1.47	2.13	2.79	2.68
1981	-0.02	2.68	5.46	7.79	1999	-1.51	0.31	0.88	0.68
1982	2.60	4.36	6.83	8.83	2000	-1.17	1.41	2.03	1.74
1983	-0.34	2.43	4.59	5.80	2001	-1.71	1.54	2.23	1.83
1984	1.02	3.23	5.57	7.25					
1985	2.90	4.33	6.27	7.72	Mean, full	1.30	3.50	5.23	5.77
1986	3.23	5.42	7.11	7.85	Mean, L10 yrs	0.89	1.78	2.76	2.77
1987	1.37	3.46	5.31	6.06	Mean, L20 yrs	1.46	2.61	4.07	4.61
1988	1.71	2.60	4.44	5.35					

Schedule 14

This schedule reports the implied risk premia or IRP for the S&P/TSX Composite and S&P500 index using various growth rates based on forecasts of future GNP growth and of S&P500 index returns and the one-stage dividend discount model or DDM. The implied Risk Premium or IRP is found by subtracting our long-term bond rate estimate from the implied rate of return generated from solving the constant growth or one-stage DDM. Div. Yield is the dividend yield for the respective index from Bloomberg as of December 6, 2002. The growth estimate for case 1 is the forecasted growth in nominal GNP from Economist.com as of November 9, 2002 for each country. The growth estimate for case 2 is of the strategist forecasts of earnings growth for the S&P500 index taken from Zacks as of December 10, 2002. Since no growth estimate was available for the S&P/TSX Composite, the S&P500 index forecast was also used for the S&P/TSX Composite. The growth estimate for case 3 is the earnings growth estimate for case 2 reduced by 15% to reflect the optimism bias inherent in strategist forecasts of market earnings. The one-stage or constant growth DDM assumes that the growth rates in dividends, earnings and price growth are all equal and constant over time.

Case	Div. Yield %	Growth Estimate %	Long Bond Rate %	IRP %
S&P/TSX Composite				
1	1.91	5.50	6.00	1.41
2	1.91	5.00	6.00	3.91
3	1.91	6.80	6.00	2.71
S&P500				
1	1.76	5.50	5.19	1.57
2	1.76	5.00	5.19	4.57
3	1.76	6.80	5.19	3.37

Schedule 15

This table provides the rolling five-year betas for our sample of ten utilities. If thin or no trading plagues any five-year period, we do not calculate a beta for that utility. This was the case for NS Power Holdings for the first three rolling five-year time periods, for Pacific Northern Gas for the first six rolling five-year time periods, and Enbridge for the first two rolling five-year time periods. All betas are calculated using monthly total returns for the utility and the S&P/TSX Composite index.

Five-year period	BC Gas	Canadian Utilities	NS Power Holdings[a]	Pacific Northern Gas	TransAlta Corp.	TransCanada Pipelines	Westcoast Energy	Enbridge Inc.	Atco Ltd.	Fortis Inc.	Mean
1990-1994	0.608	0.592			0.558	0.574	0.571		0.715	0.462	0.583
1991-1995	0.635	0.498			0.606	0.540	0.557		0.712	0.533	0.583
1992-1996	0.562	0.561			0.585	0.489	0.611	0.498	0.600	0.390	0.537
1993-1997	0.474	0.634	0.405		0.462	0.338	0.531	0.440	0.546	0.310	0.460
1994-1998	0.479	0.616	0.564		0.536	0.544	0.453	0.478	0.623	0.484	0.531
1995-1999	0.352	0.530	0.414		0.285	0.239	0.261	0.237	0.509	0.320	0.350
1996-2000	0.243	0.361	0.275	0.453	0.065	0.580	0.134	0.046	0.377	0.216	0.275
1997-2001	0.251	0.325	0.294	0.260	0.078	0.130	0.072	0.065	0.332	0.130	0.194
Mean	0.450	0.515	0.390	0.357	0.397	0.429	0.399	0.294	0.552	0.356	0.439
First four rolling periods											0.541
Last four rolling periods											0.337

[a]Now called Emera Inc.

Schedule 16

This table provides the rolling five-year correlations for our sample of ten utilities with the market. If thin or no trading plagues any five-year period, we do not calculate a correlation for that utility. This was the case for NS Power Holdings for the first three rolling five-year time periods, for Pacific Northern Gas for the first six rolling five-year time periods, and Enbridge for the first two rolling five-year time periods. All correlations (rhos) are calculated using monthly total returns for the utility and the S&P/TSX Composite index. The mean relative standard deviations (sigmas) of the sample of utilities to the market are also presented.

Five-year period	BC Gas	Canadian Utilities	NS Power Holdings	Pacific Northern Gas	TransAlta Corp.	Trans Canada Pipelines	Westcoast Energy	Enbridge Inc.	Atco Ltd.	Fortis Inc.	Mean rho	Relative mean sigmas, TransCanada Pipelines	
												In	Out
1990-1994	0.571	0.581			0.458	0.492	0.407		0.468	0.485	0.495	1.193	1.198
1991-1995	0.544	0.485			0.523	0.506	0.362		0.447	0.494	0.480	1.232	1.260
1992-1996	0.513	0.512			0.579	0.481	0.415	0.440	0.439	0.391	0.471	1.148	1.166
1993-1997	0.476	0.619	0.445		0.456	0.310	0.414	0.325	0.451	0.361	0.429	1.082	1.081
1994-1998	0.557	0.655	0.605		0.553	0.464	0.440	0.442	0.571	0.603	0.543	0.986	0.963
1995-1999	0.363	0.554	0.426		0.248	0.185	0.291	0.221	0.480	0.424	0.355	1.013	0.979
1996-2000	0.238	0.358	0.299	0.287	0.058	0.079	0.120	0.042	0.291	0.311	0.208	1.719	1.097
1997-2001	0.257	0.363	0.344	0.134	0.064	0.019	0.065	0.060	0.281	0.180	0.177	1.672	1.108
Mean	0.440	0.516	0.424	0.211	0.367	0.317	0.314	0.255	0.429	0.406	0.395	1.256	1.106
First four rolling periods											0.469	1.164	1.176
Last four rolling periods											0.321	1.348	1.037

Source: *CFMRC*.

Schedule 17

This table reports the % issue fees for Canadian utilities based on issues over the five-year period, 1997-2001

Type of financing	Maturity[a]	Number of issues	Median %Fee	Amortization period in years	Annual Amortized % Fee
Debt	< 10 years	52	0.37		
Debt	> 10 years	52	0.50	20	0.025
Preferred		16	3.00	50	0.06
Common		15	4.00	50	0.08

Issuers with following SIC codes: 4612 (crude petroleum pipelines), 4911 (electric services), 4922 (natural gas transmission), 4923 (natural gas transmission and distribution), and 4924 (natural gas distribution). Debt maturity is measured as maturity date compared to announcement date of the issue.

Source: *Financial Post Data Group*.

Schedule 18

This table reports the measure of performance for the Gas/Electric sub-group of the TSE300 Index using the TSE 300 Index as the benchmark portfolio. The measure of abnormal performance is given by the estimated intercept or alpha from a regression of the excess return on the sub-group against the excess returns on the TSE 300 index. An excess return is equal to the return on the sub-group (or TSE 300) for month t minus the risk-free rate for month t. In performance tests, the risk-free rate is proxied by the T-bill return.

	1980-2000		1991-2000	
	Sub-group	TSE300	Sub-group	TSE300
Panel A: Annualized monthly mean and standard deviation of returns				
Mean	13.54%	12.80%	14.78%	14.44%
Standard deviation	13.94%	16.82%	12.44%	15.10%
Panel B: Regression results				
Alpha (abnormal return or “free lunch”)	2.70%		6.16%	
Beta	0.46		0.29	

Source: TSE 300 and Gas/Electric sub-group total return indexes.

Schedule 19

Comparison of Witnesses Rate of Return Evidence Against Adjustment Formulas

Source	Long-Canada Forecast	Recommended Return	Risk Premium (Basis Points)
I. Witnesses			
Kryzanowski/ Roberts	6.00%	8.45%	245
Morin	6.00	10.5 – 11.0%	450 - 500
III. *Regulatory Boards*			
NEB	6.00%	9. 81%	381
OEB	6.00%	9.71%	371
BCUC	6.00%	9.50%	350
Manitoba PUB	6.00%	9.62%	362
Newfoundland PUB	6.00%	9.45%	345
Average for Boards	**6.00%**	**9.62%**	**362**

Generic Cost of Capital Proceeding
Proceeding No. 1271597

Prepared Testimony

On Capital Structure, Fair Return on Equity and Annual Adjustment Mechanism

of

Dr. Lawrence Kryzanowski and Dr. Gordon S. Roberts

On Behalf of the Consumers Group

Ned Goodman Chair in Investment Finance, John Molson School of Business, Concordia University, Montreal, Canada; and CIBC Professor of Financial Services and Area Coordinator, Schulich School of Business, York University, Toronto, Canada.

September 12, 2003

TABLE OF CONTENTS **Page**

I. INTRODUCTION AND SUMMARY

Q. Please state your names, employment and professions.

A. We are Dr. Lawrence Kryzanowski of Concordia University and Dr. Gordon S. Roberts of York University. Dr. Kryzanowski is currently Ned Goodman Chair of Investment Finance at the John Molson School of Business, Concordia University. He earned his Ph.D. in Finance at the University of British Columbia. Dr. Gordon S. Roberts is currently CIBC Professor of Financial Services and Area Coordinator, Finance Area, at York University's Schulich School of Business. He earned his Ph.D. in Economics at Boston College.

Q. Please describe your experience relative to your current role of submitting evidence before the Board.

Dr. Kryzanowski has experience in preparing evidence as an expert witness in utility rate of return applications, stock market insider trading court proceedings, and confidential final offer arbitration hearings for setting of fair rates for the movement of various products by rail. Together with Dr. Roberts in 1997, he prepared a report for the Calgary law firm, MacLeod Dixon, on rate of return considerations in the pipeline application by Maritimes and Northeast. For a group of organizations collectively and most recently referred to as the Consumers Group (formerly UNCA Intervenor Group and FIRM Customers), Drs. Kryzanowski and Roberts provided evidence on the fair return on equity and the recommended capital structure for ATCO Electric Limited in its 2001/2002 Distribution Tariff Application and for Aquila Networks Canada (Alberta) Ltd. ("ANCA") in its 2001/2002 Distribution Tariff Application and its 2002 Distribution Tariff Application (DTA) No. 1250392 before the Alberta Energy and Utilities Board. On behalf of the Province of Nova Scotia, they provided evidence and testified before the Nova Scotia Utility and Review Board in the matter of Nova Scotia Power Inc. in 2002. They filed evidence and testified before the Regie de l'Energie du Quebec for the Fédération canadienne de l'entreprise indépendante ("FCEI") / Union des municipalities du Québec ("UMQ") & Option consommateurs ("OC") in the 2003 application of Hydro Quebec Distribution.

Dr. Roberts is also experienced in preparing evidence for utility rate of return hearings. From 1995–1997 he submitted prefiled testimony as a Board witness in rate hearings for Consumers Gas. In 1996, he served as an expert advisor to the Ontario Energy Board in its Diversification Workshop. As noted above, together with Dr. Kryzanowski, he has also prepared evidence on rate of return and capital structure considerations for a pipeline application by Maritimes and Northeast in 1997, electricity applications by Atco in 2000, by ANCA in 2000 and 2002, by Nova Scotia Power Inc. in 2002, and by Hydro Quebec Distribution in 2003.

More broadly, Drs. Kryzanowski and Roberts often provide technical expertise and advice on financial policy. Among their consulting clients in recent years are the Superintendent of Financial Institutions, the federal Department of Finance, Canada Investment and Savings, Canada Mortgage and Housing Corporation, and Canada Deposit Insurance Corporation. Our brief *curricula vitae* are attached as Appendix 1.A

Q. What is the purpose of the evidence that you are presenting here?

A. Our evidence is sponsored by the following intervener groups, which have typically participated in gas and electric regulatory proceedings:

Aboriginal Communities
Alberta Association of Municipal Districts and Counties

Alberta Federation of REAs Ltd.
Alberta Irrigation Projects Association
Alberta Urban Municipalities Association
Canadian Forest Products
Consumer Coalition of Alberta
Federation of Alberta Gas Co-ops Ltd. and Gas Alberta Inc.
Public Institutional Consumers of Alberta.

This group is collectively referred to as the Consumers Group (CG). The Consumers Group has retained us to provide evidence on the fair return on equity, recommended capital structures, and an automatic adjustment mechanism for the applicant utilities in the present hearing, no. 1271597.

Q. Please describe the general approach that you have used in preparing your evidence.

In preparing our evidence we considered and used various techniques for determining an appropriate capital structure and for measuring the fair return on equity for a regulated utility. Although some of the applicant utilities are owned by municipal governments and others are subsidiaries of shareholder-owned companies, we follow the stand-alone principle under which capital structure and the fair return on equity are determined as if each company were “standing alone” as a shareholder-owned entity.

For the determination of the recommended rate of return on equity, we considered and eliminated various approaches as being unreliable, and formulated our recommended rate of return primarily based on the Equity Risk Premium Test. We supplement our rate of return evidence by conducting a Discounted Cash Flow (DCF) analysis, and benchmarking against the return expectations for stocks and bonds of various samples of buy- and sell-side investment professionals.

For determining appropriate capital structures, we conducted an analysis of the bond ratings, capital structures, interest coverage ratios, returns on equity and equity ratios (both actual and those allowed by regulators) for a comparable sample of utilities. We then determined an appropriate equity ratio for an average-risk utility. To arrive at a recommendation for each applicant company, we made two adjustments. First, we adjusted our overall capital structure to reflect the risk of an average utility in each of the four industry sectors. Second, we made another set of adjustments, as needed, to reflect the risks of individual companies within each sector.

We develop an automatic adjustment formula for the fair rate of return encompassing shifts in the long Canada rate as well as changes in the equity risk premium due to shifts in the market dividend yield. We also present our recommendations on what circumstances should trigger a review of the automatic adjustment mechanism and recommended capital structures.

Q. Please provide a summary of your evidence indicating the major conclusions of each section.

A. In section II, we lay out the methodology that we employ in section VI to update the generic rate of return and capital structures for the applicant companies for years subsequent to 2004. We summarize this methodology in our overview of section VI below.

Section III examines current economic and financial market conditions in the U.S. and Canada and forecasts those economic variables that we use as inputs in the fair rate of return and capital structure tests.

Two long-term trends make up an important context to our forecast here as well as to our analysis of the fair rate of return on equity in Section IV of our evidence. The first trend derives from the belief widely held by knowledgeable market participants that equity risk premiums will be significantly lower in the future than suggested by extrapolation from realized equity returns in the boom years of the second half of the 1990s. The second trend is the growth of income trusts, or income funds, as an important new sector of Canadian capital markets with important implications for the expected rate of return that investors expect from investing in utilities' shares.

Turning from trends to our economic forecast, we note that the Canadian economy slowed in the first half of 2003 due primarily to three negative factors. The first is a series of disasters: the SARS scare in Toronto, the power blackout in the east, mad cow disease in Alberta and the fires in the Okanagan and other locations in Western Canada. Secondly, Canadian exports have been negatively impacted by the significant increase in the dollar against its U.S. counterpart. The third factor is slow growth in the U.S. economy in the first half of 2003. As the economy overcomes the effects of the disasters and the U.S. continues to recover, the economic forecast is for moderate real growth in Canada of 2% in 2003 and under 3% in 2004.

Turning to interest rates, for rate-making purposes we require a forecast of the rate on 30-year Canada's. We examine forecasts from four sources: Consensus Economics, Bank of Montreal, Bank of Nova Scotia and Toronto Dominion Bank. Using 2004 as our "test year", we employ forecasts for June 30, 2004 to represent an "average" for the year. We employ both direct forecasts of the 30 year Canada rate as well as forecasts for 10 year Canada's adjusted upward by an average spread. We forecast the long-term interest rate or yield at 5.60%.

In Section IV, we estimate the fair rate of return for the applicant companies using primarily the Equity Risk Premium Test. We assess the expected market risk premium for the average Canadian stock at 4.70%. We check and reaffirm this conclusion using a Discounted Cash Flow (DCF) test employing historical and future estimates of dividend growth rates for the market proxy, and with comparisons of the long-term return expectations of buy- and sell-side investment professionals for equities and bonds. Next, we determine that an average risk utility is 50% as risky as the S&P/TSX Composite. We add an adjustment of 10 basis points for flotation costs. Given our point forecast of a long-term Government of Canada bond rate of 5.60%, we are recommending a return on equity of 8.05%. Our return on equity recommendation allows an average risk utility a risk premium (with inclusion of the flotation cost adjustment) of 245 basis points over our forecast for long Canada yields. As explained earlier, we apply this recommended rate of return uniformly to all the applicant utilities.

Section V contains our views on the appropriate capital structure for each sector of the utility industry as well as for each of the individual applicant companies. We begin by examining relevant financial data for a sample of eight Canadian utilities. We analyze their bond ratings, capital structures, interest coverage ratios and returns on equity. We then turn to an examination of the implications of holding company structures. Next, we look at Standard & Poor's rating guidelines and demonstrate why they are not a suitable basis for the analysis of capital structures in these proceedings. From here, we briefly review the practical implications of finance theory on capital structure for utilities. We then draw on the business risk evidence of Mr. Robert T. Liddle and Mr. William C. Marcus as a basis for our recommendation of an appropriate capital structure for each sector of the industry. Next, we turn to examining the equity ratios of comparable companies – both the actual ratios and the ratios allowed by regulators. Based on these examinations and tests, we arrive at a recommendation for the appropriate equity ratio for each of the applicant companies by industry sector as shown in the table that follows.

Applicant	Recommended Equity Ratio
Altagas Utilities	40%
AltaLink Management Ltd.	30%
Aquila Networks Canada (Alberta)	
Distribution	35%
ATCO Gas	37%
ATCO Electric Distribution	35%
ATCO Electric Transmission	30%
ATCO Pipelines	40%
ENMAX Power Corp. Distribution	35%
EPCOR Distribution	35%
EPCOR Transmission	30%
NOVA Gas Transmission	32%

In Section VI of our evidence we present our recommendation for the automatic adjustment formula. We recommend that the adjustment mechanism have two components. The first component is mathematically identical to the adjustment for shifts in the expected rate on 30 year Canada's employed by the National Energy Board and the Ontario Energy Board. The second component is new and is designed to adjust the market risk premium to reflect shifts in expectations of dividend yields. The adjustment formula we recommend is as follows, illustrated for 2005:

ROE_{2005} = ROE_{2004} + 0.75 [(2005 expected 30 year Canada rate) – (2004 average 30 year Canada rate)] + 0.50 [(2005 expected dividend yield) – (dividend yield 2004)]

This is the NEB formula and method of calculation, with the exception of the additional term to capture the expected change in the equity risk premium. Including one-half of the expected change in the dividend yield on the market index over the next year is designed to capture changes in the expected equity risk premium for the forthcoming year. The expected change in the dividend yield will require the procurement of an expected dividend yield for the S&P/TSX Composite over the next year. We provide numerous ways in which such an expectation can easily be obtained in Section VI of our evidence.

Section VII of our evidence contains our critique of key aspects of the evidence dealing with the 2004 recommended ROE(s) and capital structures, recommended automatic adjustment mechanisms and review processes, and economic/financial market assessments of the following expert witnesses:

- Ms. McShane, expert witness for ATCO Utilities [ATCO Gas, ATCO Electric (TRANSCO and DISCO), and ATCO Pipelines] and AltaGas Utilities (AUI).
- Dr. Evans, expert witness for AltaLink Management Ltd. (AltaLink), Aquila Networks Canada (Alberta) Ltd. (Aquila), EPCOR Distribution Inc. (EDI) and EPCOR Transmission Inc. (ETI) (collectively the Companies).
- Dr. John A. Neri and Mr. Richard Falconer, expert witnesses for ENMAX Power Corporation.
- Dr. A. Lawrence Kolbe, Mr. Gordon S. Lackenbauer, Mr. Paul J. Murphy and Dr. Michael J. Vilbert, expert witnesses for Nova Gas Transmission Ltd.

We focus on four key areas in our critique: the forecast for the 30 year Canada rate, return on equity, recommended capital structures and automatic adjustment mechanisms. Turning to the first area, we find that with the exception of Dr. Neri, all of the witnesses listed arrive at forecasts quite similar to our own. We note a few technical differences. For return on equity, the second area, we document in detail a number of adjustments that the witnesses listed either make or fail to make to standard methodologies. We demonstrate that the stance of the other experts on these adjustments or non-adjustments consistently leads them toward a higher recommended return on equity when compared with our recommendation. We complete our discussion of the second area with a detailed comparison of recommendations for the 2004 returns on equity by other witnesses, ourselves, and the results of the various adjustment formulas currently in use by Canadian regulators. We regard the regulatory formulas as generous because they do not reflect the trend toward a lower market risk premium discussed in section III of our evidence and are incorporated in our recommendations. With this in mind, we conclude that, should the Board wish to move deliberately in the direction of implementing a lower risk premium, it would be appropriate to set the fair rate of return for an average risk utility somewhere between our recommendation of 8.05% with a risk premium over long Canada's of 245 basis points and the average of regulatory formulas at 9.27% and an average risk premium of 367 basis points. The analysis also demonstrates once more the upward biases of the other witnesses listed.

Q. Please summarize your recommendations for the rate of return portion of your evidence using a format that is suitable for comparing your recommendation with those of the other witnesses.

A. The following table contains the summary.

	Component		Flotation Allowance	Total	Weight
	1	2			
Discounted Cash Flow Test	N/A	Risk Premium of 4.70% for S&P/TSX Composite is conservatively high	N/A	N/A	0%; for bench-marking purposes only
Survey Expectations of Investment Professionals*	N/A	Risk Premium of 4.70% for S&P/TSX Composite is conservatively high	N/A	N/A	0%; for bench-marking purposes only
Equity Risk Premium Test	Risk-free Rate of 5.60%	Risk Premium (50% of) of 4.70% = 2.35%	0.10%	8.05%	100%
Recommendation	**5.60%**	**2.35%**	**0.10%**	**8.05%**	**100%**

*Includes surveys conducted by W.M. Mercer Limited and Watson Wyatt.

II. METHODOLOGY FOR GENERIC RETURN ON EQUITY AND CAPITAL STRUCTURES

Q. Please explain the purpose of this section of your evidence.

A. This section provides a brief overview of the scope of this hearing, the goals of generic formulas in regulation and the methodology we employ in setting a fair rate of return on equity for an average risk utility in Alberta and for setting the capital structures for the applicant companies.

Q. Please begin by discussing the scope of the hearing and how you address the issues identified by the Board in your evidence.

A. In Appendix A of its Ruling on Procedural and Transitional Issues of May 28, 2003, the Board divided the scope of the proceedings into two main headings. Under the first heading, Return on Equity, are listed four main areas that we address in turn here:

1. return on equity methodology
2. allowed 2004 return on equity
3. annual adjustment mechanism
4. process to review the return on equity.

We address points 1 and 2 in section IV of our evidence. As explained there in more detail, our determination of the return on equity is based on the general principles underlying our evidence filed most recently with the Board in the Aquila Networks Canada Alberta Distribution Tariff Application No. 1250392. We maintain the definition used there:

> "We believe that the regulatory process should ensure that [the company] earns a return on common equity that compensates

investors for the risk level of its shares and enables [the company] to maintain its financial integrity and to meet its financial obligations”.[1]

In section IV, we employ the Equity Risk Premium Test to determine a fair rate of return for a utility of average risk. We supplement our analysis in various ways, including the use of the DCF method at the level of the market as a whole, and the use of surveys of the expectations of buy- and sell-side investment professionals about long-term equity and bond returns. Once we have determined the return appropriate to the average-risk utility, we apply it to all of the applicant companies. Rather than attempting to individualize the fair rate of return for each applicant company, we apply one rate to all the companies and recognize risk differences among them through their capital structures.

This approach has three advantages. First, it avoids introducing adjustments based on judgment into the cost of equity, an area of our evidence that is amenable to the use of sophisticated econometric techniques. Instead, we focus on the professional judgment required to distinguish among individual companies in the area of capital structure, a part of our evidence that is not well-suited to the use of formulas and econometrics. Second, Canadian precedent provides moderate support for our methodology. Our approach is consistent with practice in some other Canadian jurisdictions employing adjustment mechanisms. For example, the National Energy Board applies a common rate of return to a set of gas pipeline companies under its regulation while allowing for different capital structures. However, in other Canadian jurisdictions applying automatic adjustment formulas, both rates of returns and capital structures vary among companies. BC is an example of this latter approach. Third, we believe it is better to set a single rate of return on

[1] Kryzanowski and Roberts testimony, page 31, line 29 through page 32, line 4.

equity because, when carried over to the automatic adjustment mechanism, this approach should serve to streamline the process.

This brings us to point 3, the annual adjustment mechanism, and we present our recommendation in section VI of our evidence. The Board has set the goal for the annual adjustment mechanism, or standardized approach in its letter of May 28, 2003:

> "…a standardized approach to rate of return on equity and capital structure has the potential to achieve certain positive benefits including reduced regulatory costs, while continuing to result in a fair return for all utilities and in just and reasonable rates for all customers."

To achieve this goal, we recommend a mechanism that adjusts the fair rate of return for shifts in the long Canada rate, smoothes the fair rate of return by eliminating some of the random noise in interest rate shifts, and reflects shifts in the market risk premium due to changes in expected dividend yields on the market proxy.

Once the automatic adjustment mechanism is in place, it is necessary to specify the conditions under which it needs to be adjusted and we consider these as well in section VI. Consistent with the Board's statement of the goal of this hearing, our recommendation balances reduced regulation costs by avoiding excessively frequent reviews with fairness through incorporating triggers for reviews when market conditions change significantly. However, we do not provide an exhaustive list of such triggers because many of the possible triggers depend upon the automatic adjustment mechanism ultimately chosen by the Board.

Q. Kindly discuss the topics under the second major heading in the Board's Scope of Proceeding Appendix.

A. The second major heading deals with capital structure and lists five topic areas:

1. capital structure of each utility sector
2. impact on capital structure of utility holding company structures
3. adjustments to capital structure for non-taxable entities
4. 2004 capital structure for each utility company
5. events and process which might result in adjustments to capital structure.

Section V of our evidence addresses points 1-4. Examining the applicant companies we identify four utility sectors: gas distribution, electricity distribution, gas transmission and electricity transmission. Drawing on the business risk evidence of Mr. Robert T. Liddle and Mr. William C. Marcus, we set a capital structure for a typical company in each of these sectors. Next we discuss utility holding company structures and non-taxable entities and determine how, if at all, these factors need to be taken into account when moving from capital structures by sectors to setting recommended equity ratios for individual applicant companies. Then drawing on these discussions, along with the evidence of Mr. Liddle and Mr. Marcus, we set recommended capital structures for each of the applicant companies by sectors.

Finally, we address point 5 in section VI drawing on the principles we employed in addressing point 4 under return on equity.

III. ECONOMIC AND FINANCIAL MARKET CONDITIONS

Q. How is this portion of your evidence organized?

A. We begin by discussing two long-term trends in capital markets that form an important backdrop to our forecast here and to our analysis of the fair rate of return on equity in Section IV. Next, we present our view of the economic outlooks for Canada and the U.S. We conclude with our forecasts of the long Canada rate to be used in our rate of return analysis.

Q. Are there any long-term trends that influence your forecasts?

A. Yes, there are. The first relates to shifts in expected market risk premiums. The second trend is the growth of income trusts in Canada and how they afford an opportunity to obtain another benchmark for the required return for a regulated utility.

Q. Please explain the first trend related to market risk premiums.

A. After the recession of the early 1990s, the rest of the decade was an ideal period in capital markets due to a long economic expansion and falling interest rates. As evidence of the economic expansion, note that between January 1990 and December 1999 real GDP in Canada grew by 37.33%.[2] Average real GDP growth in Canada was 2% annually between 1990 and 1998, and was 5.1% in 1999 and 4.4% in 2000. Annual average real GDP growth in the U.S. was 2.9% between 1990 and 1998, and averaged 4.1% in 1999 and 2000. As evidence of falling interest rates, 91-day Canadian T-Bills decreased from 12.13% in January 1990 to 4.82% in December 1999, while U.S. T-Bills decreased from 7.75% to 5.37%. In brief, most of

[2] See CANSIM II SERIES V498943, V122484 and V121817.

the 1990s was an ideal period for capital markets characterized by strong and sustained growth for much of the period and falling interest rates.

Because the boom years of the 1990s were such a unique period, knowledgeable market participants do not expect that the excess of equity returns over long Canadian bond yields will be as high in the future. Evidence of falling equity premia comes from a number of sources. The Watson Wyatt *21st Annual Canadian Survey of Economic Expectations 2003*, a survey of Canadian economists and portfolio managers, reports a median forecasted long-run total return on the S&P/TSX Composite index of 7.8% between 2008-2017, and a median forecasted yield on Canadian ten-year bonds of 5.5% between 2008-2017. This suggests a market risk premium over 10-year Canada bonds of 2.3%. Although the Watson Wyatt survey does not report forecasts for 30-year bonds, we deduce that, given a positively sloping yield curve, the risk premium over 30-year bonds will be even smaller. Somewhat higher results (3.5%) come from 2002 and 2003 *Fearless Forecasts*, surveys conducted by William Mercer Inc.

In Section IV of our evidence and in Appendix 4.C, we return to the equity risk premium and summarize a large body of research predicting that, in the future, it will be well below its historical average.

Q. Please explain the second significant market development.

A. A second important trend is the growth of income trusts in Canada and their introduction to U.S. capital markets. Mr. John McCormick discussed this trend in his Written Evidence on Behalf of the City of Calgary of December 13, 2002 on the AltaLink Management application No. 1279345, pages 7-10. His evidence establishes that the income trust sector has grown rapidly since 1996 attracting significant amounts of capital. He reviews the yields and returns of a sample of five power and pipeline income trusts and concludes on lines 10-11 of page 9: "Without earning the return which the applicant seeks [10.75%], many of these funds have been able to attract capital." Mr. McCormick goes on to conclude (lines 9-11, page 10): "The market prices and history of issues by these funds, in my opinion, make a significant statement about the adequacy of single digit returns on equity in the current market."

Q. Mr. McCormick's evidence is dated December 13, 2002 and is based on data ending September 30, 2002. Please explain the tests you conducted to ensure that his conclusions are still current.

A. We conducted several updates to Mr. McCormick's evidence all of which serve to reinforce his conclusions strongly.

First, we note that as of September 2002, there were approximately 137 income trusts listed on the TSX with a total market capitalization of "just over $39 billion" (page 8, lines 7-9). According to the *National Post* (July 1, 2003), additional new trusts representing 86% of the market value of initial public offerings in 2002 have increased the sector size to 198 trusts with a total market capitalization of $55 billion.

Second, as of September 2002, the average power income fund in Mr. McCormick's sample of five trusts had an average return of 6.2% for the 12 months ending September 30, 2002. The average yield was 9.3%. We update these numbers for the same five trusts in Schedule 3.1 using data from the Income Fund Monitor produced by Scotia Capital for August 2003. The cash yield represents Scotia Capital's projection for the year 2003 and expected return is projected through the end of July 2004. Comparing the cash yield with the number obtained by Mr. McCormick, we note that, while our figure is marginally lower, it remains correct to state that the average fund in his sample still has an expected cash yield of around 9%. Further, Scotia Capital expects that the prices of units will fall as interest rates rise over the next year and this is reflected in the average lower expected return of 3.6%.

Mr. McCormick concludes on page 9, lines 8-9: " For the 12 months ended September 30, 2002, these funds earned between 3.5% and 8.2%, in all cases less than the 10.75% sought by the applicant." Taking the higher of the two averages in Schedule 3.1 of 8.9%, we reinforce his conclusion: investors expect single digit returns for income funds that are comparable to the applicants. We would argue that the 8.9% is an upper bound estimate for the ROE for a non-income trust utility with comparable average-risk for two reasons. First, the income fund structure effectively shifts taxation from the corporation to the individual investor by eliminating corporate income taxes if all income is paid out to investors. Income trusts are considered to be more tax efficient than their non-trust counterparts on a combined corporate and individual investor basis. This is due to the fact that the tax benefit from the elimination of taxes at the corporate level more than offsets the increase in taxes at the investor level where the non-return-of-capital portion of any payment is treated as income and taxed accordingly. Thus, to maintain the same expected after-tax return from a dollar of corporate payout for income trusts and their non-trust counterparts, the before-tax expected return on the income trusts needs to exceed its non-trust counterpart.

Second, there is considerable debate about the likelihood of unlimited liability associated with income trusts and not with their non-trust counterparts. As a result many institutional investors, such as the tax-exempt pension funds, have avoided investments in income trusts. Thus, one would expect that the expected return of an income trust would include a return premium to compensate for this risk while its non-trust counterpart would not.

Q. What is your forecast for the Canadian economy for 2003?

The Canadian economic outlook is less positive than in the first half of 2003.[3] Three factors are responsible. First, a series of systemic disasters has impacted the economy. Although the permanent impact of the August power blackout in the east is likely to be marginal, the earlier SARS scare in Toronto harmed the local economy and negatively impacted tourism across the country. The spectre of mad-cow disease has damaged the cattle industry in Alberta counterbalancing the impact of higher energy prices. Finally, the major fires in the Okanagan, will have a significant negative impact on the BC economy.

Second, the sharp increase in the Canadian dollar has harmed exporters with the forest products industry taking the biggest hit. A secondary negative effect will lead to a slowdown in import competing industries.

Third, the U.S. economy was weak in the first half of 2003 and just started to recover at the end of the second quarter. Positive factors in the U.S. include recovery in equity markets, extremely low short-term interest rates and accommodative monetary policy as well as tax cuts and Iraq war spending. On the less positive side, business investment remains weak.

The economic slowdown and U.S. monetary policy caused the Bank of Canada to lower rates by 25 basis points on September 3, 2003. All these factors support a forecast of real GDP growth in Canada in the range of 2% for 2003 and just under 3% for 2004. In comparison, in the U.S., real economic growth will be stronger going forward. While real growth in the

[3] Our economic forecast is drawn from BMO Financial Group Economics, *North American Outlook*, June 17, 2003 and *Canadian Regional Outlook – June 2003 at www.bmo.com*; TD Economics, *TD Quarterly Economic Forecast*, June 27, 2003, *Provincial Economic Outlook*, July 30, 2003 and *The Weekly Bottom Line*, August 1, 2003 on www.td.com/economics; and Scotia Economics, *Market Trends*, and *Forecast Update, both* August 1, 2003, www.scotiabank.com.

U.S. economy is expected to be only 2% for 2003, forecasters predict stronger real growth at 3.5% in 2004.

Q. What are your views on the Canadian dollar?

A. The recent dramatic rise in the Canadian dollar was driven by the weakening of the U.S. dollar across the board and by positive interest rate differentials between Canada and the U.S. As the U. S. economy recovers, the U.S. dollar is expected to stabilize making further large increases in the value of the Canadian dollar unlikely. The forecasted range for the Canadian dollar at the end of 2004 is 73 to 76 cents U.S. up moderately from its present level.

Q. What rate do you recommend as the long Canada rate for use in market risk premium analysis?

A. For rate-making purposes we need to forecast the rate on 30-year Canada's.

As seen in Schedule 3.2, in developing our forecast, we draw on forecasts from Consensus Economics and on predictions provided by the economics departments of three Canadian chartered banks. Using 2004 as our "test year", we employ forecasts for June 30, 2004 as representing an "average" for the year. In addition to working directly with forecasts for 30-year Canada's, we also follow the National Energy Board's practice of forecasting this rate by adding an average spread to the consensus forecast on 10-year Canada's. Beginning with the 10-year forecasts, Consensus Economics reported in June 2003 that the median forecast for 10-year Canada's on June 30, 2004 was 5.10%.[4] Bank of Montreal's forecast is 5.40%. Scotiabank Group forecasts that the 10-year Canada

[4] McShane, page 27, line 10.

rate will be 4.30% in the second quarter of 2003. From TD Economics comes a forecast of 4.75%. We average these three bank forecasts to obtain 4.82% as our forecast for the 10-year Canada rate in June 2004 as shown in Schedule 3.2.

To transform our 10-year forecast into a prediction for the rate on 30-year Canada's we add the average spread between these two instruments as observed over the last four quarters through Q1 2003. Using data from TD Economics, we calculate this average spread as 48 basis points. Rounding to 50 basis points and adding to 4.82% gives us 5.32% as our 30-year Canada's forecast.

As a check on this result, we repeat the same steps, using the Consensus Economics forecast for the 10-year Canada rate, 5.10%, in place of the average of the bank forecasts. Adding the average spread (rounded) of 50 basis points produces an estimate of 5.60% for 30-year Canada's.

As a further check, we recalculate the 30-year forecast as the simple average of forecasts from the three banks: 5.60% from Bank of Montreal, 5.00% from Bank of Nova Scotia and 5.40% from TD. As shown in Schedule 3.2, this gives us an average of 5.33%, virtually identical to what we obtained from our bank forecasts earlier.

Recognizing that these forecasts vary somewhat and erring on the side of caution, we adopt a long-term rate of 5.60% for purposes of our analysis of the fair rate of return on equity for the applicant utilities. The use of this, our highest estimate, builds an element of conservatism into our forecast.

Q. Please provide your forecast for the 30-year U.S. Treasury bond yield.

A. Our forecast for the U.S. Treasury bond yield follows the same methodology that we employ for the long-term Canada rate. We obtain forecasts from the same three banks for June 30, 2004.[5] BMO Economics forecasts a rate of 5.20%, Bank of Nova Scotia forecasts 4.80%, and the forecast from TD Economics is 5.05%. The average of these three forecasts is 5.02%.

Following our practice for Canadian rates discussed earlier, we create a second forecast based on the 10-year rate adjusted for a spread. To do this we find the average of the banks' forecasts for the U.S. 10-year rate and add the average spread. The forecasts are: 4.50% (BMO), 3.90% (BNS) and 4.00% (TD) for an average of 4.13%. To convert this average to a 30-year forecast we follow our earlier practice of adding the average spread observed over the most recent quarter. For U.S. Treasuries this was 0.93% based on data from TD Economics. This gives us a second forecast for 30-year U.S. Treasuries of 5.06%.

We now have two forecasts, 5.02% and 5.06%. Following our approach from our Canadian forecast, we take the higher of these two rates and round up to the nearest 10 basis points. This gives us our forecast for U.S. 30-year Treasury bonds of 5.10%.

[5] We do not have access to a U.S. forecast from Consensus Economics.

IV. 2004 RATE OF RETURN ON COMMON EQUITY

INTRODUCTION

Q. How is this section of your evidence organized?

A. We begin with a discussion of the general regulatory principles that are appropriate in conducting our fair rate of return analysis. As discussed in section two of our evidence, our general approach is to determine the appropriate return on equity for a utility of average investment risk (henceforth referred to as the "average-risk utility"), and to adjust the capital structures of the seven applicant utilities to account for differences in their business risks.

After discussing general regulatory principles, we present our implementation of the Equity Risk Premium Test. For this estimation method, the recommended rate of return on equity is equal to the estimate of the risk-free rate plus the premium (or additional return) that investors would require to bear the risk equivalent to an equity investment in an applicant utility of average risk. The premium (or additional return) that equity investors require to bear the investment risk of this average-risk utility is commonly referred to as the own market equity risk premium (ERP) or own equity risk premium for this average-risk utility.

For the estimate of the risk-free rate, we use the estimate for the yield on long Canada's for 2004 determined earlier in Section III. Since the own equity risk premium for our average-risk utility is obtained by multiplying the market ERP (i.e., the premium for investing in a well diversified equity portfolio such as the S&P/TSX Composite index) by the relative investment riskiness of our average-risk utility, we provide estimates of each of these two components in turn.

We first estimate the required market ERP for Canadian equities based on historical and forward-looking estimates for Canada and the U.S. (and to a lesser extent, the world index), and recent evidence that suggests that previously estimated market equity risk premia using realized returns as a proxy for expected returns have produced an upwardly biased estimate of the required ERP. The expected ERP estimates of various academic and practitioner scholars, and of surveys of Canadian investment professionals suggest that ERP in the future will be much lower than historically. We argue using finance theory that most of the fundamental changes in the Canadian market imply that the market ERP is decreasing, and will decrease further in the future. We explain why some have argued that the ERP can be low, nil or negative given that the risk (standard deviation of returns) of equities is higher than the risk of bonds and cash only over short holding periods of one year but is lower than the risk of bonds or cash over longer holding periods of ten to twenty years depending on the evidence examined. We also provide evidence that bond returns exhibit mean aversion over time, while stock returns and risk premia exhibit mean reversion over time. We estimate an market equity risk premium or ERP of 4.70% with a range of 4.5% to 4.9%.

We then use a DCF test, using historical and future estimates of dividend growth rates, to check the reasonableness of our estimate of the equity market risk premium of 4.70%. We also benchmark our estimate of the equity market risk premium of 4.70% against the expectations of two samples of investment professionals that include those on both the sell and buy sides of the market. We conclude that our estimate is conservatively high.

We then estimate the relative investment riskiness or beta of our average-risk utility as being 0.5, and show that the betas of utilities (and their return correlations with the market proxy) have been decreasing over time, although we make only a minimal adjustment for this latter observation. We then demonstrate that the two primary rationales that have been given for using the adjusted beta method when calculating the required rate of return on equity are not valid. We then multiply the estimate of the market ERP by the estimate of the relative investment riskiness or beta of our average-risk utility to obtain our estimate of the own equity premium for our average-risk utility of 2.35% (with a range of 2.25% to 2.45%).

This is followed by the presentation of our "bare bones" cost of equity estimate. We add 10 basis points to the "bare bones" cost to compensate an applicant utility for potential equity flotation or issuance costs. We end this section with our return on equity recommendation for an average-risk utility of 8.05%. Our return on equity recommendation allows an average-risk utility to earn a risk premium (including the flotation cost adjustment) of 245 basis points over our forecast for long Canada yields of 5.6%.

DISCUSSION OF GENERAL PRINCIPLES

Q. What regulatory principles have you found appropriate in conducting your analysis of the fair rate of return on equity capital for an average-risk utility?

A. We believe that the regulatory process should ensure that an average-risk utility earns a return on common equity that would adequately compensate equity investors for its risk level. Further, this rate of return on equity would enable an average-risk utility to maintain its financial integrity and to meet its financial obligations. The shareholders' interests must be balanced with the interests of the customers of an average-risk utility who are entitled to safe and reliable service at reasonable rates.

Q. What rate of return test have you used to determine the fair rate of return on common equity for an average-risk utility?

A. In designing our testimony, we identified various techniques that are commonly used for measuring the fair rate of return on equity both before the Board and in other jurisdictions. We have based our conclusions regarding the fair rate of return on common equity primarily on the Equity Risk Premium Test. We do not employ the Comparable Earnings Approach because we believe that it is without merit and unsuitable for use in determining a fair rate of return on equity for a utility. Section VII of our evidence includes a detailed discussion of this point. Although we consider the DCF Test to be inferior to the Equity Risk Premium Test, we use the DCF Test to provide additional estimates of equity market risk premium using both historical and forward-looking estimates of share price or dividend growth. We use these estimates as further inputs for judging the reasonableness of our estimates of the implied equity risk premium using the Equity Risk Premium or ERP Test. Section VII includes a detailed discussion of why the DCF Test is deemed to be inferior to the ERP Test, and why the DCF Test is best applied at the market and not individual firm level.

THE EQUITY RISK PREMIUM OR ERP TEST

Q. What is the Equity Risk Premium Test?

A. The Equity Risk Premium (ERP) Test estimates the cost of equity capital for utility companies with respect to other publicly traded investment opportunities that are available to investors. It is an attempt to find the risk-adjusted "opportunity cost" for investing in the shares of utility companies. This cost is based on the gross rate of return required by equity investors;

i.e., the rate of return required by equity investors before trade costs and taxes.

Q. What approach have you used to implement the Equity Risk Premium Test?

A. There are several ways to implement the ERP Test. The Test which we conducted uses the following inputs:

1. the yield forecasted for 2004 for long Canada's (input #1);
2. a forward-looking risk premium for the S&P/TSX Composite (our market diversified market proxy) based on its realized values over various periods between 1900 and 2002 for Canada, and 1802 and 2002 for its counterpart in the United States (input #2);
3. the investment riskiness (market beta) of an average-risk utility relative to the market portfolio as proxied by the S&P/TSX Composite (input #3); and
4. an adjustment to cover fees involved with potential equity offerings or issues by an average-risk utility (input #4).

As noted earlier, the reasonableness of the estimate of input #2 is judged based on comparisons against future estimates of market returns, and estimates of the risk premium obtained from the DCF Test for the market portfolios in both Canada and the U.S. The four input estimates for the Equity Risk Premium Test are combined as follows:

(Input #1) + [(Input #2) *x* (Input #3)] + (Input #4) = recommended rate of return on equity for an average-risk utility.

We now need to detail how we obtained the final estimates of each of the four inputs, and to present the recommended rate of return on equity for an average-risk utility that results from a combination of the final estimates of the four inputs.

Long Canada Yield Estimate (input #1)

Q. What is your estimate of the long-term risk-free rate that will prevail during 2004?

A. As discussed in Section III, we have forecasted the midpoint of the range of the long-term Government of Canada bond rate to be 5.6%.

Market Equity Risk Premium (ERP) Estimate (Input #2)

1. Market ERP Estimate: Some Measurement Considerations:

Q. What considerations go into the measurement of the market risk premium?

A. The market risk premium reflects equity investors' assessment of the expected (or required) return differential from investing in a diversified portfolio as compared to investing in the risk-free benchmark security. It indicates the total incremental return that equity investors require for bearing the non-diversifiable risk of the diversified portfolio relative to investing in the risk-free benchmark security. In Canada, the diversified portfolio is usually chosen to be a well-diversified equity market portfolio or index such as the S&P/TSX Composite Index. The reason is that this portfolio is well diversified when viewed from a domestic-only investment perspective. The equity risk premium occurs because risk-averse investors require a positive reward for bearing each unit of risk, and equities exhibit varying degrees of risk. The reward required for bearing each unit of risk increases, as investors become less risk tolerant, and decreases, as investors become more risk tolerant. The equity risk premium is the total compensation that investors require to bear the total risk (in this case, non-diversifiable risk only) of the diversified portfolio. We use the equity risk premium here in a forward-looking sense to project the required return on a diversified portfolio.

Since the market only rewards investors for bearing non-diversifiable risk and individual investments (such as stocks in specific utilities) are not by themselves well-diversified portfolios, this requires an estimation of the relative non-diversifiable risk or beta of the average-risk utility relative to the diversified market portfolio. The equity risk premium is then adjusted upwards or downwards to reflect the relative **non-**diversifiable risk of the average-risk utility relative to the diversified market portfolio. The lower non-diversifiable risk of our average-risk utility relative to that for the diversified market portfolio necessitates a downward adjustment in the risk premium added to the forecasted long-term risk-free rate to calculate the cost of equity for our average-risk utility.

Because the forward-looking or *ex ante* risk premium is difficult to observe, cost of equity studies typically place a heavy weight on measurement of historical or *ex post* risk premiums. This approach involves thorny measurement issues because historical measures may be biased or noisy proxies for forward-looking variables.

One important difference between expected and realized risk premia relates to the occurrence of a negative risk premium. The expected risk premium measures the expected return differential of a well-diversified but risky portfolio of equities over risk-free government securities. Since investors are risk averse, they would not invest in equities unless they expected the risk premium to be non-negative. However, since realizations can differ from rational expectations, the historical or realized market risk premium can be negative for any given period of time.

To illustrate, the total return (i.e., dividend yield plus investment value change) for the S&P/TSX Composite for 1990 was minus 14.80%. This results in a negative risk premium for 1990 when the risk premium is calculated using the Long Canada return of 3.34%. This negative risk premium was not a good proxy of the risk premium expectation of equity investors at the beginning of 1990. As of January 2, 1990, those investors holding equities must have expected that equities would outperform Long Canada's over the year. Similarly, investors holding equities must not have expected the negative total returns achieved by the S&P/TSX Composite in 1992, 1994, 1998, 2001 and 2002.

To address this potential difficulty with historical data, return on equity studies generally employ periods of at least ten years so that the realized market risk premium is positive. Also, the difference between the average realized and the average expected risk premia should diminish, as the measurement period gets longer if the underlying return distribution is normal and remains unchanged over this longer measurement period. This is commonly referred to as returns being IID normal, or independently and identically and normally distributed, in that they have the same normal distribution at each point in time and returns are independent over time. This assumption suffers from various important drawbacks. First, even if single-period returns are assumed to be normal, then multiperiod returns cannot also be normal since they are products (**not** sums) of the single-period returns. Second, several studies using longer-horizon or multi-year returns conclude that there is substantial mean-reversion (i.e., negative serial correlation) in stock market prices at longer horizons.[6] Third, the

[6] For examples, see E. Fama and K. French, 1988, Permanent and temporary components of stock prices, *Journal of Political Economy* 96, pp. 246-273; and J. Poterba and L. Summers,

plausibility of the assumption that returns are IID diminishes as the time period gets longer. Drs. Campbell, Lo and MacKinlay state this as follows:[7]

> "…the assumption of identically distributed increments is not plausible for financial asset prices over long time spans. For example, over the two-hundred-year history of the New York Stock Exchange, there have been countless changes in the economic, social, technological, institutional, and regulatory environment in which stock prices are determined. The assertion that the probability law of daily stock returns has remained the same over this two-hundred year period is simply implausible."

This means that due to fundamental shifts in economies and/or markets (technically, referred to as regime shifts), the use of too distant time periods may result in the inclusion of time periods that are no longer representative of currently possible market returns and/or market risk premia. Fundamental changes have occurred over time in the level of market integration across international markets, the level of market frictions (particularly, trade costs), and so forth. For example, much of the impact of the globalization of economies and financial markets, and of financial innovations has occurred over the past 30 to 40 years.

A second difficulty arises if returns are not IID since both the market risk and its equity risk premium then are time-varying. *Ceteris paribus* (everything else held equal), the market risk premium will change over time, and can change drastically, with changes in the risk-free rate, risk tolerance of the representative investor, and the set of available investment opportunities. For example, the set of available investment

---

1986, Mean reversion in stock returns: Evidence and implications, *Journal of Financial Economics* 22, pp. 27-60.

[7] John Y. Campbell, Andrew W. Lo and A. Craig MacKinlay, 1997, *The Econometrics of Financial Markets* (Princeton, New Jersey: Princeton University Press), pp. 32-33.

opportunities has expanded significantly since the 1960's due to the astonishing variety of new risk management securities introduced in the 1980's and 1990's.[8]

A third difficulty arises because a period with a declining required equity market risk premium is likely to coincide with a temporarily increased realized equity market risk premium. Peter A. Diamond, Institute Professor at M.I.T., states this as follows for the U.S. market:[9]

> "It is important to recognize that a period with a declining required equity premium is likely to have a temporary increase in the realized equity premium. This divergence occurs because a greater willingness to hold stocks, relative to bonds, tends to increase the price of stocks. Such a price rise may yield a higher return than the required return. For example, the high realized equity premium since World War II may be in part a result of the decline in the required equity premium. Therefore, it would be a mistake during the transition period to extrapolate what may be a temporarily high realized return."

Similarly, Glassman and Hassett argue that the equity premium will be dramatically less than it has been in the U.S. in the past. They raise the possibility that the realized rate of return in the intermediate period will be higher than in the long run if the required equity premium declines.[10]

A fourth difficulty arises because the reliability and comparability of the chosen proxy of the market portfolio varies considerably over time. To illustrate, most experts use the Canadian stock and Long Canada return series available from the Canadian Institute of Actuaries for the period from 1924 onwards. Thus, while the S&P/TSX Composite Total Return Index is used from December 1956, other proxies that are more likely to

[8] For example, see Merton Miller, Financial innovation: Achievements and prospects, 385-392, In: Donald H. Chew, Jr. (Ed.), *The new corporate finance* (New York: McGraw-Hill Irwin, third edition, 2001).
[9] Peter A. Diamond, What stock market returns to expect for the future?, *An Issue in Brief*, Centre for Retirement Research at Boston College, No. 2, September 1999, p. 2.
[10] James Glassman and Kevin Hasset, Are stocks overvalued? Not a chance, *Wall Street Journal*, March 30, 1998; and Stock prices are far too low, *Wall Street Journal*, March 17, 1999.

be contaminated by survivorship and selection biases are used from 1924 to 1957. Similarly, S&P's U.S. dividend yields reported in Ibbotson and Sinquefield (1977) are used for Canada for the period January 1926-December 1933, after adjusting for the 0.17% difference between the S&P and TSE dividend yield index over the period January 1956-December 1965. While the long-term bond series is for bonds with a term-to-maturity of over ten years, the actual average maturity is less than 30 years, and varies over time. Given a positive realized term premium, this results in realized risk premia that are somewhat too high.

Q. To reiterate, what criteria need to be satisfied when deciding on what time period yields relevant data for calculating historical market equity risk premia in Canada?

A. The chosen time period should be the longest one that satisfies the following two criteria:

First, the chosen time period should include no major regime shifts. Second, the chosen time period should have data that are reasonably reliable and are for a comparable proxy of the market portfolio over its duration.

Q. What period of time best satisfies these two criteria for the Canadian market?

A. In Canada, the time period since 1956 best satisfies these two criteria. First, reliable data for a comparable market proxy (the S&P/TSX Composite Index) are available only from 1956. The available Canadian equity market data prior to 1956 is usually obtained by splicing together series for equity portfolios with inconsistent formation characteristics. Because of the existence of interest rate controls and the absence of a

Canadian money market to price fixed income securities, the data on fixed income securities are also of poor quality prior to 1956. Furthermore, this period of time incorporates much of the impact of globalization, financial market innovation and trade cost competition on the expected returns for equities and bonds. For these reasons, we begin with an examination of the post-1956 data for our ERP tests, and then examine returns prior to and after 1956.

Q. How should the historical market ERP be calculated?

A. The historical market ERP generally is calculated using holding period returns for a market proxy and for a risk-free proxy. In academic research on Canadian markets, the S&P/TSX Composite index and the T-bill rate generally are used as the proxies for the market and the risk-free rate, respectively. In contrast, in the rate setting process, the risk-free rate is proxied by the more risky Long Canada. Furthermore, in the rate setting process, the estimated market risk premium, after being properly adjusted for non-diversifiable risk differences between the applicant utility (herein the average-risk utility) and the market, is added to the yield (not expected holding period return) on Long Canada's to get the cost of equity estimate for the applicant utility. How we deal with these inconsistencies is addressed as we describe the steps that we follow in our ERP tests.

2. Market ERP estimate: The appropriate average of historical annual data:

Q. When is it preferable to use the arithmetic and the geometric average historical market equity risk premium?

A. This issue is discussed more fully in Appendix A. We begin with the observation that the use of the geometric average or some weighted-average of the arithmetic and geometric averages is becoming conventional wisdom.

The arithmetic average is preferred when making investment decisions for a one-period investment horizon where the investment horizon is identical to the interval of time over which the historical returns are measured. Thus, if historical returns are measured on an annual basis, then the investment horizon is restricted to one year. A one-year horizon definitely is not the long-term horizon that is assumed in determining the ROE for rate-making purposes. The arithmetic average also is preferred for forward-looking decisions when historical returns are normal IID or independently and identically distributed over the estimation period. As noted earlier, the normal IID assumption is not appropriate for asset returns over long estimation periods.

The geometric mean or some weighted-average of the geometric and arithmetic mean are preferred when the length of the investment horizon exceeds the return measurement interval, and the weight given to the geometric mean in any such weighted average increases as the investment horizon becomes longer. Similarly, the geometric mean or some weighted-average of the geometric and arithmetic mean are preferred when returns are not normal IID due to, for example, long-run mean reversion in the returns for some asset classes, as has been found for stocks, and long-run mean aversion in the returns for other asset classes, as has been found for bonds. Dr. Siegel notes that his work on the risk premium using data for the period 1802-2001 provides support for mean reversion for a 30-year horizon (i.e., the horizon used for Long Canada's in rate of return regulation).[11]

[11] Jeremy J. Siegel, Historical results: Discussion, *Equity Risk Premium Forum*, November 8, 2001, p. 46.

Dr. John Campbell at a recent *Equity Risk Forum* has aptly stated this argument as follows:[12]

> "Which is the right concept, arithmetic or geometric? Well, if you believe that the world is identically and independently distributed and that returns are drawn from the same distribution every period, the theoretically correct answer is that you should use the arithmetic average. Even if you're interested in a long-term forecast, take the arithmetic average and compound it over the appropriate horizon. However, if you think the world isn't i.i.d., the arithmetic average may not be the right answer.
>
> I think that the world has some mean reversion. It isn't as extreme as in the highway example, but whenever any mean reversion is observed, using the arithmetic average makes you too optimistic. Thus, a measure somewhere between the geometric and the arithmetic averages would be the appropriate measure."

In a recent paper, Drs. Mehra and Prescott, who are the authors who first identified the equity premium puzzle, note that they reported arithmetic averages, since the best available evidence at that point in time indicated that stock returns were uncorrelated over time.[13] They now acknowledge that the arithmetic average can lead to misleading estimates when returns are serially correlated, and that the geometric average may be the more appropriate statistic to use. Drs. Mehra and Prescott (p. 57) note that stock returns have been found to be mean reverting.

---

[12] John Campbell, Historical results: Discussion, *Equity Risk Premium Forum*, November 8, 2001, p. 45.

[13] Rajnish Mehra and Edward C. Prescott, The Equity Premium in Retrospect, forthcoming: G.M. Constantinides, M. Harris and R. Stulz, *Handbook of the Economics of Finance* (Amsterdam: North Holland). Draft of their paper, February 2003.

Q. What do corporations use when they make forward-looking investment decisions?

A. Corporate practice among the leading U.S. corporate entities is to use the geometric mean if a long-term risk-free rate is used (such as long Treasuries) and to use the arithmetic mean if a short-term risk-free rate is used (such as T-bills). Specifically, the teaching note to the case study, Grand Metropolitan PLC, states:[14]

> "In practice, two combinations of risk-free rates and equity-risk premia are seen: (1) long-term risk-free rates plus geometric means or (2) short-term risk-free rates plus arithmetic means. Nothing in the theory of the CAPM dictates the use of these parameters; they are artifacts of practice. A recent survey of leading American corporations and financial institutions suggests greater use of the geometric-mean/long-term risk-free rate approach."

Q. Do you have any evidence that the returns on stocks and bonds and equity risk premiums exhibit mean reversion or mean aversion in Canada or the U.S.?

A. Yes, we do. We find that stock returns exhibit mean reversion in both Canada and the U.S., bond returns exhibit mean aversion in both Canada and the U.S., and equity risk premiums exhibit mean reversion in both Canada and the U.S. We also find that the extent of mean reversion in equity risk premiums is more pronounced in the United States than in Canada.

---

[14] The referenced study is: R. F. Bruner, K.M. Eades, R.S. Harris and R. Higgins, 1998, Best practices in estimating the cost of capital: Survey and synthesis, *Financial Practice and Education* (Spring/Summer).

Q. Would you please review the tests that you conduct to determine if stock and bond returns exhibit mean reversion or aversion, and if equity risk premium exhibit mean reversion or aversion.

A. A formal test for mean reversion/aversion is the variance-ratio test. The test is based on the fact that if returns follow a random walk (are independent), then the variance should be proportional to the return horizon. The Variance-Ratio or VR measure is:

$$VR(T) = Var[r_t(T)] \div N\ Var[r_t] = 1$$

where T is the multi-year period being examined, $Var[r_t(T)]$ is the variance of a T-period continuously compounded return, and $Var[r_t]$ is the variance of a one-period or benchmark return r_t. A variance ratio of one indicates no aversion or reversion of the mean of the series. A variance ratio greater than one indicates mean aversion, and mean aversion increases as the VR moves towards larger values above one. Thus, a VR of 3 indicates greater mean aversion in the series of returns or risk premia than a VR of 2. Similarly, a variance ratio less than one indicates mean reversion, and mean reversion increases as the VR moves away from one towards zero.

We calculate the variance ratios for holding periods of 5, 10 and 15 years relative to a benchmark holding period of 1 year for stocks, long bonds and risk premia for Canada and the United States. The Canada data are annual from the Canadian Institute of Actuaries for the period 1924-2002. The U.S. data are annual from Ibbotson & Associates for the period 1927-2002. The results are reported in Schedule 4.1 and depicted in Schedule 4.2.

From Schedule 4.2, it is apparent that:

- The equity risk premia for both Canada and the U.S. exhibit mean reversion as the investment horizon increases from 1 to 5 to 10 to 15 years;

- The extent of mean reversion in equity risk premia is more pronounced for American versus Canadian equities; and
- The extent of mean reversion in equity risk premia is more pronounced for the more recent 50 years than for the full time horizon for both the Canadian and U.S. samples.

Q. What do you conclude from your tests of mean reversion about whether the geometric or arithmetic mean market risk premium should be used in the Equity Risk Premium Test?

A. We conclude that the use of the arithmetic mean market equity risk premium results in an overstatement of the prospective market risk premium, and that the use of the geometric mean market risk premium results in an understatement of the prospective market risk premium. This is likely to be the reason why different groups of professionals use one or the other type of mean in their forward-looking analyses. Actuaries typically use the geometric mean market ERP for the determination of pension plan funding requirements. Many financial economists, especially those associated with buy-side investment entities, have historically used the arithmetic mean market ERP. Well-run corporations typically use the arithmetic mean market ERP with the T-bill rate as the risk-free proxy, and the geometric mean market ERP with a long Treasury as the risk-free proxy.

We recommend that a weighted average of the arithmetic and geometric mean market equity risk premiums is preferable. The use of a weighted average should not unduly favor equity investors over the customers of applicant utilities in a rate-setting environment. The use of any weighted-average of the geometric and arithmetic mean market risk premia also removes any perceived need to make additional adjustments to ensure the financial integrity of an applicant utility. This occurs because the difference between such a weighted-average and the geometric mean market risk premia grows with the level of market risk.

Based on the variance-ratio test results discussed above, we recommend a blended mean market risk premium with weights of 75% and 25% for the arithmetic and geometric mean market ERPs, respectively, for Canada, and with weights of 50% and 50% for the arithmetic and geometric mean market ERPs, respectively, for the United States. This reflects the greater mean reversion in the U.S. equity market risk premia discussed above.

3. Market ERP estimate: Impact of market frictions:

Q. Are there any market frictions that should be kept in mind when examining historical market equity risk premia?

A. Historical market ERP studies are based on gross and not net returns, although investors make decisions between investments of different risk based on net and not gross returns. There are at least two frictions that cause a divergence between gross and net returns from investment.

The first major market friction is taxes. As tax rates increase, investors require higher gross returns from investment to get the same net (after-tax) return, and vice versa when tax rates decrease. Similarly, if the tax rate reduction differs by type of asset, then their gross returns will change by different amounts to maintain their same net returns. To illustrate, if the effective tax rate on the return of a non-dividend-paying growth stock declines by more than that on the return of a long-term government bond, then the drop in the gross return of the stock to maintain its after-tax return will exceed the drop in the gross return of the bond. In turn, this will decrease the required market ERP, all else held equal.

The second major market friction is trade costs, which include liquidity costs (as measured, for example, by the effective bid-ask spread), broker commissions, and so forth. In general, the gap between gross and net returns increases as trade costs increase, and decreases as trade costs decrease.

4. Market ERP estimate (input #2): Initial Canadian estimate based on historical data:

Q. What is your interpretation of the relevant data on historical market equity risk premia in Canada?

A. We begin with an examination of the 1956-2002 time period because it appears to best satisfy our dual criteria of being based on a consistent market proxy with reliable data, and being based on a time period that is likely to minimize the impact of major regime shifts on market ERP estimation. We then examine two shorter periods, 1965-2002 and 1977-2002, and four longer time periods, 1951-2002, 1936-2002, 1924-2002 and 1900-2002. Based on the results reported in Schedule 4.3, the arithmetic and weighted-average annual equity risk premia for the 1957-2002 period are 2.29% and 2.10%, respectively.[15] The arithmetic average annual equity risk premium is lower at 1.27% and 1.05% for the two shorter time periods, 1965-2002 and 1977-2002, respectively, and is higher at 3.89%, 4.73%, 5.03 and 5.5% for the four progressively longer time periods, 1951-2002, 1936-2002, 1924-2002 and 1900-2002, respectively. Similarly, the weighted-average annual equity risk premium is lower at 1.12% and 0.91% for the two shorter time periods, 1965-2002 and 1977-2002, respectively, and is higher at 3.71%, 4.51%, 4.71 and 5.1% for the four progressively longer time periods, 1951-2002, 1936-2002, 1924-

[15] The weighted average consists of a 75% and a 25% weight on the arithmetic and geometric means, respectively.

2002 and 1900-2002, respectively. This strongly suggests that the equity risk premium (however measured) has been declining in Canada over time. Also, note that when the longest arithmetic mean market equity risk premium is adjusted for the material, upward re-valuation of equities for the longest time period of 1900-2002 (i.e., the sizeable increase in the price-to-dividend or price-to-earnings ratio over this period), the arithmetic mean ERP is reduced from 5.5% to 4.5%, and the weighted-average mean ERP is reduced from 5.1 to 4.4%. The arithmetic mean would decrease further if we remove the decrease of trade costs of about 1% over the period, and add in the observation that investors appeared to earn a return on bonds that was probably at least 20 basis points below their expectations for the period.

In the interest of being very conservative in ensuring that our market equity risk premium estimate has a smallish probability of being too low, we choose an initial risk premium estimate of 4.7%.

5. Market ERP estimate: Possible rationales for adjusting the initial Canadian estimate:

Q. Do you have any reason to expect that there have been some fundamental changes since 1957 that have had an impact on the market ERP?

A. Yes, there are at least 8 fundamental changes that have had an impact on the market ERP. While the effect of most of these individual changes and their net effect is to decrease the market ERP, we make no such reduction to our initial market ERP of 4.7%. This further bolsters our contention that our 4.7% estimate is conservatively high.

We now discuss two of the more important of these changes for the market ERP, and leave a discussion of the remaining six to Appendix 4.B.

A first fundamental change is the increased integration of financial markets, the rapid growth of financial innovation, mutual funds, index products, derivative products and exchange-traded funds over the past 30 to 40 years. Since this allows small investors to acquire and manage diversified portfolios at lower cost, the required risk premium will be lowered since greater diversification means that these investors attain the same expected returns by bearing less risk. Also, since the reduction in cost has been higher for equity versus fixed income investment vehicles, the equity risk premium relative to historical levels can be expected to decline.[16]

A second fundamental change is the marked decrease in the level of market frictions (particularly, trade costs). As noted by Dr. Jones, trade costs drive a wedge between gross equity returns and net equity returns. His analysis shows that the average cost to buy or sell stocks has dropped from over 1% of value as late as 1975 (i.e., before the deregulation of brokerage fees) to under 0.18% today. He concludes that, while trade costs account for a small part of the observed equity premium, the gross equity premium is perhaps 1% lower today than it was earlier in the 1900's".[17]

Q. What do these fundamental changes imply about your initial estimate of the market ERP?

[16] Similar points are made about mutual funds by Diamond (1999), p. 2.

[17] Charles M. Jones, 2001, A century of stock market liquidity and trading costs, working paper presented at an asset pricing workshop, Summer Institute, National Bureau of Economic Research, July 19-20.

A. On balance, the fundamental changes suggest that our initial estimate of the market ERP is too high. Nevertheless, in the interests of being very conservative, we do not alter our initial estimate of the Canadian market ERP to reflect this observation.

The major lesson that one can learn from the most recent high-tech bubble is that one should not determine that markets or the economy have changed fundamentally based on only three or four years of data. Similarly, <u>spot estimates of the implied ERP from DCF models using analyst forecasts at one point in time are not likely to be very meaningful</u>.

6. Market ERP estimate: Canadian forward-looking estimates:

Q. Are there any expectations data on Canadian stock and bond returns and the market ERP that you considered in assessing the robustness of your estimate of the market ERP?

A. Yes, we considered the forecasts by 81 Canadian and international investment managers contained in the *2002 Fearless Forecast* authored by W.M. Mercer Limited. The study notes on page 3 that perhaps its most interesting result is the relationship between managers' expectations for bond returns versus stock returns. A risk premium estimate of 3.0% over long Canada bonds is obtained based on the expectations of the managers that the S&P/TSX Composite Total Return Index (TRI) will beat the Scotia Capital Universe TRI by 3.5% over the next five years, and the assumption that the yield curve will continue to be positively sloped. The study notes that this number is lower than the historical average and lower than expectations in recent *Fearless Forecasts*, but is higher than the 0% that some analysts believe is reasonable to expect and is higher than the 2.0% to 2.5% that is indicated by Mercer's own research.

In its 2003 *Fearless Forecast*, Mercer reaches a similar conclusion. For the five years ending in December 2007, managers forecasted return of 8.3% for the S&P/TSX and 4.8% for the SC Universe TRI. This gives an expected risk premium as of January 2003 of 3.5%.

Douglas Porter and David Watt, from the Economist Research unit at BMO Nesbitt Burns, state that a reasonable range for the future equity risk premium is between 1.25% and 1.75%. They note that this leads to "real equities returns over the medium term [that] will closely resemble their historical norm" [our insertion].[18]

7. Market ERP estimate: Historical and forward-looking estimates for non-Canadian markets:

Q. Is there any value in examining the U.S. or international experience?

A. Yes, there is. First, as markets become more integrated, foreign-exchange and risk-adjusted returns become approximately equal across various world markets. This is referred to as the "law of one price". Second, examining other markets provides a test of how reasonable the Canadian estimates of the market ERP are. However, one must be careful not to introduce an *ex post* selection bias when selecting which other market(s) to examine. Choosing the market that has grown to be the largest market or has had an above-average *ex post* performance introduces an *ex post* selection bias. This happens to some extent when the U.S. equity market is chosen for this purpose.

[18] Douglas Porter and David Watt, Returning to equity returns, *Focus*, Economic Research, BMO Nesbitt Burns, February 22, 2002, pp. 4&5.

In their book, Drs. Campbell, Lo and MacKinlay (1997)[19] report that the mean excess return of stocks over commercial paper (**not** long bonds) is about 6% in the U.S. when asset returns are measured annually over the period 1889 to 1994. Dr. Jeremy Siegel has conducted extensive studies of the equity risk premium for the U.S. over the past 200 years. Based on his results, which are summarized in Schedule 4.4, the so-called Ibbotson time period, 1926-2001, has generated the highest arithmetic and weighted-average mean ERPs of 6.2% and 5.5%, respectively. Dr. Siegel notes that this high ERP is due to real stocks maintaining their long-term historical average real return of almost 7%, while real bond and bill returns were below their long-term historical average real returns. In fact, for the 55 years up to 1982, the real return on bills averaged nearly zero. Siegel goes on to conclude that *the reason why the ERP is too high for this period is that historical real stock returns are biased upward to some extent and government bond returns are biased downwards over this period*.[20]

Mr. Richard Arnott and Mr. Peter Bernstein reach a similar conclusion that the realized ERP exceeded the expected ERP over this time period.[21] Specifically, equity investors earned an annual 70 basis points more than what they expected and bond investors earned an annual 20 basis points less than what they expected. According to Arnott and Bernstein, one cause of this risk premium windfall was the unanticipated inflation of the late 1960s and 1970s that adversely affected realized bond returns. Another cause was the rise in price-to-dividend multiples from 18 to 70 times over the 1926-2001 period, with almost all of this increase occurring in the last 17 years of this period, that favorably affected stock returns. Mr.

[19] J.Y. Campbell, A.W. Lo and A. Craig MacKinlay, *The econometrics of financial markets* (Princeton, New Jersey: Princeton University Press, 1997).
[20] Jeremy J. Siegel, Historical results I, *Equity Risk Premium Forum*, November 8, 2001, pp. 31-32.
[21] Robert D. Arnott and Peter L. Bernstein. What risk premium is “normal”?, *Financial Analysts Journal* 58:2 (March/April 2002), pp. 64-85.

Arnott and Mr. Bernstein estimate that this rise in the price-to-dividend multiple added about 180 basis points or 1.8% to annual stock returns.[22]

When we examine the three sets of arithmetic and weighted-average mean ERP reported in Schedule 4.4 for periods that begin prior to World War II and run through 2001, we find that those that are included in the Ibbotson time period exceed our forward-looking estimate for Canada of 4.7%, and those that predate the Ibbotson time period fall short of our forward-looking estimate for Canada of 4.7%. However, if we adjust, for example, the 1926-2001 realized risk premium downwards by 90 basis points to reflect the normal expectations of investors, as per Mr. Arnott and Mr. Bernstein, the arithmetic equity market risk premium of 5.3% is now much closer to our estimate of 4.7%. Furthermore, if we add the –39.9% realized risk premium for 2002 to the time period to examine the 1926-2002 time period, the realized arithmetic mean ERP declines by about 53 basis points from 6.2% to approximately 5.7%, and further to about 4.8% with the 90 basis point adjustment of Mr. Arnott and Mr. Bernstein for realized equity (bond) returns exceeding (falling short) of their estimated expected returns over that period. This makes no adjustment for the risk of the U.S. market, which is expected to be higher over this period, and the material reduction in trade costs of about 1% over this period. Thus, an examination of the U.S. market ERP experience suggests that our estimate of 4.7% for Canada is too high.

Q. Please discuss the source of any equity ERP estimates commonly used for the United States, and any limitations of these estimates.

A. Equity ERP estimates for the U.S. are commonly based on data from Ibbotson & Associates for the period 1926-2002. Dr. Schwert points out

[22] This is higher than the 1% estimate of Dimson et al. (2003). Elroy Dimson, Paul Marsh and Mike Staunton, Global evidence on the equity risk premium, forthcoming *Journal of Applied Corporate Finance* 15:4 (Summer 2003).

that any market ERP estimates that incorporate stock returns during the Great Depression period are suspect since stock market volatility was abnormally high during this period. Dr. Schwert argues that the Ibbotson data series do not satisfy many of the criteria for choosing the best index in a given period. These criteria include coverage, weighting method, point-sampled data, and the availability of dividends.[23]

Drs. Wilson and Jones make further corrections to those made by Dr. Schwert for the biases caused by the use of time-averaged data.[24] Wilson and Jones highlight the importance of the breadth of index coverage by demonstrating that the narrower S&P 90 used by Ibbotson & Associates outperformed more broad-based market measures over the 1926-1956 period. Their finding implies that the commonly used Ibbotson series overstates the return to stock, and hence the market ERP over this period because market performance is based on this narrow market sample. Dimson et al. use the data series developed by Drs. Wilson and Jones in the data series that they assembled for the 1900-2002 period. The Dimson et al. data series have recently become available from Ibbotson & Associates.

Q. Please discuss the equity ERP estimates based on the use of the Ibbotson data and the estimates reported by Dimson et al.

A. The estimates reported by Dimson et al. and those calculated using the Ibbotson data set are summarized in panels A and B of Schedule 4.5, respectively. The arithmetic mean ERP for the longest time period for each of the sets of estimates are similar at 6.4% for the longer Dimson et

[23] G.W. Schwert, 1990. Indexes of United States stock prices from 1802 to 1987, *Journal of Business*, 63: 3 (July): 399–426. The market volatility results are reported in G.W. Schwert, 1989. Why does stock market volatility change over time?" *Journal of Finance*, 44: 5 (December): 1115–54.

[24] J.W. Wilson and C. P. Jones, 2002. An analysis of the S&P 500 index and Cowles extensions: Price indexes and stock returns, 1870-1999, *Journal of Business*, 75: 3 (July): 505-533.

al. time period of 1900-2002 and 6.39% for the shorter Ibbotson time period of 1927-2002. The same closeness in estimates exists for our weighted-average mean ERP for these two time periods (namely, 5.4% and 5.58%, respectively). Since all of these values exceed our going-forward estimate of 4.7%, they suggest that our estimate may be too low in an international context.

However, Drs. Dimson et al. argue (as we have in previous evidence) that comparisons across markets require an adjustment for risk differences, and that the effects of equity revaluations need to be removed to obtain expected ERP from realized ERP. As summarized in panel A of Schedule 4.5 and depicted in the left-hand-side graph in Schedule 4.6, risk-adjusting the arithmetic mean and weighted-average mean ERPs for the higher risk of the U.S. market over this time period compared to the Canadian market lowers the 6.4% arithmetic mean ERP for the U.S. to 5.7%. This is now comparable to the 5.5% ERP for Canada over this 103-year period. As depicted in the right-hand-side graph in Schedule 4.6, the removal of equity revaluations over the 103-year period studied by Drs. Dimson et al reduces the arithmetic mean ERPs for the U.S. and Canadian markets to 5.5% and 4.9%, respectively. When the U.S arithmetic mean ERP is adjusted so that it has the same level of risk as the Canadian market, the arithmetic mean ERP for the U.S. is further reduced to 4.9%. Thus, no change in the arithmetic mean ERP for Canada is required if the 103-year history of ERPs also is considered. This is prior to any further reductions in the ERP from various sources, such as the 1% reduction estimated by Dr. Jones from the reduction of trade costs over this 103-year period, and about a 20 basis point increase due to bond investors obtaining less than they expected. This is consistent with the forward-looking risk premium over T-bill (not long bond) estimates provided by Drs. Dimson et al of 3% on a geometric mean basis and around 5% on an arithmetic mean basis.[25]

Furthermore, why only consider the United States? Panel C of Schedule 4.5 reports that the arithmetic mean ERP for the world index of Drs. Dimson et al. over the 103-year period is 4.9%. When the revaluation of equities is removed, the arithmetic mean ERP for the world index is reduced to 4.1%. When an over-adjustment is made by adjusting for the lower total risk level of the world index as compared to the Canadian index, the arithmetic mean ERP for the world index becomes 5.0%. However, over most of this 103-year period, the achievement of the rewards associated with international diversification would have been quite high. Thus, the 1% reduction in the ERP for the U.S. due to trade cost reductions would be even higher for the world index.

Thus, these findings for the U.S. and the world for over a century of historical risk premia further support our view that our 4.7% market ERP estimate is conservatively high.

Q. What other estimates of the equity market risk premium have been reported in the more recent literature for the U.S. and other developed countries?

A review of this literature is presented in Appendix 4.C. Two recent studies estimate realized and expected equity risk premia for 15 countries over more than a century. They find that the expected equity risk premium, when measured **against short-term** government bonds over the 101-year period, is 4.0% and 3.5% for the U.S. and a sample of 15 developed countries including the U.S., respectively. All of the studies reviewed in

[25] Elroy Dimson, Paul Marsh and Mike Staunton, Global evidence on the equity risk premium, forthcoming *Journal of Applied Corporate Finance* 15:4 (Summer 2003), p. 18.

Appendix 4.C conclude that the U.S. equity risk premium has narrowed substantially, and is expected to be lower in the future. The U.S. forward-looking equity risk premium estimates vary from zero or slightly negative to about 4 %. Interestingly, at an equity risk premium forum in November 2001, Dr. Ibbotson made a long-term 4 percent (400 bps) equity risk premium forecast (i.e., geometric return in excess of the long-term government bond yield), under the assumption that the market was fairly valued.[26]

According to the legendary Warren Buffet in December 2001:[27]

> "I would expect now to see long-run returns (in stocks) in the neighbourhood of 7% after costs. Not bad at all – that is, unless you're still deriving your expectations from the 1990s."

In his 2001 letter to shareholders, Warren Buffet reiterates his expectations as follows:[28]

> "Our restrained enthusiasm for these securities is matched by decidedly lukewarm feelings about the prospects for stocks in general over the next decade or so…. Charlie and I believe that American business will do fine over time but think that today's equity prices presage only moderate returns for investors. The market outperformed business for a very long period, and that phenomenon had to end. A market that no more than parallels business progress, however, is likely to leave many investors disappointed, particularly those relatively new to the game."

---

[26] Roger Ibbotson, Summary comments, *Equity Risk Premium Forum*, November 8, 2001, p. 108.
[27] As reported in Douglas Porter and David Watt, Returning to equity returns, *Focus*, Economic Research, BMO Nesbitt Burns, February 22, 2002, p. 4.
[28] Warren E. Buffett, Warren Buffett's Letters to Berkshire Shareholders 2001, February 28, 2002, p. 15. Available at: http://www.berkshirehathaway.com/letters/2001pdf.pdf.

8. Market ERP estimate: Use of non-Canadian estimates:

Q. Do you use any explicit or implicit weighting scheme when you consider the market ERP in Canada and in foreign countries, such as the United States?

A. We use no explicit or implicit weighting scheme. Our approach is to use this additional information on foreign ERP to subjectively adjust the initial point estimate of the Canadian equity risk premium in its range (or distribution) of possible ERP values.

As we have noted in Appendix 4.D, the use of an explicit or implicit weighting scheme ignores the fact that, if the applicant utility traded in the foreign market, its beta is likely to be different than it is in the Canadian market. For example, in Appendix 4.D, we argue that if the equity market risk premium is higher in the foreign than Canadian market, the subject utility is likely to have a lower beta in that foreign market than in the Canadian market.

Fortunately, we can test this argument. Four of the utilities in our sample of ten utilities are cross-listed on the Toronto Stock Exchange and the New York Stock Exchange. They are (with their NYSE ticker symbol in parentheses): Enbridge Inc. (ENB), TransCanada Pipelines Ltd. (TRP), Westcoast Energy Inc. (WE) and Transalta Corp. (TAC).[29] We eliminate TAC because it did not have at least five years of monthly data on the NYSE when we conducted such tests for previous evidence, and we note that the trading in ENB is quite thin.

[29] Westcoast Energy traded through the end of 2001 and, hence, we include it in our sample for beta estimation.

This is a particularly "clean" test because we can examine the beta estimates and own utility risk premia in both markets for exactly the same companies in terms of business and financial risk. Shares in both markets for the same company need to provide the required risk-adjusted return for investors in both markets to hold the shares. Furthermore, any contemporaneous price differences between markets will be small because of arbitrageurs.

Our beta estimates for the three cross-listed utilities are reported in Schedule 4.7 for nine rolling five-year periods over the period 1990-2002 for the TSE and the NYSE, and over the full period 1990-2002. As expected, the beta estimates are lower for the same firm using NYSE data compared to using TSE data. To illustrate, the mean NYSE beta for the three utilities is 0.095 compared to its mean TSE beta of 0.292 based on the nine rolling five-year periods.

To show the implications of these different betas, let us assume for argument purposes that the appropriate equity risk premia for the Canadian and U.S. markets are 3.5% and 6%, respectively. If we then use the mean beta estimates for the sample of three utilities of 0.292 and 0.095 for Canada and the U.S., respectively, we obtain a higher mean own utility sample risk premia for the Canadian versus the U.S. market (i.e., 1.0% versus 0.6%, respectively). These results are in the direction that one would expect given the high level of integration between the Canadian and U.S. markets.[30]

9. Market ERP estimate: Biases and their impact:

[30] For a study dealing with integration of the Canadian and U.S. markets, see Lawrence Kryzanowski and Hao Zhang, 2002, Intraday market price integration for shares cross-listed internationally, *Journal of Financial and Quantitative Analysis*.

Q. Are there any biases in the various estimates of the equity risk premium that you refer to above?

A. Yes, there are a number of biases. All of them suggest that the various estimates are likely to be upwardly biased. We discuss four such biases.

The first bias is caused by survivorship bias. Some examples follow. First, when a new index is introduced, the index sponsor generally provides historic data on that index. For example, when the S&P/TSX Composite index was introduced in January 1977, historic ("back-fill") data was provided dating back to January 1956. The historic data was for firms in existence as of the date of the index introduction. Second, as proposed by Brown, Goetzmann and Ross (1995),[31] financial economists concentrate on the performance of surviving markets and so-called "winner" markets like the U.S. stock market. Financial economists ignore other markets that have done poorly or even disappeared. Examples given by Brown et al. include the Argentine market that is considered a comparatively less important emerging market because of long history of poor performance, and the Russian market where investors at one point had all their wealth expropriated during the last 100 years.

The second bias is caused by selection bias. Various studies argue that the historic returns for index additions or deletions (and indexes) are not representative of returns in general since S&P500 and S&P/TSX Composite replacement selection decisions use historical price information to select stocks for replacement. For example, Chung and Kryzanowski (1998)[32] find that deletions are drawn from stocks (so-called losers) that have performed abnormally poorly relative to the market prior to their

[31] S. Brown, W. Goetzmann and S. Ross, Survival, *Journal of Finance* 50 (1995), pp. 853-873. The following examples are drawn from Brown et al. (1995).
[32] R. Chung and L. Kryzanowski, Are the market effects associated with revisions to the TSE300 Index robust, *Multinational Finance Journal* 2 (March 1998), pp. 1-36.

removal from the index, and additions are drawn from stocks (so-called winners) that have performed abnormally well relative to the market prior to their addition to the index. This is not surprising because the major criterion for index deletion and addition for the former S&P/TSX Composite was relative capitalization (i.e., market price per share times the number of shares of float). Thus, relative losers are replaced with relative winners in terms of market price.

The third bias is caused by differences in index construction. For example, while the S&P/TSX Composite and S&P500 indexes are currently both value-weighted indexes, they differed until more recently in how the weights are calculated. The S&P500 index now also uses the public float when calculating a firm's weight for index construction purposes. For much of the past, differences in index construction made the S&P/TSX Composite more representative than the S&P500 of the actual investment opportunities that were available to public investors.

The fourth bias is caused by data recording problems. The price of the last trade is used to value firms in financial difficulty that have their trading suspended. If these firms later fail and are delisted, they are removed from the index using the last traded price and not their current price.

Q. Have you made any adjustments for these biases?

A. No, we have not made any adjustments for these biases. However, by not accounting for these biases, the ERP estimates reported earlier are conservatively high.

Q. Have you made any adjustments for globalization, increasing wealth of Canadians and a perceived desire of Canadians to be more heavily involved in equities?

A. No, we have not although all of the factors suggest that the ERP will decrease in the future. As we discussed more fully in this section of our evidence, all of these factors suggest that the market's tolerance for bearing risk can be expected to increase in the future. In turn, this leads to a decrease (not increase) in the equity risk premium, everything else held constant.

10. Market ERP estimate: Based on the DCF Test:

Q. Please provide a brief discussion of why you generate DCF estimates of the market ERP?

A. As is discussed in more detail in Section VII of our evidence, Discounted Cash Flow (DCF) Tests have a number of disadvantages that make them unreliable for estimating the required rate of return or risk premium on equity, particularly for individual companies. Nevertheless, because the DCF approach represents an alternative method of estimating the market ERP, it is useful as a check on the reasonableness of our ERP tests. With this in mind, we conduct DCF Tests using the constant growth and the two-stage growth versions of the Dividend Discount Model or DDM for the U.S. market as proxied by the S&P500 Index, and for the Canadian Market as proxied by the S&P/TSX Composite Index. We use both historical estimates of dividend growth and analyst forecasts of future earnings growth. The output of these DCF tests consists of various estimates of the market ERP.

Q. Would you please describe the constant growth and two-stage versions of the DDM?

A. The required rate of return in the constant growth DDM or Gordon model is given by:

$$k = \frac{D_1}{P_0} + g$$

where D_1 is the expected dividend in the next period, or D_0 (1 + g);
P_0 is the current price or level of the stock or index; and
g is the growth rate in dividends, which is assumed to be constant until the end of time.

In this version of the model, the growth rates in dividends, earnings, book value and share price are all assumed to be equal.

In the two-stage DDM, dividends are assumed to grow at a fixed rate g_1 for an initial period (herein deemed to be the first five years), and then to grow at a different fixed rate g_2 thereafter. In this version of the DDM, the implied required rate of return is found by solving for k in:

$$P_0 = \sum_{t=1}^{5} \frac{D_0(1+g_1)^t}{(1+k)^t} + \left(\frac{D_6}{k - g_2} \right)$$

where $D_6 = D_0(1+g_1)^5(1+g_2)$.

The implied equity risk premium or IERP is then obtained by subtracting the current yield on long-term government bonds from the estimate of k derived from the above models.

Q. Would you please first discuss the DCF Test results that use historical estimates of future expected growth rates?

A. The DCF Test results for the S&P/TSX Composite Index and the S&P500 Index are reported in Schedules 4.8 and 4.9, respectively, for each of the years over the period, 1971-2002. All of these tests use growth rates based on the last ten years of data ending in the year indicated that are smoothed by equally weighting each data point. The tests use the historical 10-year annual growth rate in either dividends (adjusted or unadjusted for other cash flow distributions to shareholders) or nominal GNP. Since the highest implied risk premia or IRPs are obtained using GNP growth, we confine our discussion to those results.

For the S&P/TSX Index, the mean IERP from the single-stage DDM with a generous upward dividend adjustment for nondividend cash distributions of 50% declines from 5.18% for the full 32-year period, 1971-2002, to 2.94% and 1.39% for the more recent 20 and 10 year periods, respectively. Similarly, the mean IERP from the two-stage DDM declines from 2.88% for the full 32-year period, 1971-2002, to 1.18% and 0.12% for the more recent 20 and 10 year periods, respectively. These results suggest that our forward-looking estimate of the IERP for the S&P/TSX of 4.7% is conservatively high.

For the S&P500 Index, the mean IERP from the single-stage DDM with a generous upward dividend adjustment for nondividend cash distributions of 50% declines from 5.58% for the full 32-year period, 1971-2002, to 4.18% and 2.80% for the more recent 20 and 10 year periods, respectively. Similarly, the mean IERP from the two-stage DDM declines from 3.35% for the full 32-year period, 1971-2002, to 2.55% and 1.76% for the more recent 20 and 10 year periods, respectively. These results also, once again, suggest that our forward-looking estimate of the IERP for the S&P/TSX of 4.7% is conservatively high.

Q. Is there any support for the notion that the long-term growth in earning's (dividends) cannot exceed long-term growth in GNP?

A. Yes, this is a commonly held position. In fact, in the summary comments at a recent equity risk premium forum, Dr. Leibowitz summarized his viewpoint as follows:[33]

> "I'm very impressed by the level of consensus on the view that earnings can grow only at a somewhat slower rate than GDP per capita and that no one seems to feel it can grow much more – except Roger Ibbotson…"

There are at least four reasons why the long-term growth in the economy is considered to be an upper bound for the long-term growth in the earnings of the market. First, since much of the growth in the economy comes from unlisted firms, these investment opportunities are typically not available to the general public and are not captured by the indexes used to calculate market ERPs.[34] Second, a good portion of the growth in the business sector of the economy can not be financed by retained earnings and, thus, requires the continual issuance of new shares (referred to as seasoned issues). Third, Siegel (p. 15) argues "the returns to technological innovation have gone to workers in the form of higher real wages, while the return per unit of capital has remained essentially unchanged."[35] Fourth, the growth in the economy is usual measured as growth in GDP or in GNP on a per-capita basis.

---

[33] Marin Leibowitz, Summary comments, *Equity Risk Premium Forum*, November 8, 2001, p. 109.

[34] Jagannathan et al. use the S&P, CRSP and Board of Governors (BOG) portfolios to examine the market ERP. The BOG portfolio, which includes stocks that are not publicly traded and all stocks held by U.S. residents, has about two times the value of the CRSP stocks. While they obtain nearly identical ERP estimates using the S&P and CRSP portfolios over the entire sample period and various sub-periods, their estimates using the BOG data are higher on average by roughly two percent. Ravi Jagannathan, Ellen R. McGrattan and Anna Scherbina, 2000, The declining U.S. equity premium, *Quarterly Review of Federal Reserve Bank of Minneapolis*, Fall, pp. 3-19.

[35] J. Siegel, 1999, The shrinking equity premium, *Journal of Portfolio Management* 26:1 (Fall), pp. 10–17; and W. Reichenstein, 2002, What do past stock market returns tell us about the future?, *Journal of Financial Planning* forthcoming.

Q. What adjustment do you make for the conjecture that dividend yields are an incomplete and poor proxy for the cash distributions received by equity distribution?

A. In both Schedules 4.8 and 4.9, we overadjust for the possibility that cash distributions other than dividends (e.g., share repurchases) are sizeable. We do this by increasing the dividend yield by 50% for the one-stage DDM model. However, many observers have shown that completed repurchases are much less than announced repurchases and that stock buybacks are offset by share issuances.[36]

Q. Would you please now discuss the DCF Test results that use analyst estimates of future expected growth rates?

A. These results are summarized in Schedule 4.10. Although they are only indicative due to the poor quality of the data, they suggest that even if we use the earnings growth rate forecasts of analysts without adjusting for their known optimism bias, that the forward-looking implied equity risk premia or IERP are 4.27% for both the S&P/TSX and S&P500 indexes. If we reduce the forecasted growth rates by a very conservative estimate of the optimism bias of about 15%, the IERPs drop to 3.14% and 3.13% for the S&P/TSX and S&P500 indexes, respectively. Interestingly, all of the estimates of market return are less than 10%, which is consistent with the forecast of other professionals reviewed earlier in the evidence.

Q. What inference do you draw from your estimates of the implied ERP using the earnings forecasts of analysts for U.S. and Canadian equity markets?

[36] For examples, see J.C. Bogle, 1995, The 1990s at the halfway mark, *Journal of Portfolio Management* 18:1 (Summer), pp. 21–31; and K. Cole, J. Helwege and D. Laster, 1996, Stock market valuation indicators: Is this time different?, *Financial Analysts Journal* 52:3 (May/June), pp. 56–64.

A. The conclusion that we draw is that our forward-looking estimate of the IERP for the S&P/TSX of 4.7% is conservatively high.

11. The final Canadian market ERP estimate (final input #2):

Q. What market equity risk premium are you forecasting to be used to calculate the risk premium for an average-risk utility for 2004?

A. We determine that our estimate of the Canadian market ERP of 4.7% discussed above needs no further upward adjustment since it is already on the high side. This latter observation reflects the recent evidence that the use of the realized market ERP results in an over-estimate of the risk premia required historically, and the consensus conclusion in recent studies that the required risk premium going forward will be low. On balance, weighing all of these factors leads to our Canadian market risk premium forecast of 4.7%. Our “generous” point estimate is substantially higher than the forecasted range of 2.0% to 2.5% calculated for internal use by W.M. Mercer for Canada, the consensus forecast of 3.5% reported for Canada in the *2002 Fearless Forecast* and repeated in the *2003 Fearless Forecast*, as well as the “consensus” forecast of academic and professional scholars of a low, nil or negative equity risk premium for the U.S. going forward. It is also substantially higher than the BMO Nesbitt Burns’ forecast of a maximum of less than 2% for Canada presented earlier.

Relative investment risk of HQ DIST (input #3)

Q. How does the overall riskiness of an average-risk utility compare with the typical firm contained in the S&P/TSX Composite?

A. The overall (investment) riskiness of an average-risk utility is typically determined by measuring its contribution to the risk of a well-diversified portfolio. In a CAPM world where the only factor affecting returns is the market, this contribution is measured by the firm's market beta.

Since market betas vary over time, investment professionals prefer to use only the most recent data in order to capture the firm's current risk even for firms with long trading histories. However, to ensure reasonable statistical precision, beta estimations typically are based on approximately 5 years of monthly observations. The betas used herein are based on 60 months of data, and are only calculated if almost all months have returns based on actual market transactions.

It is not possible to estimate a reliable beta for the average-risk utility directly. This utility does not trade publicly. However, it is possible to make an approximation. We use the same sample of eight utilities that we will use in our capital structure discussion in Section V. We present the rationale for the sample selection there. Here we add Westcoast Energy as this company traded throughout 2001, and as exchange units of Duke in 2002. We also add ATCO excluded from the original sample to avoid double counting with Canadian Utilites. As shown in Schedule 4.11, the average beta for a group of ten utilities is 0.104 for 1998-2002, a sizeable decrease from 0.583 for 1990-1994. The mean of the mean cross-sectional beta for each of the nine rolling five-year periods is 0.389. The means of the mean cross-sectional betas for the first four and the last five rolling five-year periods are 0.541 and 0.267, respectively. Although we believe that the downward trend in the betas will not change direction in the future due to the changing nature of the Canadian equity market, we estimate the beta for an average-risk utility at 0.50, above the grand average of the average rolling-betas for the nine periods.[37] We believe that this estimate is upwardly biased ("generous"), and provides sufficient coverage for any estimation errors.

Q. What other risk-related factors did you consider that could affect the cost of equity capital for an average-risk utility?

A. We also examined whether an average utility was becoming a more desirable investment because of an increase in its potential to diversify investor portfolios. In modern portfolio theory, an asset becomes more desirable for portfolio diversification purposes if its correlations with all the other assets decrease towards zero or even become negative, everything else held constant. This important contribution led to the awarding of a Nobel Prize in Economics to Dr. Harry Markowitz.

Thus, we calculate moving average correlations for our sample of utilities with the S&P/TSX Composite index. These results are summarized in Schedule 4.12. We find that the average correlation between a utility in our sample and the S&P/TSX Composite is substantially lower for the most recent five-year period relative to the more distant five-year period (0.087 versus 0.495), and is quite low at 0.353 across all nine rolling five-year periods. This suggests that an average utility is now more desirable as an investment because of its enhanced potential for portfolio risk reduction. A greater potential for risk reduction leads to a reduction in an asset's own equity risk premium. Furthermore, during the most recent five-year period, 1998-2002, four of the ten utilities have a correlation with the market of less than 0.1, and three of the ten utilities have a negative correlation with

[37] Betas of 0 and 1 correspond to no market risk and a market risk equal to a well diversified portfolio such as the S&P/TSX Composite index, respectively. Thus, a beta of 0.50 for an average-risk utility indicates that this utility has 50% of the investment risk of the S&P/TSX Composite.

the market. In other words, four of these utilities behave almost as if they were market neutral.

This reduction in the correlations between the returns of the utilities and the market also contributes to the reduction in the betas of the sample of utilities since the beta coefficient is given by:

$$\beta_i = \frac{\sigma_i \rho_{im}}{\sigma_m}$$

where σ_i and σ_m are the standard deviation of returns for utility *i* and the market *m*, respectively; and

ρ_{im} is the correlation between the returns for utility *i* and the market *m*, respectively.

Thus, if the relative risks of the utility and market remain constant, the beta decreases as the correlation between their returns moves from 1 to 0.

As a check of whether or not everything else is held equal, we also calculate and report the average overall risk of the sample of utilities relative to the S&P/TSX Composite index. We find that the average overall risk of the sample of utilities relative to the S&P/TSX Composite index has been above one for most of the nine rolling five-year periods as seen in Schedule 4.12. This suggests that the relative total riskiness (i.e., diversifiable plus nondiversifiable risk) of utilities exceeds that of the market, which only has nondiversifiable risk from a domestic-only perspective. However, it is important to remember that the market does not reward investors for holding diversifiable risk in their portfolios. The beta and not the sigma risk of an individual utility is important for its pricing (its own ERP).

Q. What conclusion do you derive from this analysis?

A. We conclude that the required equity risk premium for an average-risk utility should be reduced to reflect the trend that indicates the greater desirability of holding utilities for investor portfolio diversification over time. This is due to the downward trend in the lower average correlation of utilities with the market over time, although we make no such reduction.

1. Relative investment risk of an average-risk utility: The use of the adjusted beta method:

Q. What is your opinion on the practice by some other witnesses, such as Ms. McShane, in rate of return hearings of adjusting the betas used in calculating the required rate of return on equity?[38]

A. There are two primary rationales that have been given for using the adjusted beta method when calculating the required rate of return on equity. Both rationales are flawed.

Q. Would you please explain what the first rationale for using the adjusted beta method for utilities is and why it is flawed?

A. The first rationale is based on the empirical finding by Blume (1975) that the betas of individual U.S. equities, for a large sample that is representative of the overall market, tend to regress over the long run towards the mean beta for the sample.[39] In the case of a large representative sample, the mean beta will be one.

Blume regresses the beta estimates obtained over the period 1955-1961 against the beta estimates obtained over the period 1948-1954 for

[38] E.g., lines 1-5, page 47. Ms. McShane, e.g., lines 1-5, page 47, of the prepared testimony: Atco Pipelines, Alberta Energy and Utilities Board, January 2003. Refiled by Atco for this generic hearing as EX_008-01, Application, Section 3.

[39] M.E. Blume, Betas and their regression tendencies, *Journal of Finance* 30 (June 1975), pp. 785-796.

common shares traded on the NYSE. Blume finds that the betas of firms with betas less than one subsequently tend to increase towards the sample beta of one, and firms with betas of more than one tend to subsequently decrease towards the market beta of one. The relationship estimated by Blume suggests that the quality of beta forecasts can be improved, and that a higher quality predictor of an individual firm's beta may be a weighted average of the sample beta and the firm's current beta where the weights are approximately one-third and two-thirds, respectively.[40]

There are at least five substantive reasons for not adjusting betas for utilities based on this rationale.

First, Harrington (1983)[41] shows that the betas that are supplied by commercial vendors that use this adjustment have little predictive accuracy. Her conclusion is based on a comparison of the actual beta forecasts supplied by a number of commercial investment vendors (such as Value Line) with their corresponding benchmark estimates for four forecast horizons.

Second, there appears to be no evidence that the relationship estimated by Blume applies to other markets, such as the Canadian market, or more recent time periods. In other words, there appears to be no empirical evidence that the betas of Canadian stocks revert to the sample mean.

Third, if the sample average is consistently lower than the market beta, as is the case for the samples of utilities studied herein, the use of the market beta of one will result in an over-prediction of the mean beta in the next

---

[40] Also, see O.A. Vasicek, A note on using cross-sectional information vs. Bayesian estimation of security betas, *Journal of Finance* 28 (September 1973), pp. 1233-1239.
[41] D.R. Harrington, Whose beta is best?, *Financial Analysts Journal* (July-August 1983), pp. 67-73.

period for the sample. This is easily shown by taking a portfolio that is invested 40% in risk-free assets and 60% in the market, and thus, has a constant beta of 0.60 by construction. Its adjusted beta would consistently be 0.73 (i.e., two-thirds of 0.6 + one-third of 1), although its actual or true beta is substantially lower at 0.6.

Fourth, the previous point has already been documented in the published literature. Kryzanowski and Jalilvand (1986)[42] test the relative accuracy of six beta predictors for a sample of fifty U.S. utilities from 1969-1979. They find that the best predictors differ only in that they use different weighted combinations of the average beta of their sample of utilities, and that, not unexpectedly, the worst predictor is to use a beta of one or the so-called "long-term tendency of betas towards 1.00".

Fifth, adjusting the beta towards one assumes that the "true" beta for the utility is one. In other words, this adjustment method is based on the implicit assumption that the "true" beta for the utility is the same as that of the market index.

Q. Would you please explain what the second rationale for using the adjusted beta method is and why it is flawed?

The second rationale for using a variant of the adjusted beta method for utilities is that raw utility betas need to be adjusted upward due to their sensitivity to interest rate changes, and that the appropriate adjustment is one that is intermediate between the raw and adjusted betas. We provide a detailed criticism of this rationale in Appendix 4.E. This detailed criticism will now be summarized.

[42] L. Kryzanowski and A. Jalilvand, Statistical tests of the accuracy of alternative forecasts: Some results for U.S. utility betas, *The Financial Review* (1986), pp. 319-335.

As is the case for the S&P/TSX Composite index, the returns of utilities are sensitive to changes in both market and bond returns. This suggests that utility returns may be better modeled using these two potential return determinants or factors. However, one should not confuse the sensitivity of utility returns to the returns of each of these factors with the premium required by investors to bear market and interest rate risk when investing in utility equities.

When there is only one determinant of utility returns (namely, the market), the theoretically justified approach is to use the traditional one-factor CAPM to implement the Market Risk Premium Method. The method is implemented by first estimating the utility's beta by running a regression of the returns on the utility against the returns on the market proxy (S&P/TSX Composite index). The utility's required equity risk premium is obtained by multiplying the equity risk premium estimate for the market by the utility's beta estimate. The cost of equity for the utility is obtained by adding the equity risk premium estimate for the utility to the estimate of the risk-free rate (as proxied by the yield on long Canada's).

When there are two possible determinants of utility returns (in this case, equity market risk and interest rate risk), the theoretically justified approach is to use a two-factor CAPM to implement the Market Risk Premium Method. The Equity Risk Premium Method now is implemented by first estimating the utility's two betas by running a regression of the returns on the utility against the returns on the equity market proxy (S&P/TSX Composite index) and on the bond market proxy (long Canada's). The first component of the utility's required equity risk premium is obtained by multiplying the equity risk premium estimate for the market by the utility's market beta estimate, and the second component of the utility's required equity risk premium is obtained by multiplying the bond risk premium estimate by the utility's bond beta estimate. The utility's required equity risk premium is the sum of these two components. The cost of equity for the utility then is obtained by adding the equity risk premium estimate appropriate for the level of relative risk for the utility to the estimate of the risk-free rate (as proxied by the yield on long Canada's).

While one would expect the estimates of the return on the S&P/TSX Composite index, of the return on long Canada's, and of the return on the S&P/TSX Composite index over the yield on long Canada's to be positive and significant, such is not the case for the return on long Canada's over the yield on long Canada's. Over the long run, we would expect the average return on long Canada's to be equal to the yield on long Canada's (the proxy for the risk-free rate in rate of return settings). This is because our expectation is that rates would fluctuate randomly so that returns would be above yields to maturity in some periods and below them in others. Thus, while it is true that utility returns are sensitive to interest rates, it is not true that interest rate risk will have a positive risk premium over the long run.

To examine the nature of bond market risk premia, we calculate the bond market risk premia over various time periods that correspond to those used previously to calculate the equity market risk premia. These results are reported in Schedule 4.E2 in Appendix 4E. As expected, over long periods, such as 1965-2002, the mean bond market risk premium is only 30 basis points, and it becomes negative over the three progressively longer time periods of 1957-2002, 1951-2002 and 1936-2002. While it is positive and quite material over the 1980-2002 period at 1.745%, this is offset by the relatively low market equity risk premium of 2.797%. Furthermore, according to our expectations, all of the mean bond risk premia are not significantly different from zero at conventional levels. In contrast, the mean equity risk premia are significantly different from zero for the two longest time periods of 1936-2002 (at 5% level) and 1951-2002 (at 12% level).

Looking forward we expect market equity risk premia to be low, and we do not expect the bond market risk premium to be material (on the positive side) since interest rates are now at or near historic lows.

THE INITIAL COST OF EQUITY CAPITAL RECOMMENDATION

Q. What cost of equity capital are you recommending for the average-risk utility based on this Equity Risk Premium Test?

A. Based on a market risk premium estimate of 4.70% and at a relative risk factor of 50% of the S&P/TSX Composite index, the equity risk premium required for our average-risk utility (i.e., our final estimate of input #2 multiplied by our final estimate of input #3) is calculated to be 2.35%. Given our point forecast of a long-term Government of Canada bond rate of 5.60% (our final estimate of input #1), our cost of equity capital point estimate is 7.95%.

ADJUSTMENT TO THE INITIAL COST OF EQUITY CAPITAL RECOMMENDATION FOR AN AVERAGE-RISK UTILITY

Q. What adjustment is required to this “bare bones” figure to make it suitable for a cost of equity estimate for purposes of regulation?

A. Past practice in varous regulatory jurisdictions considers the need to adjust from a market-value based rate of return to an accounting-based rate of return in order to preserve the financial integrity and financing flexibility of a utility such as our average-risk utility. The idea is that our average-risk utility should be allowed to maintain its market-to-book value ratio sufficiently above unity (the value of one) in order to attract investment and to recoup flotation costs associated with issuing new equity financing instruments.[43] The notion that each company should maintain market value above book value is somewhat contradictory as it suggests that each company should plan to earn a return on new investments above the allowed rate of return.

Also, as was discussed earlier, the use of a weighted average of the arithmetic and geometric means in determining the market risk premium already provides generous protection to ensure the financial integrity and financing flexibility of an applicant utility.

For these reasons, we only consider flotation costs as a justification for making an adjustment to the “bares bones” cost. However, given the high dividend payout ratios paid by utility firms, no compelling justification even exists for making an adjustment for equity flotation costs. Since all ongoing equity needs should be able to be totally funded internally, no flotation costs should be incurred for public equity offerings. Furthermore, some of the applicant utilities and their holding company owners neither have nor are expected to undertake public equity offerings. Nevertheless, we make an adjustment to the “bare bones” cost to compensate the applicant utilities for potential equity flotation costs.

Q. What adjustment to the “bare bones” cost do you make to compensate the applicant utilities for potential equity flotation costs?

A. When firms issue or sell new equity to the market, they incur underwriting fees paid for marketing the issue, and other underwriting and issue expenses for legal and accounting services, printing of issuing documents,

[43] For example, see G.R. Schink and R.S. Bower, Application of the Fama-French model to utility stocks, in *Financial Markets, Institutions and Instruments; Estimating the Cost of Capital: Methods and Practice* 3:3 (1994), pp. 74-95.

and applicable registration fees. Research on flotation or issuance costs for new equity issues for utilities in Canada over the five year period ending with 2001 finds that the median fee is 4% of gross proceeds for equity offerings (see Schedule 4.13). When the equity offering fees are amortized over a 50-year period, the annual adjustment needed to compensate the average-risk utility for potential equity flotation costs is about 8 basis points annually, which we round up to 10 basis points to cover other issue costs.

THE FINAL RECOMMENDED COST OF EQUITY CAPITAL FOR THE AVERAGE-RISK UTILITY

Q. What cost of equity capital are you recommending for the average-risk utility based on this Equity Risk Premium Test?

A. As noted earlier, our Equity Risk Premium or Equity Risk Premium Test used the following inputs:

1. the yield forecasted for 2003 for long Canada's (input #1);
2. the forecast of the implied risk premium for the S&P/TSX Composite (input #2);
3. the investment riskiness (market beta) of the average-risk utility relative to the market portfolio as proxied by the S&P/TSX Composite Index (input #3); and
4. an adjustment to cover fees involved with potential equity offerings or issues (input #4).

We also stated that the recommended rate of return on equity for the average-risk utility is obtained by combining our final estimates of these four inputs as follows:

(Input #1) + [(Input #2) *x* (Input #3)] + (Input #4)

Based on a market risk premium estimate of 4.70% and a relative risk factor of 50% of the S&P/TSX Composite index, the equity risk premium required for the average-risk utility (i.e., our final estimate of input #2 multiplied by our final estimate of input #3) is calculated to be 2.35%. Given our point forecast of a long-term Government of Canada bond rate of 5.60% (our final estimate of input #1) and adding 0.10% for equity flotation costs (our final estimate of input #4), our point estimate of the cost of equity capital for an average-risk utility is 8.05%.

Thus, we are recommending a return of equity of 8.05%. Our return on equity recommendation allows an average-risk utility a risk premium (with the inclusion of the equity flotation adjustment) of 245 basis points over our forecast for long Canada yields.

V. CAPITAL STRUCTURE

Q. Please explain how you have organized this section of your evidence on capital structure.

A. The purpose of this section of our evidence is to develop a recommended target capital structure, in particular, a target common equity ratio, for each of the eleven applicant companies. In setting capital structures, we examine financial data and regulatory precedents at three levels. The first, and broadest level consists of a sample of Canadian utilities. Our second level divides the utility industry into sectors of which the applicant companies represent four sectors; namely: electricity distribution, electricity transmission, gas distribution and gas transmission. Finally, we examine individual companies.

We begin by examining relevant financial data for a sample of eight Canadian utilities drawn from *Stock Guide*. This sample consists of gas and electric utilities and pipelines that are covered in *Stock Guide* and have publicly traded common shares. We require the common shares of the included companies to be publicly traded to ensure consistency between our samples here and in later sections where we present our evidence on the fair rate of return on common equity. Two companies appear in *Stock Guide* but not in our sample because they do not meet this criterion. For Union Gas only the preferred shares are traded while Gaz Metropolitain is a limited partnership. Finally, to avoid double counting, we exclude ATCO because it is wholly owned by Canadian Utilities. Applying these rules in choosing a sample has the advantage of precision in coverage and comparability with the earlier work in Section IV of this evidence but it comes at a price. The rules exclude a number of well-known companies in the utility industry. As a remedy, in various stages of the analysis, we compare our findings with those obtained from a broader, more generally defined sample.

We analyze bond ratings, capital structures, interest coverage ratios and returns on equity for our sample companies. Next, we examine the implications of holding company structures for our analysis. We then discuss Standard & Poor's rating guidelines and explain why they are not a firm foundation for setting capital structures for regulated utilities. Then we briefly review the practical implications of finance theory to set up a conceptual framework for our analysis. From here, we move to examine the business risk and recommend a capital structure for each sector of the utility industry represented in these proceedings. We base our assessments of the sector business risks on the evidence of Robert T. Liddle and William C. Marcus. We then turn to examining the equity ratios of comparable companies – both the actual ratios and those allowed by regulators in Canada. We conclude this section of our evidence with our recommendation on the appropriate target equity ratios for each individual applicant utility.

BOND RATINGS AND OBSERVED CAPITAL STRUCTURES

Q. What evidence can you present on bond ratings and capital structures for Canadian utilities?

A. Schedule 5.1 displays Dominion Bond Rating Service (DBRS) and Standard & Poor's (S&P) bond ratings in August 2003 for our eight Canadian utilities: three gas utilities, four electric utilities and one oil and gas pipeline. These companies represent a current sample of utilities with publicly traded shares for which data are available in *Stock Guide*. As stated earlier, in forming this sample we seek to measure ratings and financial ratios for the traded entity associated with the regulated utility. In focusing on traded companies, our goal is to maintain sample consistency throughout our evidence. We recognize, however, that the traded companies are primarily holding companies which include nonregulated businesses in addition to regulated utilities. We control for any bias by commenting on the differences as well as comparing our conclusions to those drawn strictly for regulated entities. We return to issues arising from the holding company structure later in this section of our evidence.

The bond ratings are from the websites of DBRS and S&P. Starting with the DBRS ratings, Schedule 5.1 shows that these ranged from A for Canadian Utilities, Enbridge, Terasen Gas and TransCanada Pipelines down to BB (high) for Pacific Northern Gas. The Schedule shows that the typical Canadian energy utility is rated A (low) by DBRS.

We next turn to the S&P ratings and make a similar comparison. The S&P ratings for the utilities in our sample ranged from A+ for Canadian Utilities down to BBB- for TransAlta. Standard & Poor's does not rate Pacific Northern Gas. The Schedule shows that the typical Canadian energy utility is rated BBB+ by S&P.

As a final measure of bond ratings of utilities in Canada, we examine a broader sample of additional companies available on the websites of the two bond rating agencies. The bond ratings for these companies are in Schedule 5.2. The schedule confirms what we find from our examination of Schedule 5.1: the typical utility carries a DBRS rating of A (low) and is rated one notch lower at BBB+ by S&P.

The next step is to examine the actual capital structures of the companies in our sample for 2000 through 2002, the latest years for which data are available in *Stock Guide*. Focusing on the 2002 ratios, Schedule 5.3 reveals that there is considerable variation in common equity ratios for these companies ranging from a high of 48.39% for Emera down to 33.90% for TransCanada Corporation. The average percentage of common equity for these companies was 38.77% in 2002. Schedule 5.3 also presents common equity ratios for 2001 and 2000. With the exception of Terasen, the ratios were quite stable over these three years.

In addition, Schedule 5.3 shows the percentages of long-term debt and preferred shares in the capital structures of these companies. Again, there was considerable variation in the proportionate use of financing across companies. On average, the companies employed 59.17% long-term debt and 2.06% preferred shares in 2002. These ratios show common equity, long-term debt and preferred shares as percentages of long-term capital excluding short-term debt. If we include short-term debt, Schedule 5.4 shows that the percentage of debt falls marginally to 58.54% for the average utility for 2002. Given the marginal nature of this difference, we continue our focus on long-term capital.

The presentation of ratios for the same group of companies continues in Schedule 5.5. The first three columns show the coverage ratio, EBIT/ Interest expense.[44] The average coverage ratio was 2.41 in 2002. The next three columns display cash flow to debt which averaged 0.14 over the three years.

Q. What conclusions about an appropriate capital structure for an utility can you draw from Schedules 5.1 to 5.5?

A. The schedules show that, from the vantage point of DBRS, Canadian Utilities, Enbridge, Terasen and TransCanada are the only companies which enjoy an A credit rating. The other companies are all rated A (low) (or lower). For S&P, only one company in our sample (Canadian Utilities)

[44] EBIT are earnings before interest and taxes.

is rated A+. As stated earlier, the typical company is rated A(low) by DBRS and given a one-notch-lower BBB+ rating by S&P. Of the eight utilities in our sample, five received a rating below A- (A (low)) from at least one of the rating agencies. Yet, despite their lower ratings, these companies have experienced no difficulties in accessing capital markets to raise long-term financing.

We conclude that the experience of the companies in Schedules 2-5 suggests that a bond rating in range of BBB or higher is sufficient to maintain good access to capital markets.

Q. Schedule 5.5 also contains data on ROEs for the companies in your sample. Do these data support your argument that a bond rating in the range of BBB or above is sufficient for a regulated electric utility?

A. Yes, they do. The ROE figures for 2000 through 2002 show that all of the companies earned positive ROEs in all three years. Further, a 2001 study on the Canadian electric utility industry by DBRS, concludes that actual earned ROEs typically exceed ROE targets set by regulators.[45] This strongly suggests that having a bond rating in the range of BBB did not impede these companies from profitably conducting their businesses.

HOLDING COMPANY STRUCTURES

Q. The Board has identified utility holding company structures as an issue to be addressed in these proceedings. Please explain the relevance of this issue for your analysis.

[45] G. Lavalee, M. Kolodzie and W. Schroeder, *The Canadian Electric Utility Industry*, Dominion Bond Rating Service, November 2001, p. 49.

A. We noted earlier that the traded companies in our sample are primarily holding companies. In such structures, the regulated utility typically accesses capital markets through the parent. In such cases, application of the stand-alone principle requires that the Board ensure that the subsidiary is not subsidizing the parent holding company. This could occur if the parent company issued debt and used the proceeds to provide "equity" to the regulated subsidiary. The subsidy would occur as the ratepayers would be charged a higher rate reflecting the higher cost of equity in the subsidiary while the true cost of financing to the holding company would be lower. In such a situation, the assets of the regulated utility effectively serve as collateral to increase the borrowing power of the unregulated part of the holding company adding value for the shareholders.

If such over leveraging were to occur, the shareholders would gain unfairly at the expense of the customers of the regulated utility who would have to pay higher rates to "compensate" the regulated utility for the cost of carrying unwarranted extra "equity". Further, the equity in the capital structure of the subsidiary would not serve its purpose of reducing the financial risk of the regulated entity. In the event that the parent corporation, encountered financial distress, the subsidiary would likely not be spared the consequences of over leveraging at the parent level.

To guard against these possibilities the Board recognizes the need to examine the capital structures of parent holding companies which provide equity to regulated subsidiaries. This necessity is reflected in the minimum filing requirements, Appendix C, part f) which states: "Parent information is required if and only if the Regulated Entity does not directly issue its equity to the public."

Later in this section of our evidence, we return to this topic and conduct a general comparison of the average capital structures of utility holding companies against structures awarded by regulatory boards. Previewing our results, we find that, in general, the capital structures of utility holding companies contain equity levels only slightly lower than those awarded by regulatory boards. This suggests that, for the industry as a whole, over leveraging is not a major problem. We also investigate the issue for individual utilities.

STANDARD & POOR'S RATING GUIDELINES

Q. A number of other witnesses in this hearing employ S&P's guidelines for an A- bond rating as a basis for setting a capital structure for applicant utilities. Can you please comment on the validity of this procedure?

A. Unfortunately, this approach is flawed for several reasons. First, bond rating is not an exact science. Although rating agencies publish guidelines for the amount of debt required to maintain a certain rating, in practice, a large number of companies are not downgraded and maintain higher ratings than these guidelines imply. Second, even when companies are downgraded below A-, their ability to access capital markets is unimpaired.

Q. Please discuss the first reason why the approach based on S&P's rating rules is not appropriate in determining utility capital structures.

A. Bond rating is far from an exact science suggesting that it is overly simplistic to argue that only companies with ratings of A (low) or higher can function successfully in financial markets.[46]

[46] As argued in Ms. McShane's, Prepared Testimony on Capital Structures for the ATCO Utilities, page 6, lines 13-14, and in Mr. Falconer, page 16, lines 3-11 of his evidence.

To illustrate the role that judgment plays in bond ratings, we have only to examine Schedule 5.1 where we see that the two agencies rating Canadian utility bonds often disagree. This situation, termed split ratings, is quite common. To illustrate, we begin by excluding Pacific Northern Gas which has only one rating and then compare ratings to determine the extent of agreement or disagreement between rating agencies. In this remaining sample of seven not a single company was assigned a comparable rating by DBRS and S&P.

A well-known Canadian investments textbook documents that such disagreements between bond raters are common:

> "A study of 55 Canadian issues that were rated by at least one U.S. and one Canadian rating agency showed that the latter assigned a higher rating in 45 cases, lower in 4 and the same in 6. On average the ratings by the Canadian raters were one quality level higher. This has led some analysts to conclude that the Canadian bond raters are systematically biased. Other analysts, however, point out that the Canadian firms are more familiar with the domestic market and may uncover aspects of the debt issuer's financial condition overlooked by S&P's and Moody's".[47]

Bond rating agencies often disagree and ratings of the same company often differ by one "notch" between rating agencies. For this reason, it is highly unlikely that a downgrade of one notch would have a material impact on a utility as long as it remained BBB or better (investment grade).

[47] W.F. Sharpe, G.J. Alexander, J.V. Bailey, D.J. Fowler and D.L. Domian, *Investments*, Third Canadian Edition, Prentice Hall Canada, Scarborough, 2000, p. 371.

Kryzanowski and Ménard conducted a comprehensive study of bond rating migrations (movements) for senior, unsecured, long-term bonds rated by the Canadian Bond Rating Service (CBRS now owned by S&P) for 395 corporate issuers over the 25-year period 1973-1998, and by Moody's for 195 corporate issuers over the 16-year period 1982-1998.[48] The sample consists of all bond issues found in CBRS's proprietary database, Moody's Credit Opinions and Bloomberg. Their major findings of relevance here are:

- The rating drift ratios (a measure of whether bond rating movements have predominantly improved or deteriorated) differ appreciably for CBRS- and Moody's-rated bonds, especially during the 1985-1989 period.
- The rating drift ratios show that the bond ratings of Canadian issuers improved during each of the years in the 1975-1980 period, and they deteriorated substantially during each of the years in the 1982-1983 and 1990-1993 period.
- The highest annual rating activity ratios (i.e., the number of rating changes during a year divided by the number of issuers rated during the year) of about 65% in 1982 and 76% in 1991 occurred during the last two economic recessions.
- The highest sub-groups of B-rated debtors exhibited an increasing tendency to be upgraded as the tracking horizon lengthened.
- The probabilities of retaining specific bond ratings are higher for the next year (79%, 72% and 73% for bonds rated A, A- and BBB+, respectively) but tend to decrease substantially with a longer tracking horizon.

Q. Did you conduct any tests of the S&P guidelines?

[48] Lawrence Kryzanowski and Jocelyne Ménard, 2001, Migration behavior of long-term bond ratings of Canadian corporate issuers, *Canadian Investment Review* (Fall).

A. Yes, we did. In order to test the extent to which S&P bond ratings are actually based strictly on published guidelines, we employ a sample of actual bond ratings for 182 U.S. investment grade utilities drawn from Schedules 3-6 in Ms. McShane's capital structure evidence. These tables provide the actual debt rating, S&P business profile score, and total debt / capitalization ratio for each utility. We compare the actual debt ratio against the target debt ratio for the business profile score in Standard & Poor's *Corporate Rating Criteria* for U.S. utilities. We then assign a predicted rating based on this comparison.

To illustrate, the first company in Schedule 3 of Ms. McShane's capital structure evidence is Nicor Gas with a debt rating from S&P of AA and a debt ratio of 55.0%. The schedule also reports that S&P has assigned a business risk profile of 2 to this company. S&P's profiles range from 1 (lowest business risk) to 10 (highest) and 2 represents a business position "well above average". Turning to the Ratio Guidelines in *Corporate Rating Criteria,* page 56, on the line for company business risk profile of 2, we find that S&P targets a debt/capitalization ratio of 49% for a AA rating, 54% for an A and 60% for BBB. Applying this to Nicor Gas, suggests that the company should be downgraded to A or BBB. To be conservative, we assign a predicted rating of A to Nicor Gas.

Schedule 5.6 summarizes the results of repeating this exercise for the full sample of 182 utilities. The actual bond rating for these companies range from AA to BBB as shown in the rows in the schedule. Predicted bond ratings are displayed across the top of the schedule. Returning to Nicor Gas, we showed that the actual rating is AA and the predicted rating A making this one of the four companies in the AA row and A column.

To interpret the results in Schedule 5.6, we begin with the shaded boxes along the diagonal. These shaded boxes show companies for which the predicted rating is the same as the actual. This occurs once for companies actually rated AA, 24 times for A-rated companies, and 31 times for BBB-rated companies for a total of 56 companies (30.8% of the total) for which the predicted rating confirms the actual. The numbers in the boxes below the shaded line represent companies with predicted ratings above the actual, i.e., companies that should be upgraded if we take the S&P ratio targets as the only criterion for their ratings. There are 46 companies (25.3% of the total) in this category. Finally, 80 companies (44.0%) to the right of the shaded diagonal have predicted ratings below the actual. These companies should be downgraded based on the ratio guidelines. Stated differently, 69.3% (i.e., about 7 out of 10) of the companies are misclassified based on a strict interpretation of this single rating criterion.

This analysis strongly suggests that S&P does not consider its guidelines as “gospel”.

Q. How does your conclusion conform with statements about bond ratings by S&P and other knowledgeable market participants?

In *Corporate Ratings Criteria*, S&P states:

> “Guidelines are not meant to be precise. Rather, they are intended to convey ranges that characterize levels of credit quality as represented by the rating categories. Obviously, strengths evidenced in one financial measure can offset, or balance, relative weaknesses in another.” (page 56)

In *Project and Infrastructure Finance Review*, 2003, page 58, S&P writes:

> “Caution should be exercised when using the ratio ranges because:

- Ratings are designed to be valid over the entire business cycle, and ratios of a particular firm at any point in the cycle may not appear to be in line with its assigned debt ratings…
- Ratios cannot encapsulate all elements of a financial analysis (such as financial policy or financing flexibility); and
- There are many nonnumeric distinguishing characteristics that determine a company's creditworthiness."

Q. Does your statement on the qualitative nature of bond ratings have any support from other witnesses in these proceedings?

A. Yes, it does. Information request CG-NGTL-60 posed the following question to Mr. Lackenbauer:

"Given your assessment of the record of rating agencies and their use by institutional debt investors, how accurate will the use of specific benchmarks (such as on debt-to-equity ratios) be for the classification of the risk of a specific utility, such as NGTL?"

The first paragraph of the response was:

"Mr. Lackenbauer believes the use of specific benchmarks by rating agencies will be increased in their ratings going forward to what has been the case over the past several years. Nevertheless, Mr. Lackenbauer believes the rating agencies will continue to use qualitative assessments as well, just not to the degree that they have in the past in Canada."

Q. Do you have further evidence to support your view of bond ratings and their impact?

A. Just as bond rating agencies often disagree, institutional investors, bond traders and other sophisticated bond market participants often challenge bond raters' assessments. A number of academic papers document the lag between information becoming publicly available about a company and the upgrading or downgrading of its debt by rating agencies. A recent example of rating lag features Enron's debt which continued to enjoy an investment grade rating until shortly before the company declared bankruptcy. More generally, a number of academic papers have estimated the rating lag as being up to 1 ½ years in length.[49]

This suggests that bond investors form their own views of the risk of individual bonds which are often more finely tuned than those of the rating agencies and may not be dissuaded from holding bonds that have been downgraded. A passage from the textbook cited earlier verifies this:

> "Some institutional investors attempt to take advantage of the uncertainty surrounding a bond's rating…Thus an investor who purchases underrated bonds and avoids overrated bonds can construct a portfolio that will outperform a passively managed portfolio of similar risk".[50]

Analysts at Scotia Capital applied this textbook bond trading strategy to Nova Scotia Power Inc. (NSPI) bonds last year. On February 15, 2002, Stephen Dafoe, Scotia Capital fixed income analyst, put out a buy recommendation on these bonds. We quote the conclusion of his recommendation:

---

[49] Two examples are: M.I. Weinstein, The Effect of Rating Change Announcement on Bond Price, *Journal of Financial Economics* 6, 1978, pp. 329-350; and G. Pinches and J.C. Singleton, The Adjustment of Common Stock Prices to Bond Rating Changes, *Journal of Finance* 33, 1978, pp. 29-94.

[50] W.F. Sharpe, G.J. Alexander, J.V. Bailey, D.J. Fowler and D.L.Domian, *Investments*, Third Canadian Edition, Prentice Hall Canada, Scarborough, 2000, p. 372.

> "We think that NSPI, despite the BBB+ rating from Standard & Poor's, is still a very solid Canadian utility credit, and the NSPI bonds rightly trade more like many single-A (low) category utility bonds. Compared to traditional peers such as Gaz Met and Union Gas, NSPI represents good value, with very little difference in credit risk."[51]

Our point here is that, once again, there is little reason to believe that the downgrade to BBB+ by S&P caused difficulties for NSPI.

Q. Have any of the witnesses in this hearing expressed agreement with the view that a downgrade to the range of BBB has not caused difficulties for utilities?

A. Yes, in Information Request CG-NGTL-59, Mr. Lackenbauer was asked:

"Kindly provide all examples of which Mr. Lackenbauer is aware of Canadian utilities which experienced difficulty in accessing debt or equity financing after being downgraded to BBB."

The first sentence of his reply was: "To this point, Mr. Lackenbauer is not aware of any significant difficulty experienced by any Canadian utility."

Further, Information Request CG-AUI-11 posed a similar question to Ms. McShane. The first sentence of her reply reads: "Ms. McShane has not surveyed utilities to determine their specific difficulties with obtaining financing."

[51] S. Dafoe, Credit Analysis, Nova Scotia Power Inc./ Emera Inc., Scotia Capital, February 15, 2002.

We conclude that neither Mr. Lackenbauer nor Ms. McShane are aware of any specific instances of Canadian utilities experiencing difficulties in obtaining financing due to downgrades to the range of BBB.

Q. Do you have any further evidence on the attitude of institutional investors toward bond ratings?

A. Yes, we do. In its July 2003, *Gas & Electric Utilities Outlook*, Scotia Capital expresses disagreement with S&P:

> "Standard & Poor's (S&P) March 5, 2003, announcement that it had put 14 Canadian public and private energy utilities on negative watch with its decision to review the federal and provincial regulatory climate at each led to seven downgrades during Q2/03. During the past 20 years, there has been no material change in Canadian energy utility regulations and decisions. Generally, Canadian regulation improved over time due to increased support for private customer and energy utility agreements." (page 17)

On the next page Scotia Capital states its view of the reason for S&P's incorrect conclusion about Canadian regulation:

> "We believe that the S&P review of Canadian regulatory fairness was prompted by its offices in New York and Europe. These offices have had to deal with multiple bankruptcy issues in both U.S. and European energy utility sectors". (page 18)

CONCEPTUAL FRAMEWORK FOR UTILITY CAPITAL STRUCTURE

Q. Turning to the realm of finance theory, what can we learn from finance theory about the conceptual underpinnings for an appropriate level of the equity ratio for a regulated utility?

A. The first thing we can learn is to be suspicious of attempts to determine an appropriate equity ratio using a formula. Unlike other areas in finance, research on capital structure can offer only qualitative policy advice. To quote a leading, current corporate finance textbook:

> "We clearly have no unique formula that can establish a debt-equity ratio for all companies."[52]

While we expect an introductory textbook to contain an element of simplification in order to present material to beginning students, this statement has yet to be superceded by advanced research.[53]

Q. In the absence of a formula, can you explain the key considerations in determining capital structure?

A. In the same textbook we find the following:

> "From a theoretical perspective and from empirical research, we present three important factors in the final determination of a target debt-equity ratio:[54]
>
> 1. Taxes. If a company has (and will continue to have) taxable income, an increased reliance on debt will reduce taxes paid by the company and increase taxes paid by some bondholders…

[52] S.A. Ross, R.W. Westerfield, J. F. Jaffe and G.S. Roberts, *Corporate Finance*, Third Canadian Edition, Toronto, McGraw-Hill Ryerson, 2003, p. 465.
[53] We return to this topic in more detail in Section VII and Appendix 7.C.
[54] S.A. Ross, R.W. Westerfield, J. F. Jaffe and G.S. Roberts, *Corporate Finance*, Third Canadian Edition, Toronto, McGraw-Hill Ryerson, 2003, pp. 465-6.

2. Types of assets. Financial distress is costly, with or without formal bankruptcy proceedings. The costs of financial distress depend on the types of assets that the firm has. For example, if a firm has a large investment in land, buildings, and other tangible assets, it will have smaller costs of financial distress than a firm with a large investment in research and development. Research and development typically has less resale value than land; thus, most of its value disappears in financial distress.
3. Uncertainty of operating income. Firms with uncertain operating income have a high probability of experiencing financial distress, even without debt. Thus, these firms must finance mostly with equity. For example, pharmaceutical firms have uncertain operating income because no one can predict whether today's research will generate new drugs, and the product development process generally is long and costly. Consequently, these firms issue little debt. By contrast, the operating income of utilities generally has little uncertainty. Relative to other industries, utilities use a great deal of debt [emphasis added]."

Q. What does consideration of these three factors tell us about the appropriate amount of debt for a utility?

A. For any company, if we set aside factors 2 and 3 for a moment, factor 1 tells us that a company should use a large proportion of debt financing to reduce its cost of capital. Simply stated, factors 2 and 3 restrain the company's use of debt in order to reduce the cost of financial distress and the probability that it will occur due to low operating income. Turning from speaking in general about any company to focusing on a regulated utility, we believe that factors 2 and 3 are largely mitigated by the special features of this industry.

For a utility, the costs of financial distress (factor 2) are reduced because its assets make excellent collateral. Further, the regulation process allows the company to go back to its regulator to apply for relief in the unlikely event that it does not earn its fair rate of return in a given year. We term this unlikely based on the DBRS study cited above which states that Canadian electric utilities typically earn more than their allowed ROEs. Additionally, in the extreme event that an utility became insolvent, it is highly likely that the regulator (and other governmental bodies) would work with the company to find new investors or a merger partner so that service (and thus, asset usage) would not be interrupted. This is what occurred with the bankruptcy of Pacific Gas and Electric Company in California.[55] As a result, the cost of financial distress is far lower than for a nonregulated firm.

The third factor is the probability of financial distress. As stated in the quotation, this probability is low for utilities because operating income has low variability. The evidence of Mr. Robert T. Liddle and Mr. William C. Marcus on business risk supports this conclusion.

In conclusion, we come back to the beginning of our answer to this question. If we set aside factors 2 and 3 (the costs of financial distress and the probability of financial distress), the theory suggests that a company should use a high proportion of debt. Our comments on factors 2 and 3 explain why it makes sense to downplay them in practice for this industry. With the focus then on the first factor, taxes, we would expect regulated

[55] K. Gaudette, Bankrupt Pacific Gas and Electric hopes to avoid state laws, Associated Press, *The Nando Times*, January 25, 2002, www.nando.net/business/story/228567p-2199342c.html.

electric utilities to be among the most highly leveraged industries. This expectation is supported by the empirical evidence.

BUSINESS RISK AND RECOMMENDED CAPITAL STRUCTURES BY INDUSTRY SECTOR

Q. Your answer to the previous question addressed utilities as a whole. How do you assess business risk by sectors of the utility industry?

A. We draw on the analysis of Mr. Robert Liddle and Mr. William Marcus who summarize their views (with the headings removed) as follows starting on page 63, line 21 and running to page 64, line 23:

> "Having identified the specific aspects of business risk in the prior sections of this evidence, we will first summarize the aggregate business risks of the transmission and distribution sectors.
>
> Generally the transmission sector for both electric and gas utilities are judged to have the lowest risk. The one outlier to this finding is AP which will be discussed separately.
>
> With respect to differentiating between electric transmission utilities and NGTL, the transmission activities of AltaLink, ETI and AE are of equivalent risk and have slightly less risk than NGTL, because of the guaranteed recovery of all forecast costs through fixed payments from AESO and the capital deferral account, without any significant supply risk.
>
> The distribution utilities as a sector have a modestly higher risk than transmission utilities primarily based on the fact that there is greater risk in recovering forecast revenues since rates for service have significant cost recovery on a variable basis and are therefore subject to throughput risks.
>
> With respect to differentiating between gas and electric distribution utilities, the four electric distribution companies (Aquila, Enmax, AE-Disco, and EDI) face approximately the same business risk and, as an equal risk group are positioned between NGTL and AG. They face similar types of risk to AG and AUI, but in the aggregate face

slightly less risk (less weather-related demand variation and a slightly higher percentage of fixed components in rates, offset by higher proportions of large commercial and industrial loads that are more difficult to forecast and are tied to general economic conditions)."

Based on their analyses, the riskiest sector represented in this hearing is gas distribution. In declining order of risk, the remaining sectors are electricity distribution, gas pipelines and finally, electricity transmission as the least risky.

Q. Starting with electricity distribution because it is the sector most widely represented among the applicant companies, and given Mr. Liddle's and Mr. Marcus' assessment of the business risk of this sector, what capital structure do you recommend for an electricity distribution company (DISCO)?

A. In response to an earlier question, we briefly explained why we believe the determination of capital structure represents a qualitative judgment. Following that approach and dovetailing with the qualitative approach taken by the Board in past decisions, we arrive at our recommendation through a pair of comparisons. First, we turn to Schedule 5.3 where we observe that the average actual equity ratio for utilities in our sample is 38.77% for 2002, the most recent year for which we have data. Since the utilities in our sample provide a cross section of the different sectors, we regard this as a measure of the equity ratio for an integrated utility.

As a check on our calculations we examine the equity ratios allowed by various Canadian regulatory bodies for the companies in our sample for which we obtained data from past decisions. The sample (in **bold** in Schedule 5.7) includes Canadian Utilities (ATCO Electric and ATCO Gas and Pipelines), Enbridge, Emera (Nova Scotia Power), Pacific Northern Gas, Terasen Gas, TransAlta, and TransCanada Corporation

(TransCanada Pipelines). We calculate the average allowed equity ratio for these 8 regulated companies as 36.94%. Following our earlier practice, we reexamine the allowed equity ratio employing a broader sample including the original sample and an added list of companies. Schedule 5.6 shows that the average allowed equity ratio for this broader sample is virtually unchanged. The analysis in Schedule 5.7 reinforces our conclusion that the average "generous" equity ratio for an integrated electric or gas utility is around 37-39%.

Q. Why do you call this average equity ratio "generous"?

A. We term it "generous" because it represents the result of a regulatory process in which decisions by regulatory bodies take as input the views of opposing parties each representing its own interest. We already showed how the regulatory process may be regarded as generous as it almost always results in the regulated companies earning an ROE in excess of the allowed return.

Q. What adjustment do you recommend to this "generous", integrated utility, average equity ratio of 37-39%?

A. Recognizing that a DISCO is somewhat less risky than an integrated utility, we drop below the lower end of this range and recommend an equity ratio of 35%.

Q. You have explained how your recommended common equity ratio of 35% is reasonable compared to equity ratios for integrated utilities. Do you have any other benchmarks?

A. Yes, another useful benchmark is the common equity ratio for gas distribution utilities more generally. Earlier in our evidence, we quote Mr.

Robert T. Liddle and Mr. William C. Marcus to the effect that the business risk faced by an electricity distribution utility is slightly below that of a gas utility. In Schedule 5.7, we can identify a subsample of 7 gas utilities for which we have data on allowed equity ratios: Altagas Utilities, Atco Gas and Pipelines, Enbridge, Gaz Metropolitain, Pacific Northern Gas, Terasen Gas, and Union Gas. The average allowed equity ratio for this subsample is 36.82%. This suggests that regulatory boards in Canada regard 36% - 37% as an appropriate allowed equity ratio for a gas company. Following Mr. Liddle's and Mr. Marcus' assessment that the risk of an electric DISCO is lower, reinforces our conclusion that 35% is sufficient equity for an electric DISCO.

Q. Using your recommendation for an electric DISCO as a starting point, what do you recommend for the other sectors?

A. The next logical sector to discuss is gas distribution since we already used it as a benchmark. Our discussion showed that 36-37% is the range of equity ratio that Canadian regulatory boards typically allow for a gas distribution company. This figure is compatible with actual equity ratios as well. To be conservative, we recommend 37% equity for a gas distribution company of average risk.

According to the evidence of Mr. Liddle and Mr. Marcus quoted earlier, gas transmission in the form of major pipelines is less risky than gas distribution. This is consistent with past decisions of the NEB which allow an equity ratio for pipelines consistently lower than the average for gas distribution companies. Accordingly, we adopt the NEB standard of 30-33% equity for major pipelines with a midpoint rounded to 32%. Further, we note that in its Decision 2003-061 on AltaLink Management Ltd. and TransAlta Utilities Corporation, the Board used gas pipelines as a benchmark in setting the capital structure for AltaLink at 32% before adjusting that structure upward to 34% to reflect AltaLink's income tax allowance:

> "Thus, the Board notes that Calgary has provided evidence that gas pipelines have capital structures characterized by equity ratios of between 30% and 33%, while AltaLink's witness has provded evidence that the mid-point equity ratio for gas pipelines is 32.5%[56]

The final section is electricity transmission. Again referring to the evidence of Mr. Liddle and Mr. Marcus, we assess the business risk of this sector as marginally below that of gas pipelines. Accordingly, we recommend an equity ratio of 30%.

We summarize our recommendations by sector in Schedule 5.8.

NON-TAXABLE UTILITIES

Q. In moving from recommended capital structures by industry sectors, to recommendations for individual companies, it is important to recognize that three companies have special circumstances which result in their not being subject to corporate income taxes. ENMAX and EPCOR are municipally owned and AltaLink is a limited partnership. Please explain the adjustments you recommend to reflect this non-taxable status.

A. We believe that the argument for an adjustment is flawed and recommend that no such adjustment is necessary. The argument for an adjustment is stated in the application of ENMAX Power Corporation in this hearing, July 10, 2003:

[56] EUB Decisions 2003-061, August 3, 2003, page 105.

"EPC's tax-exempt status also impacts its financial risk profile by generally lowering its interest coverage ratio when compared with taxable utilities. Financial markets look at pre-tax coverage ratios as a measure of financial health. All other things being equal, tax-exempt utilities have a lower revenue requirement, because they do not need to gross up their rates for tax. However, without this gross-up, tax exempt utilities generally have lower pre-tax interest coverage ratios." (page 17)

The application goes on to argue that such lower ratios lead to higher financial risk and justify "thicker equity".

Dr. Evans makes a similar argument on behalf of AltaLink on page 16 of his evidence.

We believe this argument is flawed for several reasons. First, it is based on the same overly simplistic view of financial markets that we debunked in our earlier discussion of S&P's debt ratio guidelines. We showed that S&P itself neither states nor acts as if it believed that having a key ratio below a certain target level is grounds for a downgrade. Further, we provided a range of evidence that even when such downgrades occur, utilities can carry on their businesses profitably as long as they remain investment grade. While our earlier discussion was framed in terms of debt/capitalization ratios, the argument carries over in its entirety to coverage ratios. It follows that lower coverage ratios resulting from non-taxable status should not increase risk for utilities. With no increased risk, the argument for a higher equity component collapses.

Q. Please explain the second reason why you hold that no adjustment is necessary.

A. The second argument applies particularly to AltaLink with its structure as a limited partnership. Even if, for the sake of argument, we were to set aside our first argument about the irrelevance of fine tuning coverage ratios, the second argument derives from a close examination of the identity of the limited partners.

In a limited partnership, taxes are paid by the limited partners not by the entity. This would normally support the idea that income should be grossed up to allow the partners to pay those taxes. However, as stated by Calgary in its Written Evidence in the matter of AltaLink Management 2002-3 and 2003-4 Transmissions Tariff, Board File No. 2002-2/1209-1, December 16, 2002, pages 13-14, this argument falls away once we recognize that the limited partners in AltaLink are themselves limited partners not subject to taxes. Calgary points out that this is consistent with Canadian precedents. While there do exist Canadian precedents in which partnerships have been allowed to gross up regulated rates for taxes, "in none of these instances has the principal ownership of the regulated entity been a limited partnership, which again, is a non-taxable entity". Calgary goes on to state that:

> "In the U.S. the FERC has ruled that limited partnerships with individuals as the limited partners should not be entitled to corporate income tax since the individual partners are not subject to corporate income tax." (page 14)

In summary, given that there is no evidence that the ultimate owners of AltaLink are paying taxes, there is no justification for allowing a higher equity ratio.

RECOMMENDED CAPITAL STRUCTURES FOR INDIVIDUAL APPLICANT COMPANIES

Q. Please explain the framework you used in setting a recommended capital structure for each applicant company.

A. We start with our recommendations by industry sector and then adjust the equity percentage for each company to reflect its business risk as assessed by Mr. Robert T. Liddle and Mr. William C. Marcus. We then examine the reasonableness of our recommendation by comparing it to past Board awards where available. As explained earlier, we regard the past awards as a “generous”, upper bound on what we recommend. Finally, mindful of our earlier caution against subsidies running from regulated entities to their parent companies, we compare each equity recommendation to the equity level of the ultimate parent company with public equity, where applicable.

Q. Please explain your recommendations.

A. Our recommendations are presented in Schedule 5.9. In assessing the risks of individual applicants, we follow past practice before this Board of examining risks for the “pure” companies by industry sector. For example, we recommend a separate capital structure for ATCO Gas, ATCO Electric DISCO and ATCO Electric TRANSCO.

Starting with the gas distribution sector, we follow Mr. Liddle and Mr. Marcus in assessing ATCO Gas as a typical risk and therefore assign a recommended equity ratio of 37%. They rate Altagas Utilities as somewhat more risky than ATCO Gas. Reflecting this assessment we set the target equity ratio at 40%. Both of these recommendations are in line with past decisions of the Board which have assigned 37% equity to ATCO Gas South and 41% to AltaGas Utilities.

Next we turn to the electricity distribution sector represented by four applicant companies. All of these companies are of average risk for this sector according to the evidence of Mr. Liddle and Mr. Marcus. Accordingly, we assign an equity ratio of 35%, the sector benchmark to each company.

Our third sector is gas transmission for which we earlier assigned a sector benchmark equity ratio of 32%. Turning once more to the evidence of Mr. Liddle and Mr. Marcus, we find that NGTL bears a level of business risk consistent with the pipelines regulated by the NEB on which we base our benchmark. Accordingly, we conclude that this benchmark level constitutes an appropriate equity ratio for NGTL and recommend that the Board maintain the equity in that company at its presently approved level.

In contrast with NGTL, Mr. Liddle and Mr. Marcus rate ATCO Pipelines at a considerably higher level of business risk. As a result, we recommend 40% equity for ATCO Pipelines.

The final sector that we must consider is electricity transmission. In this sector, we regard all the companies as typical risks based on the evidence submitted by Mr. Liddle and Mr. Marcus and assign an equity percentage of 30% to this company.

This completes our summary of recommended equity ratios as summarized in Schedule 5.9.

Q. Your recommendation for NGTL is that the Board maintain the equity ratio assigned in its prior decision. In making this recommendation did you recognize that the NEB has increased the equity ratio for TransCanada Pipelines from 30% to 33%?

A. Yes, we did. We note that Mr. Liddle and Mr. Marcus identify two factors which mitigate the risk of NGTL relative to the risk of TransCanada Pipelines at the time of the NEB decision.

Q. Your recommendations for EPCOR Distribution, ENMAX Distribution, and EPCOR Transmission make no adjustment for municipal ownership. Please explain your views on this point.

A. Under the stand-alone principle, the ownership structure of a regulated utility should have no impact on determining its capital structure for purposes of regulation. We addressed this principle in our prior discussion of tax status. We disagree with Dr. Neri's view on this point:

> "Also EPC faces a higher business risk than other Alberta utilities because of its limited access to capital… and the political risks associated with City ownership."[57]

Presumably "limited access to capital" refers to the fact that neither the company nor its parent can issue equity on public markets. A similar argument could apply to ENMAX. We reject this argument for two reasons: one practical and the other conceptual. On the practical level, the cities enjoy strong bond ratings and their access to capital is not in question. Conceptually, even if this were not the case, the stand-alone principle requires that we assess the business risk of a regulated entity independently of its ownership structure. To illustrate, consider the case of a utility such as Hydro Quebec which is able to issue debt guaranteed by a provincial government. Based on the provincial guarantee, Hydro Quebec had only 24.1% equity in its capital structure in 2002.[58] Would it be fair to the shareholders (the citizens of Quebec) to regard 24% as an

[57] Dr. Neri, evidence page 18, lines 23-25.
[58] Hydro Quebec, *Financial Profile 2002/2003*, page 3.

appropriate equity ratio for the purposes of regulation under the stand-alone principle? Clearly, the answer is no. In fact, the Regie du l'energie set the equity ratio at 35% in its recent decision for Hydro Quebec Distribution.[59]

Q. Earlier you indicated the importance of comparing your recommended equity ratios against the equity in the parent company with traded common shares. Please discuss the results of these comparisons.

A. As we noted earlier, these comparisons are meaningful for regulated entities which do not issue common shares but rather access equity through a publicly listed parent company. Among the applicant companies, we identify Altagas Utilities, the ATCO group of companies, Aquila, NGTL as qualifying for such a comparison. In Schedule 5.10 we list these companies and their exchange-listed parents. The schedule also compares the equity ratio we recommend for each regulated entity with the common equity ratio (common equity to total capitalization) of its parent. In all cases, the ratios of parent and regulated entity are quite similar leading us to conclude that over leveraging is not a problem for the applicant companies.

Q. Does this conclude this section of your evidence on capital structure?

A. Yes, it does.

[59] Régie de L'énergie du Québec, D é c i s i o n, Demande relative à la détermination du coût du service du Distributeur et à la modification des tarifs d'électricité, phase I, D-2003-93, R-3492-2002, 21 mai 2003, p. 51.

VI. AUTOMATIC ADJUSTMENT MECHANISM

Q. How is this section of your evidence organized?

A. We begin with our conceptual framework for future adjustments to the return on equity or ROE and target capital structure for each utility. We then present our proposed automatic adjustment mechanism. This section of our evidence closes with our recommendations on a review process for the ROE adjustment formula and for the target capital structures of the regulated utilities.

CONCEPTUAL FRAMEWORK FOR FUTURE ADJUSTMENTS TO ROEs AND TARGET CAPITAL STRUCTURES

Q. Please discuss your conceptual framework for making future adjustments to the ROEs and to the target capital structures of individual utilities.

A. As discussed in Section II, our underlying conceptual framework for the determination of the starting combination of ROE and target capital structure for each utility is a two-step process. In the first step, we determine the appropriate starting ROE for a utility of average investment risk (the so-called “average-risk” utility). We then apply this ROE to all the applicant utilities. In the second step, we determine the appropriate starting target capital structure for each sector of the utility industry represented by the list of applicants to this hearing. Schedule 5.9 displays the applicant companies and lists the four generic sectors: electricity distribution, electricity transmission, gas distribution and gas pipelines. We draw on the business risk assessments of each sector contained in the evidence of William B. Marcus and Robert T. Liddle. Their evidence also addresses any variances in the business risk among companies in a common sector.

In forming our recommended target capital structures, we are cognizant of the fact that bond ratings of individual utilities are subjective assessments of current and expected future business risks for stand-alone investments. Thus, such ratings ignore the risk-reduction benefits that investors obtain by holding diversified portfolios of bond investments. In the determination of the appropriate target capital structure for each utility, we reflect two empirical observations discussed earlier in detail in Section V of this evidence. The first empirical observation is that bond ratings are subject to considerable error given the material probability of future bond rating migrations. The second empirical observation is that many bonds are misclassified if one uses a rigid application of the bond rating criteria specified by the bond rating agencies.

For these reasons, we define an appropriate target capital structure as one that facilitates ready access to debt capital at a reasonable cost. For the typical utility in Canada this translates into a bond rating of A- or A (low). However, because bond ratings are imprecise measures of risk, we do not rely on them as our principal measure.

Our underlying conceptual framework for making going-forward adjustments to the starting (current in subsequent years) combination of ROE and target capital structure for each utility depends upon whether or not a material and permanent change occurs in the business risk of a utility or in the risk premium requirements of equity investors. We now discuss the recommended regulatory action for each type of change.

If no material and permanent change is deemed to have occurred in the business risk of a utility or in the market risk premium requirements of equity investors over the past year, then we recommend that only the sector-wide allowable ROE be adjusted using a formulaic approach, which is detailed below. The formulaic approach is designed to capture expectations with regard to changes in required returns on equity for a utility of average investment risk for the next year. The formulaic approach is engineered to capture the rewards (returns) that investors require for holding the risk-free asset plus the premium for bearing the risk of a utility of average investment risk.

If a material and permanent change is deemed to have occurred in the business risk of one, but not all, of the utilities and no material and permanent change is deemed to have occurred in the market risk premium requirements of equity investors over the past year, then we recommend that the target capital structure(s) of the affected firm(s) be adjusted via firm-specific hearing(s) and that the sector-wide allowable ROE continue to apply to the applicant utility (utilities).

If a material and permanent change is deemed to have occurred in the market risk premium requirements of equity investors over the past year, then we recommend that the starting ROE be reset in a generic sector-wide hearing. Such a hearing would also investigate whether changes in target capital structure values also are necessary.

AUTOMATIC ROE ADJUSTMENT MECHANISM

Conceptual Underpinning

Q. What is the conceptual underpinning for the automatic ROE adjustment mechanisms currently used in Canada?

A. The conceptual underpinning for current automatic ROE adjustment mechanisms currently used in Canada appears to be the Security Market Line or SML.

Q. Would you please describe what the Security Market Line or SML means?

A. The Security Market Line or SML is the equilibrium relationship between the expected returns on portfolios of assets or single assets and their priced risk. In the context of the Capital Asset Pricing Model (CAPM), priced risk is measured by the beta of the portfolio or single asset relative to the market index. The SML is easily found by fitting a straight line to two points. The first point represents the co-ordinates to the risk-free asset, and is given by the combination (risk-free return, beta of zero). The second point represents the co-ordinates of the market portfolio (such as the S&P/TSX Composite), and is given by the combination (expected return on the market portfolio, beta of one).

According to the CAPM, in efficient markets, the risk and return combinations of single assets or portfolios thereof should fall on the straight line. The reason is that assets should be correctly priced in efficient markets. Thus, any single asset or portfolio of assets should not systematically provide abnormal positive or negative returns given their level of risk.

Q. What are the component terms in the SML?

A. The component terms in the SML are easily obtained by examining the following equation for the SML:

(Expected Return for Firm i) = (Risk-free rate) + (Expected return on the market minus the risk-free rate or Equity Risk Premium for the market) *x* (Priced risk or investment risk or beta of firm i)

Thus, in a regulatory setting, the required ROE increases (decreases) for a utility if:

a. The own investment risk of the utility increases (decreases), all else held equal;

b. The risk-free rate increases (decreases), all else held equal; and

c. The Equity Risk Premium or ERP for the market increases (decreases), all else held equal.

Q. Which of these changes are relevant for the automatic or formulaic ROE adjustment mechanisms currently being used by some Canadian regulatory bodies, and for the ROE adjustment mechanisms that you propose in this evidence?

A. All three of the changes are relevant. However, the automatic ROE adjustment mechanisms currently being used by some Canadian regulatory bodies and the ROE adjustment mechanisms that we propose in this evidence adjusts for the effect of investment risk changes for a utility by adjusting its target capital structure. Thus, both the currently available adjustment mechanisms and our proposed mechanism attempt to adjust for changes in the risk-free rate and in the ERP.

Q. Before proceeding to a critique of the formulaic ROE adjustment mechanisms currently being used by some Canadian regulatory bodies, would you please illustrate the adjustments required to the ROE when there is only a change in the risk-free rate, there is only a change in the ERP, and there is a change in both the risk-free rate and the ERP?

A. We provide an illustration of each change in Schedule 6.1, Cases 1, 2 and 3. We now discuss each in turn. Schedule 6.1, Case 1, illustrates by example what happens to the ROE of a utility when the risk-free rate, r_f, increases by 1% from 5% to 6% and all else remains equal. As expected, there is a parallel upward 1% shift in the SML. Thus, no matter what the beta of the utility, its ROE increases by 1%. In other words, the ΔROE =

Δr_f for all utilities, where Δ refers to a change. Thus, conceptually, the required ROE of all utilities would change in the same direction on a 1-for-1 basis with a change in the risk-free rate.

Schedule 6.1, Case 2, illustrates by example what happens to the ROE of a utility when the market ERP, r_m - r_f, increases by 1% from 5% to 6% and all else remains equal. In this case, there is no change in the intercept of the SML and there is an increase in the slope of the SML from 5 to 6. Thus, the effect of the change in the market ERP on the ROE of the utility now depends upon the investment risk or beta of the utility, and is given by $\Delta ROE = \Delta\beta_i \, x \, \Delta ERP$, where ΔERP is the change in the market equity risk premium. Thus, given a 1% change in the ERP, the ROE of a utility with a beta of 0.4 will change by 0.4 *x* 1%, or by 40 basis points.

Schedule 6.1, Case 3, illustrates by example the slightly more complicated case where both the risk-free rate and the market ERP change. In this case, the risk-free rate increases by 1% and the market ERP increases by 1%. In this case, the change in the ROE of a utility is given by the sum of the effect of each change that was illustrated in cases 1 and 2, respectively. Thus, the $\Delta ROE = \Delta r_f + (\Delta \, \beta_i \, x \, \Delta ERP)$. To illustrate, for a utility with a beta of 0.25, the ΔROE = (1% from the change in the risk-free rate) + (0.25 from the 1% change in the market ERP when multiplied by the beta of this utility). The combined value of these two changes is a change in the ROE of 1.25%. Thus, the new ROE for this utility is 7.5%, or 1.25% higher than its old ROE of 6.25%. Similarly, for a utility with a beta of 0.75, the ΔROE = 1.75%. This is found by adding (the 1% from the change in the risk-free rate) to (0.75 from the 1% change in the market ERP when multiplied by the beta of this utility). Thus, the new ROE for this utility is 10.5%, or 1.75% higher than its old ROE of 8.75%.

AUTOMATIC ROE ADJUSTMENT FORMULAS CURRENTLY USED BY CANADIAN REGULATORY BODIES

Q. How do the automatic ROE adjustment formulas currently used by Canadian regulatory bodies correspond to this conceptual framework?

A. Generic formula-based approaches have been in place in Canada since 1994 when the BCUC and the NEB both adopted them.[60] They also are currently in use in Ontario, Manitoba, and Newfoundland & Labrador (Orders No. P.U. 16 and 36 (1998-99) and No. P. U. 18 (1999-2000) for the latter). Nova Scotia currently follows the traditional practice of conducting hearings. We are not aware of any strong interest in adopting a generic approach in Nova Scotia. In Quebec, the Regie de l'Energie adopted a formula for Gaz Metropolitain. The possibility of moving to a generic approach for the three components of Hydro Quebec was raised in evidence filed by Drs. Booth and Berkowitz in December 2000 in the Hydro Quebec TransEnergie hearing. At present the Regie is conducting the second phase of a traditional hearing for Hydro Quebec Distribution. It is our understanding, however, that the Regie may be open to considering the merits of a generic formula-based approach for Hydro Quebec Distribution in 2004.

We begin with the NEB formula. To obtain the starting ROE, the NEB procedure takes the average 3-month out and 12-month out forecasts of 10-year Government of Canada bond yields as reported in the November issue of *Consensus Forecasts* (Consensus Economics, Inc., London, England.) To this, the NEB adds the average daily spread between 10-

[60] National Energy Board, Multi-Pipeline Cost of Capital, RH-2-94; British Columbia Utilities Commission, Return on Common Equity Decision, June 10, 1994, Order G-35-94; Ontario Energy Board Draft Guidelines on a Formula-Based Return on Common Equity for Regulated Utilities, March 1997; Manitoba Public Utilities Board Order 49095, page 50; National Energy Board's Reasons for Decision, TransCanada Pipelines Limited RH-4-2001, June 2002; Quebec Régie de l'Énergie, D-99-11, R-3397-98, February 10, 1999.

year and 30-year Government of Canada bonds as reported in the *National Post* for October to obtain its starting 30-year Canada rate. This procedure provides the starting risk-free rate component of the starting allowed return on equity. To get the final starting allowed return on equity, an equity risk premium of 300 basis points is added to the determined 30-year Canada rate to get the final starting allowed return on equity for the sample of pipeline companies.

In order to incorporate the belief of the NEB that equity risk premiums decrease when 30-year Canada rates are rising and increase when rates are falling, the NEB adopted an adjustment mechanism that allows for the ROE to be adjusted upwards or downwards by 75% of the subsequent annual increases in the consensus estimates of the long Canada rate (when calculated using the above procedure).

The adjustment formulas used by other regulatory bodies in Canada follow a similar logic. The Ontario Energy Board formula began with a risk premium of 340 basis points for Consumers Gas at a long Canada yield of 7.25%, and has used a 75% adjustment factor for subsequent annual changes in the long Canada rates. The Public Utility Board of Manitoba sets an initial risk premium of 300 basis points at a long Canada yield of 9.12%, and has used an 80% adjustment factor for subsequent annual changes in long Canada rates. The most recent position of the BC Utilities Commission calls for an equity risk premium of 350 basis points for a forecasted long Canada rate of 6.0%, and an adjustment factor of 80% and 0% when long Canada rates rise and fall, respectively. The Newfoundland Public Utilities Board set its equity risk premium at 350 basis points at a long-Canada rate of 5.75%, and has used an 80% adjustment factor for changes in the long Canada rate from its base value of 6.0%.

Thus, all of these formulas attempt to capture both changes in the risk-free rate and in the equity risk premium. Thus, they are in the spirit of the conceptual underpinnings that we discussed in the previous section of our evidence. However, the formula used by the BC Utilities Commission is asymmetric in that it sets a floor of 350 basis points on the risk premium when long Canada rates fall below 6%.[61] Thus, it effectively shifts up the lower part of the ROE distribution for its regulated utilities that are subject to its formula at 9.5% as long as the current version of the formula is in effect. Not only could one argue that such an asymmetric adjustment mechanism is inconsistent with the conceptual underpinnings presented above but we are not aware of any evidence that the bond rating agencies reflect the value of this valuable risk-reduction option when rating the debt of utilities regulated by the BC Utilities Commission.

Q. Does empirical testing verify the validity of these formulas?

A. Unfortunately, the answer is no. The formulas make a number of assumptions that are not supported empirically.

First, there does not appear to be any a priori rationale for believing that the ERP should vary inversely with the long Canada yield. As a risk-free proxy, changes in long Canada yields are by definition not due to changes in investor tolerances to bear risk. Thus, changes in long Canada yields should provide no ex ante information about the reward that investors require to bear risk.

Second, the adjustment formulas currently in use assume that changes in long Canada yields should and are a significant determinant of changes in the market ERP. We would argue that one would not expect changes in

[61] See British Columbia Utilities Commission, "1999 Rates of Return on Common Equity / August 26, 1999". Available at: http://www.bcuc.com/. Click: ROE_1999.pdf.

long Canada yields (i.e., the intercept of the SML) to be a significant determinant of changes in the market ERP (i.e., the slope of the SML). In a conditional multivariate setting, basic statistics would suggest that the slope of the linear regression relationship cannot be significantly related to the intercept of that same relationship. Furthermore, we subsequently provide empirical evidence that changes in long Canada yields are not a robust determinant of changes in the market ERP.

Third, the adjustment formulas currently in use assume that changes in the market equity risk premium and the long Canada yield are correlated. Such should not be the case a priori, since a risky return is expected to be uncorrelated with its risk-free counterpart. In fact, using ERP data from the Canadian Institute of Actuaries and long Canada yield data from Cansim, we determine that over the twenty-five year period 1978-2002, the correlation between the changes in these two variables is small at 0.16.

Q. Please comment on the empirical evidence that the equity risk premia for utilities are negatively related to long Canada yields.

A. There are some papers that find an empirical relationship between equity risk premia for utilities and long government bond yields. To illustrate, Dr. Brigham et al. find that the equity risk premia for utilities increased with the level of interest rates prior to 1980, and decreased with the level of interest rates thereafter.[62] In the absence of an underlying theory to explain the expected relationship between risk premia and interest rates, Dr. Brigham et al. had to rely on a number of ex post possible explanations for this turnaround. Of more concern here, however, is the fact that this relationship could be either positive or negative based on their evidence.

[62] E. Brigham, D. Shome and S. Vinson, 1985, The risk premium approach to measuring a utility's cost of equity, *Financial Management* (Spring), pp. 33-45.

We also would argue that you might expect to find a relationship for utilities using ex post data since it may merely be an artifact of the regulatory process, especially in Canada. There are at least two reasons for this expectation. First, since many regulators now set ROEs based on the premise that changes in the risk premium for utilities are negatively related to changes in the long government yield, logic suggests that this should be confirmed when we examine the data. Second, other regulators in their desire to partially mute changes in ROEs will reflect less of any required change by applying adjustments that only partially reflect movements in the long Canada rate. On the downside, for example, this is often justified by the need to maintain the "financial integrity" of the utility. Once again, this will induce a spurious negative relationship between changes in utility ERPs and changes in long government yields.

Another major problem with using data on utilities for such an analysis is the evidence provided earlier in our testimony that utility indexes have historically earned abnormal returns. In other words, on a realized return-to-risk basis, they have plotted above the SML. As noted earlier, this is commonly referred to as abnormal performance or obtaining a "free lunch".

On a conceptual basis, this line of argument leads to the conclusion that changes in the slope of the Security Market Line depend on changes in the intercept of the Security Market Line for only a subset of securities (specifically, utilities). In market equilibrium, this is conceptually impossible since the SML, which applies to each and every security or portfolio thereof (including utilities), only has one intercept and one slope at each point in time. If instead, we assume that the yield on government bonds is a proxy for a low risk but not risk-free asset, this leads to other problems. In this case, a determination of the market ERP requires that the difference in the risks of the market and long governments remain constant over the measurement interval, or that the estimator make adjustments to neutralize for any such variation over time. In appendix 6.A, we also detail our concern that any significant relationship found between ex ante risk premia and long government yields is spurious, and due to measurement error.

After considering all of these factors, we conclude that one cannot logically infer that data on utility returns constitute evidence that equity risk premia are negatively related to long Canada yields.

Q. Based on the literature, what variables have been found to be useful instruments for capturing the time-series variation in the returns and/or risk premium for the market and various multi-factor proxies of priced investment risks?

A. In the multifactor asset pricing and portfolio performance literature, lagged values or innovations in at least five variables have been found to be useful instruments for capturing the time-series variation in the returns and/or risk premia for the market and various multi-factor proxies of priced investment risks. The choice of these variables is based on evidence of their power in predicting stock returns. The variables include the dividend yield on a market index such as the S&P500 or S&P/TSX Composite, which has been used by Fama and French (1988), Ferson and Schadt (1996), Kryzanowski et al. (1997), Christopherson et al. (1998), Farnsworth et al. (2002) and Ayadi and Kryzanowski (2003); the one-month T-bill rate, which has been used by Ferson and Korajczyk (1995) and Ayadi and Kryzanowski (2003); the risk premium as measured by the yield spread between long corporates and long governments, which has been used by Chen, Roll, and Ross (1986), Kryzanowski and Zhang (1992), Koutoulas and Kryzanowski (1996) and Ayadi and Kryzanowski

(2003); the slope of the term structure as measured by the yield spread between long governments and the one-month Treasury bill rate, which has been used by Ferson and Harvey (1991), Chen and Knez (1996) and Ayadi and Kryzanowski (2003); the variance of the returns on the market, which has been used by Kryzanowski et al. (1994), and a dummy variable for the month of January, which has been used by Ferson and Schadt (1996), Kryzanowski et al. (1997) and Farnsworth et al. (2002).[63]

In the relatively sparse literature using the more simplistic asset pricing models, such as the DCF model with analyst forecast data to obtain estimates of ex ante equity risk premia, variables identified as being significant determinants of variations in the equity risk premium include changes in long government yields, changes in a consumer confidence index, dispersion of the forecasts of analysts for earnings growth, and the volatility of the S&P500 index. Most surprisingly, this literature appears not to test the dividend yield on the S&P500 index as a possible determinant. Drs. Harris and Marston find that much of the variation in the market risk premia in the U.S. can be explained by changes in interest rates or in changes in their forward-looking risk proxies. Since they also find that

[63] Ayadi, M. and L. Kryzanowski, 2003, Linear Performance Measurement Models and Fund Characteristics, paper to be presented at North Finance Association Meeting, September 2003; Chen, Z. and P. J. Knez, 1996, Portfolio Measurement: Theory and Applications, *Review of Financial Studies*, 9, 511-555; Chen, N. F., R. Roll and S. A. Ross, 1986, Economic Forces and the Stock Market, *Journal of Business*, 59, 383-403; Christopherson, J. A., W. E. Ferson, and D. A. Glassman, 1998, Conditioning Manager Alphas on Economic Information: Another Look at the Persistence of Performance, *Review of Financial Studies*, 11, 111-142; Fama, E. F., and K. R. French, 1988, Dividend Yields and Expected Stock Returns, *Journal of Financial Economics*, 22, 3-25; Farnsworth, H., W. E. Ferson, D. Jackson, and S. Todd, 2002, Performance Evaluation with Stochastic Discount Factors, *Journal of Business*, 75, 473-503; Ferson, W. E., and C. R. Harvey, 1999, Conditioning Variables and Cross-Section of Stock Returns, *Journal of Finance*, 54, 1325-1360; Ferson, W. E., and R. Schadt, 1996, Measuring Fund Strategy and Performance in Changing Economic Conditions, *Journal of Finance*, 51, 425-461; Kryzanowski, L., S. Lalancette, and M. C. To, 1997, Performance Attribution using an APT with Prespecified Macrofactors and Time-Varying Risk Premia and Betas, *Journal of Financial and Quantitative Analysis*, 32, 205-224; Kryzanowski, L., and H. Zhang, 1992, Economic Forces and Seasonality in Security Returns, *Review of Quantitative Finance and Accounting*, 1, 227-244; Koutoulas G., and L. Kryzanowski, 1996, Macrofactor Conditional Volatilities, Time-Varying Risk Premia and Stock Return Behavior, *Financial Review*, 31, 169-195; L.. Kryzanowski, S. Lalancette and M.C. To, Performance attribution using a multivariate intertemporal asset pricing model with one state variable, 1994, *Canadian Journal of Administrative Sciences* 11:1, pp. 75-85.

equity risk premia move inversely with interest rates in the U.S., they conclude that required returns on stocks are more stable than the interest rates themselves.[64] Of concern in this literature is the lack of theoretical justification for the choice of the tested determinants, such as the long government rate, and our demonstration that the use of a risk-free proxy whose returns are independent of the returns on stocks results in an estimated beta of –1 between the ERP and that risk-free proxy.

A theoretical link has been established for one of the potential determinants of changes in the equity risk premium. Rozeff (1984) shows that the relation between the equity risk premium and the dividend yield is an identity where the changes in the equity risk premium are directly related to changes in the dividend yield.[65]

Q. Which of these variables do you find are significant determinants of Canadian equity market risk premiums using annual data?

A. We find that only two variables are significant determinants of realized ERPs in Canada using annual data. They are the dividend yield on the S&P/TSX Composite and the default premium. We find that the statistical significance of the default premium varies depending on the series used to calculate the default premium, and is marginally significant at best.

Q. Please discuss how you reached this conclusion.

A. We reached this conclusion by estimating the ordinary least squares (OLS) relationships between the changes in the realized ERP for the Canadian market using the annual data from the Canadian Institute of

---

[64] Robert S. Harris and Felicia C. Marston, 2001, The market risk premium: Expectational estimates using analyst's forecasts, *Journal of Applied Finance* 11:1 (2001), pp. 6-16.
[65] Michael S. Rozeff, 1984-85, Dividend yields are equity risk premiums, *Journal of Portfolio Management* 11:1, pp. 68-75.

Actuaries (CIA) against the changes in each of the following potential determinants: Dividend Yield on the S&P/TSX Composite (DivYld), Long-Term Canada Yield (LtCanYld), the Default Premium (DefPrem), One-month T-bill Yield (1mTbYld), and the One-year T-bill Yield (1yTbYld). The definitions of these variables, the sources of the data, and the regression results are summarized in Schedule 6.2.[66]

Based on the F statistics, only the relationships with DivYld and DefPrem are significant at the 0.10 level, and only the relationship with DivYld is significant at the 0.05 level – the accepted standard in finance research. The same inferences are drawn for the estimated coefficients of the tested determinants based on their t-values. We should note, however, that we initially thought that the inferior results for the default premium might be due to the proxy that we used to measure the default premium. Our initial proxy includes corporates from all rating classes. However, we obtained insignificant regression results when we used default spreads based on the yields for same-class Scotia McLeod long Canadian corporate indexes (A and BBB, respectively).

Q. The estimated coefficients for both DivYld and DefPrem are both negative. Are these consistent with a priori expectations?

A. Yes, they are, and we now deal with each in turn. With regard to DivYld, our a priori expectation is that a decrease in the ERP required by equity investors due to an increase in their risk tolerance will lead to an increase

[66] In its 1994 generic hearing decision, the BCUC stated on page 39: “Like Drs. Evans and Sherwin and Ms. McShane, Drs. Berkowitz and Booth suggested that an inverse relationship existed between long-term bond yields and the equity risk premium; however, they estimated the relationship to be substantially smaller. For every 1 percentage point rise (decline) in the long-term Canada bond yields, they estimated that the allowed ROE would rise (decline) by 80 to 90 basis points. The witnesses indicated that they did not consider their estimates to be statistically significant and did not place a great deal of faith in them (T. 1109-1110).” Return on Common Equity Joint Hearing for BC Gas Utility Ltd., Pacific Northern Gas Ltd. And West Kootenay Power Ltd, Decision, June 10, 1994.

in the market price of the market proxy, all else held equal. If these lowered investor ERP expectations are realized, then the increased realized market price will result in a lower realized dividend yield and a higher realized ERP, all else held equal. Thus, although the relationship between expected ERP and expected dividend yields is positive, we expect to find a negative empirical relationship between changes in the realized market equity risk premium and changes in the realized dividend yield on the market proxy.[67] Thus, decreases (increases) in dividend yield expectations are related to decreases (increases) in ERP expectations. This is consistent with the belief on the "Street" that a rising dividend yield on the market signifies decreasing investor risk tolerance, and that a decreasing dividend yield in the market signifies increasing investor risk tolerance.

A similar logic applies to DefPrem. Holding all else equal throughout unless noted otherwise, our a priori expectation is that an increase in investor risk tolerance will result in lower investor expectations for the risk premium for equities and a lower expected default premium on bonds. In turn, this will result in a higher realized risk premium for equities. Thus, although the relationship between expected ERP and default yield premiums are positive, we expect to find a negative empirical relationship between changes in the realized market equity risk premium and changes in the default yield premium. Thus, decreases (increases) in default

[67] Brealey and Myers make a similar argument as follows: "Over the past 75 years stock prices in the United States have outpaced dividend payments. In other words, there has been a long-term decline in the dividend yield. Between 1926 and 2000, this decline in yield added about 2 percent a year to the return on common stocks. Was this yield change anticipated? If not, it would be more reasonable to take the long-term growth in dividends as a measure of the capital appreciation that investors were expecting. This would point to a risk premium of about 7 percent [as opposed to the 9.1% calculated from historical data]." R. A. Brealey and S.C. Myers, *Principles of Corporate Finance*, Seventh Edition, McGraw-Hill Irwin, New York, 2003, p. 158. Dimson, Marsh and Staunton make a similar argument when they assume that the increase in the realized price/dividend ratios in the U.S. and the U.K. from 23 in both countries in 1900 to 64 and 32, respectively, at the start of 2002 is attributable to a long-term fall in the required equity risk premium. Elroy Dimson, Paul Marsh and Mike Staunton, Global evidence on the equity risk premium, forthcoming *Journal of Applied Corporate Finance* 15:4 (Summer 2003), p. 17.

premium expectations are related to decreases (increases) in ERP expectations. This is consistent with the belief on the "Street" that a rising default premium signifies decreasing investor risk tolerance, and that a decreasing default premium signifies increasing investor risk tolerance.

Q. Did you study the relationship between the market equity risk premium in Canada and various potential determinants using monthly data?

A. Yes, we did. We first examined univariate or simple regression results for changes in the ERP on the S&P/TSX Composite index over Long Canada returns against each of the potential determinants examined using the annual data series discussed above over the period 02/1982-12/2002, and the sub-periods of 02/1982-12/1990 and 02/1991-12/2002. We chose this time period because the CANSIM data series that we used for the one month and one year T-Bill series for Canada started in 01/1982. The sub-period results are approximately of equal length and are designed to test the stability of any identified relationships and their parameter estimates. We also examined multiple regression results for changes in the ERP on the S&P/TSX Composite index over Long Canada returns against four of our potential determinants over the same three time periods. We dropped changes in the yield on one-year T-Bills due to its high correlations with the two retained yield variables. Our expectations are that the estimated coefficients for each determinant would be the same as that for the annual regressions, and in particular that the estimated coefficient for the long Canada yield would be positive given the U.S. findings and the current belief implicit in the formulas current used by regulators in Canada. The sign will change when we regress realized ERP on long Canada yields instead of ERP expectations as was used in the U.S. studies. We also expected that the explanatory power of the variables would be reduced since monthly variations in monthly ERP are likely to contain much more noise than in annual ERP.

The regression results are presented in Schedule 6.3, and can be summarized as follows:

- As expected, the explanatory power of the estimated relationships as measured by the adjusted R-square values is low, and increases with the multiple regressions.
- The dividend yield is the only determinant that consistently has its expected sign and is consistently significant at conventional levels.
- The yield on Long Canadas consistently is positive but is not significant during the first sub-period 02/1982-12/1990 and is only marginally significant for the entire estimation period 02/1982-12/2002.
- The change in the default premium is generally significant but its sign changes from minus to plus from the first sub-period to the second sub-period.

Q. What conclusions do you draw from these monthly regressions?

A. We conclude that they reinforce our conclusions from the earlier regressions using annual data. The results are consistent with our hypotheses: increases in expected dividend yields and expected default premiums increase the expected market risk premium. The regressions with monthly data also reinforce our earlier conclusion that there is no robustly significant relationship between changes in long Canada yields and market risk premia.

Q. Earlier you presented the conceptual underpinnings of an appropriate automatic ROE adjustment formula. Are there any other considerations that need to be considered when designing such a formula?

A. Yes, one other very important consideration is that the adopted formula generates a ROE that reflects permanent and not temporary or year-to-year noise in the ROE. If we examine the annual changes in the market ERP for Canada since 1977, they range from a high of 63% to a low of -45%. At an average beta of say .5 for the sake of argument, this suggests that the realized risk premium for a firm with half of the risk of an average firm should have varied between 31.5% and –22.5% over this period of time. However, it seems reasonable to assume that much of this variation in realized annual ERPs is temporary and not permanent (i.e., just random deviations or surprises around the long-term mean ERP).[68]

A similar argument can be made for changes in the yields on long Canada's, that is, on the risk-free proxy. Most interest rate modeling assumes that interest rates follow some diffusion process where interest rate changes are random.

Thus, if at least part of the change is transitory noise, then not reflecting the total annual change in either the intercept or slope of the SML appears reasonable from a conceptual viewpoint. It also appears reasonable from a practical viewpoint since minimizing variability or noise in the ROE over time reduces price uncertainty for consumers, reduces revenue forecast risk for utilities, and reduces the variability of earnings before interest and taxes or EBIT (with or without depreciation and amortization added back) which has importance for bond investors and bond raters.

Recommended Automatic ROE Adjustment Formula

Q. How do you arrive at your recommended automatic ROE adjustment formula?

[68] Dimson et al (2003, p. 14) make a similar argument. Elroy Dimson, Paul Marsh and Mike Staunton, Global evidence on the equity risk premium, forthcoming *Journal of Applied Corporate Finance* 15:4 (Summer 2003), p. 17.

A. We recommend that the automatic adjustment formula be the summation of two components. The first component is the adjustment designed to capture the change in the intercept of the Security Market Line. It can be proxied by the adjustment factor multiplied by the change in the long Canada yield from its base year value using a variant of the NEB formula described earlier. Specifically, component one is given by:

$$\text{Component One} = X \; x \; (LtCanYld_t - LtCanYld_{BaseYear})$$

where $LtCanYld_t$ is the forecast of the yield for long Canada's for year t subsequent to the base year;

$LtCanYld_{BaseYear}$ is the yield for long Canada's determined by the Board for the base year 2004; and

X is the adjustment factor that is equal to 1 if the full impact of the change in the risk-free asset is reflected in the ROE, and is less than 1 otherwise. X should be less than one if a portion of the annual change in the risk-free rate is noise.

The second component is the adjustment designed to capture the change in the equity risk premium of the Security Market Line. The second component can be proxied by the adjustment percentage multiplied by the beta for the utility sector multiplied by the change in either next year's forecasted dividend yield on the S&P/TSX Composite from its base year value or in next year's forecasted default premium from it base year value. For expositional purposes, we let Y be the adjustment percentage multiplied by the beta for the average-risk utility.[69] After this change, component two is given by:

$$\text{Component two} = Y \; x \; (DivYld_t - DivYld_{BaseYear})$$

or: $$\text{Component two} = Y \; x \text{ of } (DefPrem_t - DefPrem_{BaseYear})$$

[69] The beta of the average-risk utility appears here because it represents the proportion of the change in the market equity risk premium that should be reflected in the equity risk premium for the average-risk utility.

where $DivYld_t$ and $DefPrem_t$ are the forecasts of the dividend yield for the S&P/TSX Composite and the default premium, respectively, for year t subsequent to the base year;

$DivYld_{BaseYear}$ and $DefPrem_{BaseYear}$ are the dividend yield for the S&P/TSX Composite and the default premium, respectively, as determined by the Board for the base year 2004; and

Y is the adjustment factor, which embeds the beta applicable to the average-risk utility. Decreasing values of the adjustment factor indicate that a lower proportion of the full annual impact of the sector's share of the change in the market equity risk premium is reflected in the ROE.

Q. Please provide your recommended range of values for both X and Y?

A. We would recommend that X and Y lie in the range of 0.5 to 1.0. This recommendation reflects the desire to capture changes in the ROE requirements of investors while simultaneously tempering or dampening the variability in annual ROEs over time. The dampening is designed to remove the noise in ROEs over time.

Q. Please use historical data to illustrate the effect on the starting ROE from using your recommendation versus that from using a formula that uses various proportions of the change in Long Canada yields over a base year.

A. We summarize the results of such a historical simulation using Canadian data for the 25-year period 1978-2002 in Schedule 6.4.[70] We begin by

[70] To help the reader understand how the values are calculated in Schedule 6.4, we now explain how the values in the row for 1979 are calculated for X=Y=0.75 and the risk premium determinants are none (in other words no adjustment is made for risk premium changes), DivYld or the dividend yield on the S&P/TSX Composite, and DefPrem or the default premium for SC Long Corporate bonds versus Long Canada proxy. These are the three values in boxes in Schedule 6.4. The first of these values is 1.79%, which is obtained by taking 75% of the change

adjusting for all of the change in the prospective long Canada's relative to its base year value and no risk premium adjustment (i.e., X = 1 and Y=0). In this case, the deviations in the annual ROEs from the base ROE range from 6.30% to –3.99%. We then reduce the value of X or the proportion of the change in the prospective long Canada from its base value. As expected, the range tends to zero as the value of X tends to zero. To illustrate, deviations in the annual ROEs from the base ROE range from 4.73% to –2.99% for a value of X of 0.75 (the NEB type of formula), and from 3.15% to –2.00% for a value of X of 0.5.[71]

Next, we examine the ROE adjustments using either the changes in the TSE dividend yield or the default premium. We begin by adjusting for all of the change in prospective long Canadas and the risk premium proxy relative to their base year values (i.e., X=Y=1). For this case, the deviations in the annual ROEs from the base ROE range from 6.06% to –7.13% using dividend yield, and from 6.72% to -3.76% using the default premium. Thus, both ranges are wider than that obtained using a NEB type of formula. When both X and Y are reduced to 0.75, the deviations in the annual ROEs from the base ROE range from 4.55% to –5.35% using dividend yield, and from 5.04% to –2.82% using the default premium. Thus, the ranges using dividend yield and default premium are wider and similar to that obtained using a NEB type of formula. However, the magnitudes of the annual ROE adjustments are quite different even when

in the Long Canada between 1979 and 1977 (i.e., 0.75 *x (*11.60% - 9.22%). This is essentially the NEB formula. The second of these values is 1.23%, which is obtained by taking 75% of the change in the Long Canada's between 1979 and 1977 [i.e., 0.75 *x* (11.60% - 9.22%] and then adding it to 75% of the change in the DivYld between 1979 and 1977 [i.e., 0.75 *x* (3.99% - 4.73%)]. In other words, adding 1.79% with –0.56% yields 1.25%. The third of these values is 1.67%, which is obtained by taking 75% of the change in the Long Canada's between 1979 and 1977 [i.e., 0.75 *x* (11.60% - 9.22%] and then adding it to 75% of the change in the DefPrem between 1979 and 1977 [i.e., 0.75 *x* (0.45% - 0.60%)]. In other words, adding 1.79% with –0.11% yields 1.67%.

[71] In other words, the NEB formula is equivalent to a 75% adjustment for changes in the risk-free rate and no adjustment for changes in the risk premium. The same comment applies to the formulas used by the other applicable Canadian regulatory bodies, with the exception of the BCUC.

the ranges are similar. As expected, when both X and Y are reduced further to 0.5, both ranges using the new ERP determinants become still tighter. Specifically, the deviations in the annual ROEs from the base ROE range from 3.03% to –3.57% using dividend yield, and from 3.36% to –1.88% using the default premium.

Q. Please provide your recommended formulaic ROE adjustment mechanism?

A. We would recommend that the formulaic adjustment formula with two components be adopted. We would recommend that the first component reflect the change in the expected long Canada yield over the base yield, and that the second component reflect the change in the expected dividend yield on the S&P/TSX Composite over its base year value, and that X (the adjustment factor for the first component) be set at 0.75 and Y (the adjustment factor for the second component) be set at 0.5. This recommendation reflects our desire to capture changes in the ROE requirements of investors while simultaneously tempering or dampening the variability in allowed ROEs by dampening the impact of noise in annual long Canada and market dividend yields over time. Our recommendation reflects our belief that changes in expected long Canada yields relative to their base year value are likely to contain less noise that changes in expected dividend yields relative to their base year value. Our recommendation also reflects our belief that one should proceed prudently when one is the first to introduce a real equity risk premium adjustment into a formulaic ROE adjustment mechanism.

Q. Did you conduct a historical simulation of how the ROE of class I pipelines would have differed if your recommended formula had been used by the NEB instead of the one that they have used since 1995?

A. Yes, we did. We simulated the ROE using our recommended formula with our recommended values; that is, a 75% change in the ROE for each change in the annual long Canada yield forecast and a 50% change in the ROE for each change in the annual dividend yield forecast on the S&P/TSX Composite index. Since we did not have access to past forecasts for annual dividend yields for this index, we used the realized end-of-period values for this dividend yield variable. We also simulated a slightly more aggressive version of our proposed formula where 75% and not 50% of each change in the annual dividend yield forecast on the S&P/TSX Composite index are reflected in the ROE.

Q. What were the results of this historical simulation?

A. The results of this historical simulation are summarized in Schedule 6.5. The results obtained by the NEB using their formula also are summarized in this schedule. As expected, we find that the resulting ROE using our formula drops faster than the ROE obtained by the NEB using their formula, which as we discussed earlier does not really make any change for changes in the equity risk premium. Since the ERP has dropped for most of this period, a formula that reflects ERP changes should produce lower ROE than a formula that makes no adjustment for ERP changes. Also, as expected, the ROE changes direction sooner using our formula than it does using the NEB formula (2002 using our formula versus 2003 using the NEB formula). The results using our formula better conform to what commentators have expressed about the risk tolerance of investors over this period of time. From 1995 through the end of the market bubble years during 2001, investors were increasingly more risk tolerant. In turn, this reduced the market's equity risk premium expectations, and manifested itself in higher stock prices and lower dividend yields. By and during 2002, investors became increasingly less risk tolerant. In turn, this increased the market's equity risk premium expectations, and manifested itself in lower stock prices and higher dividend yields. Also, not surprisingly, the use of our slightly more aggressive ERP adjustment formula moves our ROE values further away from those obtained using the NEB formula.

Implementation Issues

Q. Since the NEB formula is well known, would it not be better to just use that formula?

A. No, because the conceptual and empirical foundations for the NEB formula are fragile.

Q. Is the procurement of expectation data for either the market dividend yield (or a default premium) a major obstacle to the use of the ERP determinant that you recommend herein?

A. In our opinion, it is more of a nuisance than a major obstacle. It would be relatively easy for the Board to contract an outside vendor to conduct a survey in November of each year to obtain such data or to conduct such a survey in-house using the internet or to collaborate in such a survey with other Boards that use a formulaic approach to adjusting a base ROE. The advantage of the latter two options is that over time the Board would develop a time series of forecasts that would be useful in testing whether or not the forecasts currently used contain any systematic biases.

ROE AND TARGET CAPITAL STRUCTURE REVIEW PROCESSES

Mandatory Reviews

Q. Do you believe that there should be mandatory periodic reviews of the ROE adjustment formula and the target capital structures of the utilities being regulated?

A. Yes, we do. We believe that there should be a generic review within three years after the first implementation of the formula, and every five years thereafter, provided circumstances have not changed in the interim to necessitate an interim generic review. In the event of an interim generic review, we recommend that the next mandatory generic review be scheduled five-years forward. We believe that such mandatory reviews are required to ensure that the system is not only fair and equitable but that it also is perceived to be such.

Triggers for Special Reviews

Q. Do you believe that there are circumstances that necessitate a special review of the ROE adjustment formula and/or the allowed target capital structures of one or more of the utilities under the regulation of the Board?

A. Yes, any material shift in the investment risk of the regulated sector or any material and permanent shift in the market ERP would warrant a special sector-wide generic review of the ROE adjustment formula and a resetting of base ROE and possibly of target capital structures. Similarly, any material and permanent shift in the investment risk of a specific regulated utility would warrant the consideration of a firm-specific review of that utility's allowable target capital structure.

Q. What sort of indicators or triggers would suggest that the investment risk of a specific utility has changed materially so that a utility-specific review of target capital structure may be required?

A. Such indicators or triggers would include:

(a) A bond rating downgrade to speculative grade;

(b) A bond rating downgrade of 2 or more grades when system-wide bond rating upgrades and downgrades are reasonably balanced.

Q. Who should be able to initiate the possibility of special reviews

A. We recommend that any interested party be able to petition for a special review, and that the initiating party bear the burden of proof for such an action.

VII. DISCUSSION OF EVIDENCE SUBMITTED BY THE EXPERTS FOR THE APPLICANT UTILITIES

INTRODUCTION

Q. Please explain what evidence is critiqued by you in this section of your evidence.

A. In this section of our evidence, we critique the evidence dealing with the 2004 recommended ROE(s) and capital structures, recommended automatic adjustment mechanisms and review processes, and economic/financial market assessments of the following expert witnesses:

- Ms. McShane, expert witness for Atco Utilities [ATCO Gas, ATCO Electric (TRANSCO and DISCO), and ATCO Pipelines] and AltaGas Utilities (AUI).
- Dr. Evans, expert witness for AltaLink Management Ltd. (AltaLink), Aquila Networks Canada (Alberta) Ltd. (Aquila), EPCOR Distribution Inc. (EDI) and EPCOR Transmission Inc. (ETI) (collectively the Companies).
- Dr. John A. Neri and Mr. Richard Falconer, expert witnesses for ENMAX Power Corporation.
- Dr. A. Lawrence Kolbe, Mr. Gordon S. Lackenbauer, Mr. Paul J. Murphy and Dr. Michael J. Vilbert, expert witnesses for Nova Gas Transmission Ltd.

Q. What is the primary purpose of your critique of the evidence submitted by these expert witnesses?

A. The primary purpose of this critique is four-fold. First, it is to present the similarities and the differences between the recommendations made by these experts and us for the forecast of the 30-year Canada yield and the rate of return on equity for an average-risk utility, and the equity ratios for each of the various applicant utilities for the initial year of 2004. Second, it is to show which adjustments made or not made to various standard methodologies by the various experts result in return on equity and equity ratio recommendations being different than ours. We show that these adjustments or non-adjustments consistently inflate the recommended values for the return on equity and the equity ratios of these experts compared to our recommendations. Third, it is to compare the recommendations for the return on equity for the applicant utilities against that which would be obtained by using the various adjustment formulas presently in use by a number of Canadian regulators. Fourth, it is to assess the merits of the automatic adjustment and review processes recommended by the various experts for the applicant utilities.

Q. How is this section of your evidence organized?

A. We begin by highlighting that, with one exception, there is little disagreement between the 2004 forecasts of the 30-year Canada yield advanced by the various experts for the applicant utilities and ourselves.

We then proceed to the first major area of disagreement; namely, the initial (2004) rate of return on equity. We show that the implementation of various standard methodologies for estimating the rate of return on equity by the experts for the applicant utilities consistently leads to inflated rate of return on equity estimates. After we demonstrate the impact of introducing or not dealing with known biases in the evidence of the various experts, we find that with the correction for all of these biases, the fair rate of return estimates made by these experts are quite close to our own recommended rate. We end this sub-section with a comparison of the recommendations for the 2004 return on equity by the various experts for the applicant utilities and ourselves against the estimate that would be obtained if it were calculated using the various adjustment formulas presently in use by some Canadian regulators. Our recommendation reflects the current trend towards a lower equity risk premium. The comparison indicates that our own recommendation represents a reasonable choice should the Board wish to embrace our argument and adjust to the new market regime. However, if the Board wishes to move more cautiously, it could choose to set the allowed equity return for an average-risk utility in the range between our recommendation and the average of the regulatory formulas. Either way, our examination of the regulatory formulas and other evidence suggests that the Board should attach little weight to the rate of return recommendations of the various experts for the applicant utilities.

We then proceed to the third major area of disagreement; namely, the initial 2004 equity ratios for each of the applicant utilities. We examine the two methodologies employed in determining common equity ratios (ranges) by the experts for the various applicant utilities and show that they are flawed. As a result, their recommendations are overly generous when viewed in the context of the business risks of the various applicant utilities and recent awards by the regulatory bodies.

We then proceed to the fourth major area of disagreement; namely, the automatic adjustment formula for determining future adjustments to the 2004 ROE. We show that most of the experts adopt a NEB-type of adjustment formula, which we have shown in section VI makes a questionable adjustment for changes in the equity risk premium.

ECONOMIC AND CAPITAL MARKET TRENDS

Q. What comments do you have on the various forecasts of the 30-year Canada yield by the experts for the applicant utilities?

Long Canada Rate Forecast

Q. Do you have any comments on the forecasts for 30-year Canada's advanced by the other witnesses in this hearing?

A. Yes, we do. All of the other witnesses use a methodology similar to ours although there are some differences in the details of implementation. They first obtain a forecast for 10 year Canada's from Consensus Economics or another source. Then they add an estimate of the average spread of 30 year Canada's over 10 year Canada's. In all cases but one, Dr. Neri's forecast, the other witnesses arrive at forecasts that lie within 15 basis points of ours. Nonetheless, it is important to identify and correct differences in implementation as these may lead to significant forecast errors in the future.

There are two areas in which other witnesses' implementation techniques differ from our own – the forecast used for 10 year Canada's and the spread calculation. Beginning with the forecast, we draw ours from an average of Consensus Economics and three banks' forecasts all for June 2004. Ms. McShane and Dr. Vilbert follow the same approach using only the Consensus Economics forecast.

In contrast, each of the other witnesses forecasting rates makes an implementation error on this point. Dr. Evans correctly turns to Consensus Economics for his forecast. However, he incorrectly discards the June 2004 forecast and adopts an average of forecasts for 2004 and 2005. Dr. Neri uses Consensus Economics and Blue Chip Financial Forecasts and obtains an average forecast for 10 year Canada's of

5.60%. This is out of line with our forecast, Consensus Economics and all the other witnesses. It would appear that Blue Chip Financial Forecasts' numbers are too high.

The second step involves adding a spread to the 10 year Canada forecast to obtain a forecast for 30 year Canada's. We measure this spread as the average over the most recent four quarters for which data are available and obtain a rounded estimate of 50 basis points. In contrast, three other witnesses measure the spread over shorter periods. Ms. McShane follows NEB practice in using the spread over the most recent month for her estimate of 61 basis points. Dr. Evans uses the spread on one day for his estimate of 60 basis points. Dr. Neri measures the spread over the months, March to May 2003 obtaining 55 basis points. While these three estimates are close to ours, using short periods could lead to an unrepresentative spread in unsettled markets.

Finally, Dr. Vilbert increases his spread estimate by 40 basis points to "partially compensate for the downward pressure on Government bond yields" (page 36, line 16). In our view, this unnecessarily *introduces judgment* into the forecasting process, and will be difficult to deal with in any formulaic approach.

FAIR RATE OF RETURN ESTIMATES BASED ON THE EQUITY RISK PREMIUM METHODOLOGY

Introduction

Q. Please describe how your equity risk premium estimate differs from that submitted by the various experts for the applicant utilities?

A. We obtain equity risk premia above long Canada's that are substantially lower than those entered into evidence by the various experts for the applicant utilities. These experts arrive at overly generous estimates of both the betas for either an average-risk utility or of specific applicant utilities, and of the magnitude or size of the risk premium required to adequately compensate equity investors for bearing those levels of risk. Basically, we find that some of these experts:

- adjust their beta estimates when they should not, and do not adjust their beta estimates when they should; and
- do not adjust their market equity risk premia estimates for the significant reduction in trade costs, the benefits of easier and less costly diversification both across investment classes and internationally, and the near consensus view that not only is the realized ERP an overestimate of the ERP that investors expected historically, but also that the forward-looking ERP is expected to be significantly lower than that realized in the past.

<u>ROE Evidence of the Experts For the Applicant Utilities</u>

Q. Please describe your understanding of the evidence on rate of return presented by each of the experts in this hearing.

A. In addition to the new evidence filed for this hearing, it is our understanding that the following refiled evidence provides a “point of departure” for the evidence of Dr. Evans and Ms. McShane:

- The studies and analyses in the December 2002 ETI Direct Evidence for Dr. Evans.[72]
- The “evidence filed in the most recent ATCO Electric, ATCO Gas, ATCO Pipelines and AltaGas Utilities General Rate and General

[72] Dr. Evans, page 20, of the prepared testimony for Alta Link Management Ltd., Aquila Networks Canada (Alberta) Ltd., EPCOR Distribution Inc. and EPCOR Transmission Inc. before Alberta Energy and Utilities Board, re: generic cost of capital hearing.

Tariff Applications, with updates as appropriate".[73] However, the ROE material appears to be based on the "evidence" [rebuttal?] filed by Ms. McShane in ATCO Pipelines' 2003/2004 GRA.[74]

Q. What methods for estimating the rate of return do the experts for the applicant utilities use in their evidence?

A. Dr. Evans uses two methods: Equity Risk Premium Method and Comparable Earnings Method.

Ms. McShane uses three methods: Equity Risk Premium Method, Discounted Cash Flow Method and Comparable Earnings Method.[75]

Dr. Neri uses the Equity Risk Premium Method and the Discounted Cash Flow Method.[76] Dr. Neri states that: "Comparable earnings, as the Board has recognized, is problematic".[77]

Dr. Vilbert uses the Risk Positioning Approach and the Discounted Cash Flow Method to estimate the cost of equity for two benchmark samples of utilities (sample of Canadian utilities and a sample of U.S. gas local distribution companies).[78] With regard to the DCF model, Dr. Vilbert states that:

> "For both samples, the results of the DCF model are more variable and less reliable than those based upon the risk positioning model; however, I provide results using the DCF model because it is a method that has been used extensively in the past. In addition, the DCF model

[73] Ms. McShane, lines 16-18, page 6, of new evidence.
[74] Ms. McShane, lines 3-4, page 27, of new evidence.
[75] Ms. McShane, lines 11-14, page 5, of new evidence.
[76] Dr. Neri, lines 10-14, page 5, of new evidence. He also used the CAPM but that is basically a minor variant of the standard Risk Premium Model. Dr. Neri, lines 3-4, page 25, of new evidence.
[77] Dr. Neri, response to IR CAL-EPC-NERI.14.
[78] Dr. Vilbert, line 5, page 3 to line 14, page 4, of evidence.

results serve as a check on the results from the equity risk positioning approach, but I rely primarily on the risk positioning model."

With regard to the Comparable Earnings Approach, Dr. Vilbert states that "I do not provide estimates based upon the comparable earnings method, because I believe the problems inherent in that model are too great to be reliably overcome". Dr. Vilbert acknowledges that, since the market ERP has declined in Canada, he has reduced his estimate over long Canada's by 50 basis points to about 5.5%.[79] This is the closest estimate that is recommended by these experts to our recommended market ERP of 4.7%. However, if we adjust for the fact that Dr. Vilbert uses the ERP for the U.S. without adjusting for its higher risk and we eliminate his consideration of the International Cost of Capital estimates obtained from Ibbotson Associates, we would expect that his estimate would be about the same as ours.

Dr. Kolbe essentially interprets the tests conducted by Dr. Vilbert to estimate the rate of return on equity for an applicant utility. Both Dr. Kolbe and Dr. Vilbert base their evidence on the 40% equity ratio that was decided by NGTL.[80]

<u>Beta Estimates</u>

Q. Please discuss the beta estimates made by each expert for the applicant utilities.

A. Dr. Evans basically derives his estimate based on the range of estimates provided by other experts at recent hearings and on the range

[79] Dr. Vilbert, line 11, page 20 to line 10, page 21, of evidence.
[80] Dr. Koble, lines 3-4, page 6, of evidence.

recommended by the Independent Assessment Team.[81] Since the lower and upper points of this range depend upon whether or not adjusted betas are used, Dr. Evans is implicitly putting some weight on this dubious position, which is critiqued below.

Q. Ms. McShane argues that utility betas are no longer reliable because they have become “decoupled” from the overall equity market.[82] Please comment on this position.

A. Decoupling (or its counterpart recoupling) are just words with negative connotations, which are used merely to describe the strength of the correlation between the returns of utilities and the market. When the returns on utilities become less correlated with the returns on the market (i.e., the correlations move towards zero), Ms. McShane describes this as being a decoupling. However, a lowering of the correlation between the returns of utilities and the market would be expected if regulators are focusing on rate stability while all else is held constant. In the extreme case where the returns on utilities did not vary, the correlations and hence the betas of the utilities would be equal to zero. Also, even if the own risks of utilities in Canada and the U.S. and their correlations with their respective markets remained constant, their betas in each country could move in opposite directions. For example, if the own risk of the market increased in Canada and remained constant in the U.S., the betas of the Canadian utilities would drop while those in the U.S. would remain unchanged. These comments also apply to similar argument provided in the evidence of Dr. Vilbert, and to his termination of the time period for estimating betas for the Canadian sample in May 2000.[83]

[81] Dr. Evans, page C-20-21, of the evidence: Epcor Transmission Inc. (ETI), Alberta Energy and Utilities Board, December 2002. Refiled by Epcor for this generic hearing as 012_ETI_Exhibits/012-01/12-01_2003_07_09_App_D_December2002_Rate_of_Return_Evidence.

[82] Ms. McShane, lines 1-10, page 20.

[83] For example, Dr. Vilbert, lines 6, page 37 to line 3, page 38, of evidence.

Beta Estimation Problems

1. Use of Value Line betas:

Q. Please discuss the validity of using Value Line beta estimates to calculate the own risk premium for an average-risk utility or for each applicant utility?

A. Value Line or so-called adjusted betas to obtain beta proxy(ies) for a representative and/or the applicant utilities are used by Ms. McShane, Dr. Neri,[84] Dr. Vilbert and implicitly by Dr. Evans.[85] Before discussing the validity of using Value Line adjusted betas, one should note that raw (or unadjusted) Value Line betas are likely to be higher than traditionally estimated betas since Value Line uses weekly and not monthly returns in their estimates. The variability of weekly returns is affected more by noise caused by market microstructure effects such as trades bouncing between bids and asks, and this effect is likely to be more pronounced for individual firms than for a weighted average of a large number of firms as is the case for a market index.

The beta adjustment procedure used by Value Line is quite simple in that it is a weighted average of the firm's raw or unadjusted beta and the market beta of 1, where the weight placed on each is two-thirds and one-third, respectively. Since regulated utilities almost always have raw betas less than one, a Value Line type of adjustment almost always results in an adjusted beta that is higher than its corresponding raw or unadjusted beta.

[84] Dr. Neri, lines 24-26, page 31, of evidence.
[85] Ms. McShane, e.g., lines 1-5, page 47, of the evidence: Atco Pipelines, Alberta Energy and Utilities Board, January 2003. Refiled by Atco for this generic hearing as EX_008-01, Application, Section 3.

Adjusted betas were discussed in Section IV of our evidence, where they were shown to be inappropriate for Canadian utilities. One justification proposed for the use of this method is the argument that utility betas tend to revert to the mean market beta of one. In section IV of our evidence, we provide five substantive reasons why this is not the case for a sample of utilities, including evidence that using an adjusted beta to forecast future betas results in a substantial over-estimate of actual realized betas. Value Line betas are based on a dated empirical study that found that the average U.S. equity beta for a sample of all the stocks in the U.S. market regresses towards the market beta of 1. This has to be true by construction since the market beta itself is by definition equal to one and is by definition equal to the weighted average of the betas of all the stocks in that market. In contrast, utility-specific studies find that a forecast of a U.S. equity utility beta is improved by either reflecting the tendency of utility-specific betas to regress to the sample average for utilities or incorporating estimation error into the derivation of the estimate. Mean reversion implies that the mean will be reached at some point in time, and fairly quickly given an assumed reversion rate of one-third. In fact in section IV, we showed that the rolling five-year average beta was moving towards zero and not one for our sample of utilities. This is hardly the behavior that would occur if the average sample beta had a tendency to regress towards the market beta of one.

Since some of the experts for the applicant utilities, such as Dr. Evans, Ms. McShane and Dr. Neri, basically use the sample average utility beta as their estimates of the beta(s) for a representative utility (applicant utilities), no adjustment is needed to adjust the tendency of the beta of a specific utility to regress to that same sample average utility beta. These experts should not have adjusted the raw sample betas. Undoing the range of adjusted beta estimates of 0.60-0.65 for an average-risk utility proposed by Ms. McShane yields a beta estimate range of 0.40-0.48, which is lower than our beta estimate of 0.50 for an average-risk utility.[86] Thus, Ms. McShane used a beta estimate that was upwardly biased by about 50% [i.e., $(0.60-0.40)/0.40$] at the low end of the range, and by about 35% [i.e., $(0.65-0.48)/0.48$] at the high end of the range. Furthermore, as we have shown in Section IV of our evidence, Ms. McShane's beta mid-point estimate of 0.625 is higher than the highest five-year mean beta of 0.583 for our sample of utilities for the 1990-1994 period, and is substantially higher than the five-year mean beta of 0.104 for our sample of utilities for the 1998-2002 period. Thus, while the beta values proposed by Ms. McShane are beyond the upper end of the range of possible beta values, we have chosen to use a beta value as our point estimate that is somewhat above the longer-term mean of that range, and substantially above the shorter-term mean of that range.

Similar results occur when we unadjust the 0.60 beta used by Dr. Neri. Furthermore, Dr. Neri uses a Value Line adjustment that assumes that the underlying mean is one but he responds to the information request that these betas do not revert to one.[87] However, mean reversion means that betas revert to the mean (i.e. beta changes are negatively correlated). Thus, when they are above or below the mean of one they tend to move in the direction of the mean. In other words, the actual beta varies around the mean of one but actual beta changes are not independent.

Q. What impact did the use of this inflated beta estimate have on Ms. McShane's calculated CAPM Risk Premium estimate?

A. Ms. McShane's benchmark utility risk premium estimate is obtained by multiplying her adjusted beta estimate of 0.6-0.65 times her market risk premium estimate of 6.0% to obtain her estimate of the own equity risk

[86] This is obtained by solving: [(0.60*3) – 1] / 2 to get 0.40 and: [(0.65*3) – 1] / 2 to get 0.48.
[87] Dr. Neri, response to IR CAL-EPC-NERI.19.

premium of the benchmark utility of 3.75%.[88] Using the corresponding upper end of the range of the corresponding unadjusted or raw beta estimate for the benchmark utility of 0.48 yields a revised estimate of the own equity risk premium of the benchmark of 2.88%, or a reduction of almost 23% from her estimate of 3.75% using her estimation method. This is assuming, for the moment, that Ms. McShane's estimate of the market risk premium is not similarly too high. We will return to this point later.

Q. Ms. McShane provides reference to service vendors that provide such adjusted betas as support for the use of adjusted betas. Do you agree with her justification?

A. No. Vendors provide many products that are devoid of both theoretical and empirical justification. The studies by Kryzanowski and Jalilvand, Gombola and Kahl, and others cited in section IV, provide support for the regression tendency for betas of utilities to regress toward their grand utility mean and not toward the grand or market average of 1.0. However, since Ms. McShane already effectively uses the grand utility mean for her benchmark utility, properly accounting for the tendency to regress to itself would not change the raw or unadjusted beta estimate for the benchmark utility.

Dr. Damodaran, the author of many textbooks, states that "it can be argued that the beta looking forward will be different from the historical beta" even if the latter is well estimated if the firm has changed in terms of business and financial risk. He states that "[o]ne simplistic way of adjusting historical betas is to assume that betas will move towards one in the long term and adjust beta estimates towards one", and then provides what he considers to be more accurate ways of estimating forward looking

[88] Ms. McShane, lines 5-6, page 30, of evidence.

betas than using historically estimated betas.[89] Once again, it is important to emphasize that this is only for the case where the business and financial risks of the firm have materially changed. It also is important to emphasize that, by extension, Dr. Damodaran would suggest a reduction in the historically estimated beta if the firm has undergone a material lowering of its business and financial risks and all else remains constant. Thus, using a Value Line adjusted beta in this case would move the historically estimated beta in the wrong direction.

Q. Many of the classic tests of the CAPM did not use Value Line adjusted betas. Could one not argue that these studies used raw beta because adjusted betas were not available over most of the time periods covered in these studies?

A. No, this is a fallacious argument. If Value Line adjusted betas are superior to raw betas, then these studies would have been replicated using such betas, since such betas are easy to calculate. Furthermore, many studies on the CAPM have appeared since Value Line adjusted betas appeared, and most (if not all) of the published studies use raw betas. This includes numerous studies by Fama and French, amongst others, about whether or not the traditional CAPM is empirically supported.[90]

Q. Does Dr. Vilbert use adjusted betas and what is his rationale for doing so?

[89] A. Damodaran, Discussion issues and derivations, under his section 4. Available at: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/AppldCF/derivn/ch4deriv.html#ch4.3, and accessed on December 11, 2002.

[90] Eugene F. Fama and Kenneth R. French, 1996, The CAPM is wanted, dead or alive, *Journal of Finance* 51:5 (December), pp. 1947-1958; Eugene F. Fama and Kenneth R. French, 1995, Size and book-to-market factors in earnings and returns, *Journal of Finance* 50:1, pp. 131-155; Eugene F. Fama and Kenneth R. French, 1996, Multifactor explanation of asset pricing anomalies, *Journal of Finance* 51:1 (March), pp. 55-84; and James L. Davis, Eugene F. Fama and Kenneth R. French, 2000, Characteristics, covariances, and average returns: 1929 To 1997, *Journal of Finance* 55:1 (February), pp. 389-406.

A. Dr. Vilbert uses adjusted betas for Canadian utilities and unadjusted betas for U.S. utilities. He acknowledges that this asymmetrical method of calculating betas for different samples is not his normal method.[91] He attributes this difference to the greater interest rate sensitivity of utilities in the Canadian sample than in the U.S. samples. As we show in Appendix 4.E, this is a fallacious argument.

Q. Which adjustment method does Dr. Vilbert use for the Canadian sample?

A. Dr. Vilbert states that he uses the Merrill Lynch or ML adjustment procedure that adjusts for sampling errors but he actually uses the Value Line approach. ML betas can either increase or decrease depending on the nature of the estimated sampling errors.[92]

Q. Dr. Kolbe argues that the betas measured against the stock market return and that part of the bond market returns that are not caused by the sensitivity of bonds to the stock market are higher than conventional betas?[93] Do you agree?

A. No, we do not agree, as we show in Appendix 4.E of our evidence. Also, Dr. Kolbe is confusing the determinants of deviations from expected returns for the same firm (i.e., variation around the mean) with the determinants of differences in expected returns (changes in the means) across firms. While interest rates may explain the deviations of actual returns from their expected returns over time, this does not mean that they explain cross-sectional differences in expected returns across different assets (such as utilities). The multifactor or Arbitrage Pricing Literature

[91] Dr. Vilbert, lines 4-13, page 24, of evidence.
[92] Dr. Vilbert, lines 5-16, page 23, of evidence. For a discussion of the two methods, see: L. Kryzanowski and A. Jalilvand, Statistical tests of the accuracy of alternative forecasts: Some results for U.S. utility betas, *The Financial Review* (1986), pp. 319-335. Also, see O.A. Vasicek, A note on using cross-sectional information vs. Bayesian estimation of security betas, *Journal of Finance* 28 (September 1973), pp. 1233-1239.
[93] Dr. Kolbe, line 1, page C-3 to line 16, page C-4, of evidence.

has long recognized that there is a major difference between a significant risk factor and one that is priced in the market.

2. Further upward beta adjustment in the ECAPM:

Q. Are there any other cases where an expert further adjusts his or her beta estimate upwards when he or she should not have?

A. Yes, there is. In what he calls the Empirical CAPM or ECAPM risk positioning approach, Dr. Vilbert calculates the cost of equity capital using the following expression:[94]

$$K = R_F + a + \beta_i (R_M - R_F - a) \qquad (1)$$

In response to an information request from the Board, Dr. Vilbert responds: "the NEB has given some weight to the ECAPM results in the evidence of Dr. Roger Morin on behalf of TQM in decisions for proceedings RH-2-90 and RH-4-92".[95] However, the formula used by Dr. Vilbert is different that the one used by Dr. Morin in his evidence. For example, Dr. Morin uses the following formula in his evidence for the recent Hydro Quebec distribution proceedings before the Regie de L'Energie in Quebec:[96]

$$K = R_F + a(R_M - R_F) + (1-a)\beta_i (R_M - R_F) \qquad (2)$$

where a is determined by "empirical fit" to be 0.25. Since this "model" has no theoretical basis and has no real empirical support, we have no means of determining which of these versions of this faulty procedure is better.

Q. Why can this be viewed as a further upward beta adjustment?

[94] Dr. Vilbert, line 6, page 25 to line 2, page 26, of evidence. Also, see his Appendix C for more detail on the ECAPM.
[95] Dr. Vilbert, response to IR: BR-NGTL-22.
[96] Dr. Roger A. Morin, Testimony Before the Régie de l'Energie du Québec on: Fair Return on Common Equity on Hydro-Quebec's Electricity Distribution Operations, May 2002, p. 8.

A. If we take the version of the model used by Dr. Morin in a recent proceeding, it is easy to show that this is merely an additional upward adjustment to the beta estimate for a utility. An implicit term in the second term on the right-hand side of his equation [equation (2) above] is the market beta or β_m of one. Inserting that in the second term, the two risk premium terms in equation (2) can be written as:

$$a\beta_M(R_M - R_F) + (1-a)\beta_i(R_M - R_F)$$

where β_M and β_i are the raw beta of the market and the raw or Value Line adjusted beta of the utility, respectively, R_F is the risk-free rate as proxied by the Long Canada, and a is the adjustment factor (equal to 0.25 in the evidence of Dr. Morin).

This can be rewritten as:

$$(a\beta_M + ((1-a)\beta_i)(R_M - R_F)\text{, or}$$

$$[a + (1-a)\beta_i](R_M - R_F)\text{ since } \beta_m = 1.$$

Thus, using the formula used by Dr. Morin, the ECAPM-adjusted beta, β_i^{ECAPM}, is given by: $[a + (1.0-a)\beta_i]$.

Taking the formula used by Dr. Vilbert in his evidence, we find that his ECAPM-adjusted beta is given by: $\dfrac{a + \beta_i(R_M - R_F - a)}{(R_M - R_F)}$, or $\dfrac{a}{(R_M - R_F)} + \dfrac{\beta_i(R_M - R_F - a)}{(R_M - R_F)}$, where Dr. Vilbert uses assumed values for *a* of either 0.75% or 1.75% when using the long Canada yield as the risk-free proxy.[97]

Stated simply, the ECAPM is merely another method to further inflate an already inflated beta estimate for a utility. As a result, the ECAPM arrives at a super-adjusted or inflated beta for the utility. To illustrate, we calculate

[97] This is counter to the response by Dr. Vilbert to Board IR BR-NGTL-22 that there is no adjustment of beta that will duplicate the return on equity estimated by the ECAPM for each company".

the implicit betas for the values presented in Table 1b: Panel A on page 47 of the evidence of Dr. Vilbert. Using the values in line 7 and his long-term risk-free rate of 5.65% gives an implicit beta of 0.77 when one solves for beta in: 9.9% = 5.65% + Beta * (9.9% - 5.65%). Using the values in line 9 and the same risk-free rate estimate of 5.65% gives an implicit beta of 0.95 when one solves for beta in: 10.9% = 5.65% + Beta * (10.9% - 5.65%).[98] In other words, an initially inflated estimate of beta of 0.77 becomes 0.95 after being adjusted once again. In other words, with adjusting there is little difference between the systematic risk of the sample of regulated utilities and the market.

Q. Why is this additional adjustment to the already adjusted beta of the sample of Canadian utilities inappropriate?

A. The rationale presented for the ECAPM by Dr. Vilbert basically is that the statistical evidence indicates that the risk-return relationship is flatter than that predicted by the CAPM so that low-beta stocks tend to have higher risk premia than predicted by the CAPM, and higher-beta stocks tend to have lower risk premia than predicted.[99] If true, this implies that the CAPM would understate the return requirements of utilities only if their true betas were less than one. However, this contradicts a basic assumption of the Value Line adjustment that the “true” beta is one if the adjustment is to be used.

While most recent studies do not support the traditional or unconditional CAPM, the empirical evidence for multifactor or conditional CAPMs is stronger. The earlier studies that found such biases in the CAPM have typically used U.S. 90-day Treasury bills as a proxy for the risk-free rate. These studies do find that the estimated intercept of the Security Market

[98] The response of Dr. Vilbert to CG-NGTL-47 confirms these calculations.
[99] Dr. Vilbert, lines 1-5, page 25, of evidence.

Line or SML is above the risk-free rate, and that the estimated slope of the SML is smaller than the difference between the mean return on the market proxy and the mean return on T-bills (i.e., the market risk premium measured relative to the T-bill rate). More recent studies find evidence against the traditional form of the CAPM, and find strong support for the zero-beta version of the CAPM where the estimated intercept is the return on the zero-beta portfolio. The expectation of the CAPM is that the return on the zero-beta portfolio should exceed the return on T-bills.[100] The use of the higher long Canada rate as the proxy for the risk-free rate is consistent with these empirical findings.

Using the higher long Canada rate when constructing the SML already increases the intercept of the SML and flattens the slope of the SML. Thus, making a further adjustment to beta to account for a flatter-than-expected SML results in an over or double adjustment for the same empirical phenomenon. Thus, this represents another case where Dr. Vilbert further adjusted his beta estimate for a sample of utilities upwards when he should not have.

Q. Are there any adjustments that should be made to account for the empirical evidence for the traditional CAPM?

A. Yes, there is. The slope of the estimated security market line or SML of the traditional CAPM (i.e., equity risk premium) needs to be reduced to account for its “flatter-than-expected” value. In other words, it is the slope of the SML and not the betas of the individual assets or portfolios that need to be adjusted.

Q. How do you arrive at this recommended adjustment?

---

[100] Robert F. Stambaugh, 1982, On the exclusion of assets from tests of the two-parameter model: A sensitivity analysis, *Journal of Financial Economics*, November, pp. 237-268.

A. We arrive at this recommended adjustment by using first principles, and by adding what we learn from an examination of the more recent evidence on the relationship between the equity risk premium that was realized over past periods and what the equity risk premium expectations of investors were estimated to be. We now detail our argument on this point.

First, one of the major assumptions made when testing the CAPM using realized returns is that realized returns are an unbiased estimate of expected returns. In other words, what happened was what investors expected, at least on average. Based on the assumption that realized returns are unbiased estimates of expected returns, the early empirical evidence is interpreted as showing that the estimated CAPM relationship has an estimated intercept that is higher than expected and has an estimated slope that is lower (or flatter) than expected. These tests generally consist of regressions of the realized returns or realized excess returns on portfolios formed to maximize the spread across portfolios in their betas. The interpretation that the estimated intercept is higher than expected is based on a comparison of the estimate against the average T-Bill *yield* over the period. The interpretation that the estimated slope is lower (flatter) than expected is based on a comparison of the estimate against the average realized equity risk premium over the period.

Second, the more recent evidence indicates that realized returns are not unbiased estimates of expected returns, even over very long periods of time. In other words, what happened is not what investors expected, even over very long periods of time. As we discussed in Section IV and Appendix 4.C of our evidence, the more recent literature concludes that the realized equity risk premium that investors earned exceeded the equity risk premium that investors expected to earn. This is based on the finding that equity investors earned more than what they expected, and bond investors earned less than what they expected.

Third, it then follows that combining the literature referenced in our first and second points leads to the following conclusions:

- The finding that the estimated slope of the CAPM is flatter than expected is what one would expect given that the realized ERP exceeded the expected ERP over the period. This is prior to making any adjustment for the fact that these tests generally use T-bills and not long Governments as a proxy for the risk-free rate.
- The finding that the estimated intercept of the CAPM is higher than expected is also expected given that using lower equity risk premia for all the portfolios would shift the SML downwards if we assume that the true expected risk-free rate remains constant, and would result in a lower estimated intercept for the SML. Again, this is prior to making any adjustment for the fact that these tests generally use T-bills and not long Governments as a proxy for the risk-free rate.

Q. What are the implications for the determination of the ROE using the ERP method?

A. The implications are two-fold. First, the expected yield on the long Canada should be used since we have no evidence that it is not an unbiased expectation of the future one-period return for the true risk-free rate. Second, the realized mean market equity risk premium needs to be revised or adjusted downwards since the upward bias in mean realized equity returns exceeds the downward bias in mean realized bond returns when each is used as a proxy of investor expectations.

Q Are there any regulatory commissions, boards or régies that have reached a similar conclusion to the use of the ECAPM?

A. Yes, the Public Utilities Commission of the State of California in "D.99-06-057 rejected the ECAPM financial model because it artificially raises the ROE requirement".[101] Similarly, in its recent decision for Hydro Quebec Distribution, the Regie de l'Energie found insufficient support for the use of the ECAPM. It also reaffirmed its earlier decision against the use of adjusted betas, and indicated that it did not support estimates obtained using the comparable earnings method or the DCF for individual firms.[102]

3. No downward beta adjustment with the use of U.S. market risk premia:

Q. You stated earlier that some of the experts for the applicant utilities not only adjusted betas when they should not have but also did not adjust betas when they should have. Would you please provide an example of the latter?

A. Dr. Evans used the equity risk premium estimates obtained from the Ibbotson Historical return data for the U.S., along with other estimates, to obtain an estimate of the market risk premium. He then applied his beta estimate of 0.6 for ETI to his market risk premium estimate to obtain an own equity risk premium estimate for ETI. Thus, he effectively used the same beta estimate for both his Canadian risk premium estimates and his U.S. risk premium estimates. Thus, Dr. Evan's use of an implicit scheme for weighting market risk premia from the U.S. and Canadian markets ignores the fact that the beta of a utility is different for each market proxy,

---

[101] As noted on pages 24 and 33 in the Proposed decision of A.L.J. Galvin (mailed 10/8/2002), Interim opinion on rates of return on equity for test year 2003 before the Public Utilities Commission of the State of California, Application of Pacific Gas and Electric Company for authority to establish its authorized rates of return on common equity for electric utility operations and gas distribution for test year 2003. (U39M), application 02-05-022, filed May 8, 2002. Available at: http://www.cpuc.ca.gov/published/comment_decision/19761.htm.

[102] Régie de L'énergie du Québec, D é c i s i o n, Demande relative à la détermination du coût du service du Distributeur et à la modification des tarifs d'électricité, phase I, D-2003-93, R-3492-2002, 21 mai 2003, pp. 71-73.

and differs in a domestic-only context from that in an international context. As noted by Dr. René Stulz, a former editor of the *Journal of Finance*, “globalization reduces the beta of all companies whose profits and values are more strongly correlated with their local economies than with the global economy”, as one would expect to be the case for the portions of the applicant utilities whose ROE is regulated by the Board.[103]

In Section IV of our evidence, we demonstrate for Canadian utilities cross-listed in the U.S. that their beta estimates based on the U.S. index are lower than those based on the Canadian stock market index. In Appendix 4.D, we argued that the applicant utilities will most likely have a lower beta in the foreign market than in the Canadian market if the equity market risk premium is higher in the foreign than the Canadian market. This is the case for the market risk premium estimates for the U.S. used by Dr. Evans in arriving at his final market risk premium estimates. The two U.S. risk premium estimates are higher. By factoring in these two higher risk premium estimates without reducing his beta estimate to reflect the fact that the corresponding appropriate beta for these two estimates should be adjusted downwards, Dr. Evans has artificially inflated his final equity risk premium estimate for ETI.

<u>Market Risk Premium Estimation Problems</u>

1. Use of arithmetic mean returns:

Q. Would you please comment on the validity of using arithmetic means when calculating the historical market risk premium?

[103] René M. Stulz, 1999. Globalization, corporate finance, and the cost of capital, *Journal of Applied Corporate Finance* 12:3 (Fall), p. 12.

A. Only one expert for the applicant utilities does "not accept the proposition that exclusive reliance should be placed on arithmetic returns in estimating risk premiums".[104] However, it is unclear how this belief is reflected in the estimates presented by Dr. Evans in his evidence. Ms. McShane reports both types of averages but does not appear to use the geometric mean in any of her estimations of the equity risk premium. Dr. Neri states that the arithmetic mean is more appropriate than the geometric mean based on a pronouncement by Ibbotson Associates.[105] All of the other experts for the applicant utilities only use the arithmetic mean throughout their analyses to calculate the historical market risk premium. In contrast, we use a conservative approach in which we use a weighted-average of the arithmetic and geometric means as a further benchmark in determining how conservatively high our estimate is. We do this because there are advocates for three possible approaches; namely, the use of the arithmetic mean only, the use of the geometric mean only, and the use of a weighted average of the arithmetic mean. As we noted in section IV, fairness dictates that a weighted average be used when there is no consensus on which polar position is best.

Q. Would you please discuss the references that are often cited in terms of the use of the arithmetic mean only?

A. The typical citations include the Brealey and Myers' basic finance textbook, *Principles of Corporate Finance*, and the Ibbotson Associates publication. As Dr. Ritter notes in the first paragraph of his article published in a scientific journal:[106]

> "When I started teaching at the University of Pennsylvania's Wharton School over twenty years ago, I used the very first edition of the

[104] Dr. Evans, page C-12, of the evidence: Epcor Transmission Inc. (ETI), Alberta Energy and Utilities Board, December 2002. Refiled by Epcor for this generic hearing
[105] Dr. Neri, lines 4-24, page 30, of evidence.
[106] Jay R. Ritter, 2002, The biggest mistakes we teach, *The Journal of Financial Research* 25:2 (Summer), p. 159.

> Brealey and Myers textbook. The book had some mistakes in it, as almost all books do. For example, the first two editions had an incorrect formula for the valuation of warrants."

Dr. Ritter then goes on to focus on some on the conceptual mistakes that need to be corrected in what some academics teach in introductory finance courses, including the use of arithmetic rather than geometric returns. He concludes that the correct average return will be closer to the geometric (compounded) average than the arithmetic (simple) average if there is mean reversion in stock returns and/or mean aversion in bond returns.[107] Furthermore, since the difference between the arithmetic and geometric averages usually is higher for stocks than bonds, this inflates estimates of risk premia based on historical data.

In section IV and Appendix 4.A of our evidence, we provide numerous reasons why the historical risk premium should not be measured using only the arithmetic mean return. We provide a multitude of evidence that concludes that a weighted average of the arithmetic and geometric means should be used. Our evidence includes the more advanced textbooks by Drs. Campbell, Lo and MacKinlay, *The Econometrics of Financial Markets* (1997) and by Drs. Campbell and Viceira, *Strategic asset allocation: Portfolio choice in long-term investors* (2002), articles published in major finance peer-reviewed journals, such as the *Journal of Finance*, *Journal of Financial Research*, and the *Journal of the American Statistical Association*, by Drs. Fama, French, Ritter, Blume, Indro, Lee, amongst others; and support or non-objection by the participants at the recent *AIMR Risk Forum* by Drs. Campbell, Siegel, Ibbotson, amongst others. Nevertheless, **we opt for a very conservative position where we estimate the historical risk premium using the arithmetic annual mean returns and use a weighted-average of the arithmetic and**

[107] Jay R. Ritter, 2002, The biggest mistakes we teach, *The Journal of Financial Research* 25:2 (Summer), p. 160.

geometric annual mean returns as a benchmark for our estimate to provide one gauge of how conservatively high our estimate is.

2. Choice of return series for determining the market risk premium

Q. Please discuss the return series used by Dr. Evans to determine the market or utility-specific risk premium.

A. Dr. Evans uses a weighted average of four risk premium studies; namely, the CIA data for the period 1924-2001, the data published by Ibbotson Associates for the U.S. for the period 1926-2001, the so-called International Cost of Capital study published by Ibbotson Associates, and the realized risk premia for his sample of 15 high grade and 12 non-technology companies. Dr. Evans gives least weight to the studies of historical risk premia using broad market indexes, and equal weight to the International study and his samples of companies.[108] Before commenting on this choice and weighting of the studies, we would like to make five points:

a. As we discussed in section IV of our evidence, including substantially inferior estimates to obtain a larger sample of estimates leads to bias and larger (not smaller) estimation errors.
b. The risk premia results should be updated to reflect realized returns for 2002.
c. More comprehensive historical risk premium studies are distributed by Ibbotson Associates (namely, the Dimson et al. module) but they are not the studies that he uses. [109]

[108] Dr. Evans, page C-5, of the evidence: Epcor Transmission Inc. (ETI), Alberta Energy and Utilities Board, December 2002. Refiled by Epcor for this generic hearing.
[109] Dr. Evans, page C-9, of the evidence: Epcor Transmission Inc. (ETI), Alberta Energy and Utilities Board, December 2002. Refiled by Epcor for this generic hearing.

d. Dr. Evans argues that the "U.S. results from the Institute of Actuaries study are consistent with the broad 5.5-7.5% range from the Ibbotson study". Unfortunately, he compares the returns unadjusted for foreign exchange risk against those subject to no foreign exchange risk and incremental trade costs. Most comparisons of returns across countries are on a hedged and not unhedged basis, and hedging costs over much of this period would have been sizeable. Trade costs for U.S. investing versus Canadian investing also would have been material over much of this period.

e. The risk premia estimates that Dr. Evans obtains by using bond yields instead of bond returns are inconsistent with the rationale that he uses to justify the use of bond yields instead of bond returns. Specifically, he finds that the arithmetic mean risk premium increases from 7.0% to 7.5% when he moves from using returns to using yields on long-term government bonds (i.e., from using 5.7% to using 5.2%). However, a partial extract from his quoted rationale from Ibbotson Associates is that:[110]

> "There is no evidence that investors expect the historical trend of bond capital losses to be repeated in the future (otherwise, bond prices would be adjusted accordingly). Therefore, historical total returns are biased downward as indicators of future expectations. The income return better represents the unbiased estimate of the purely riskless rate of return, since an investor can hold a bond to maturity and be entitled to the income return with no capital loss."

Thus, the quoted rationale argues that using the income return should increase not decrease the estimate of the risk-free rate. Furthermore, the rationale for using yield implicitly assumes a zero-

[110] *Stocks, Bonds, Bills and Inflation: 2002 Yearbook*, Valuation Edition, Ibbotson Associates, p. 71.

coupon government bond since it ignores reinvestment risk, and is dubious at best since it ignores changes in the required returns of investors over the term-to-maturity of the bond. Also, interestingly, there is no recommendation to remove the large increase in the re-valuation of equities that has caused historical total returns for equities to be biased upwards as indicators of future expectations. As discussed more fully in Appendix 4.C, Drs. Chen and Ibbotson have lowered their estimates of the equity risk premium for this and other reasons. Specifically, based on his co-authored paper with Dr. Chen, Dr. Ibbotson concludes that:[111]

> "My estimate of the average geometric equity risk premium is about 4 percent relative to the long-term bond yield. It is, however, 1.25 percent lower than the pure sample geometric mean from the risk premium of the Ibbotson and Sinquefield study (Ibbotson Associates 2001)."

As we detail below, Dr. Evans puts the most weight on two studies that generate materially inferior estimates. The estimated relationship used in the International sample not only has no material explanatory power but its in-sample estimate of the return for Canada has almost a 100% error. In other words, when you compare the mean fitted return for Canada to its mean actual return for the sample used, the Canadian mean return is overestimated by almost 100%. Dr. Evans makes no adjustment for this over-estimation bias when using the values for this method.

As we discuss in more detail below, the realized risk premium for small samples of firms that supposedly have low ex post risk suffers from a severe selection bias, and the likelihood is high that such firms have earned a "free lunch" over the studied period. Below, we show that this is

[111] Roger Ibbotson, Moderator, Implications for asset allocation, portfolio management, and future research: Discussion, Equity Risk Premium Forum, November 8, 2001, p. 103.

the case for the samples that he used in an earlier case. Since the desire is to obtain a forward-looking estimate of the risk premium, one needs samples of non-regulated firms that are expected to be of comparable risk to the applicant utilities at the beginning of the estimation period, and not samples of regulated firms that were of comparable risk to the applicant utilities when we have the benefit of hindsight at the end of the estimation period.

Q. Please discuss the return series used by Ms. McShane to determine the market or utility-specific risk premium.

A. Ms. McShane uses the historic average risk premia for Canada and the U.S. over the period 1947-2002. Not only does she not consider much longer time periods and not make any adjustments for differences in risks across the market portfolios used to calculate the risk premia in the different countries but she also makes no adjustment for the effect of equity re-valuation over this period of time. Mr. Arnott and Mr. Bernstein (2002) find that a good part of the realized equity premium over this period was caused by rising valuation multiples. The price-to-dividend multiple increased from 18 to 70 times from 1926 to 2001, with most of the increase in the last 17 years of this period.[112]

While Ms. McShane is correct that the various smoothed annual market returns in the 3 pages of her schedule 5 have not changed much over time, such is not the case for Long Government Bond Returns and, more importantly, the equity risk premium. Using her 25-year rolling average market returns from page 1 of her schedule 5, the Canada and U.S. risk premia are 10.4% and 11.8% for 1947-1972, 4.3% and 3.9% for 1962-1987 and 1.0% and 3.0% for 1977-2002, respectively. Using her

[112] Robert D. Anrott and Peter L. Bernstein, 2002, What risk premium is “normal”?, *Financial Analysts Journal* 58:2 (March/April), pp. 64-85.

increasing average market returns from page 2 of her schedule 5, the Canada and U.S. risk premia are 10.4% and 11.8% for 1947-1972, 7.9% and 8.4% for 1947-1987, and 5.0% and 6.7% for 1977-2002, respectively. Using her increasing market returns from page 3 of her schedule 5, the Canada and the U.S. risk premia are 5.0% and 6.7% for 1947-2002, 1.6% and 3.3% for 1962-2002, and 1.0% and 3.0% for 1977-2002, respectively. In other words, all of the series she presents indicate a steady decrease in the risk premium in both Canada and the U.S.

Even more telling is a comparison of her average stock returns in all three pages of schedule 5 with her fair return for a benchmark, or average risk, Canadian utility for 2004 in the range of 11.0 to 11.5%, with a mid-point of 11.25%.[113] These values are only somewhat smaller than the average stock returns of 11.8% and 12.2% for Canada and the U.S., respectively, based on the 25-year rolling average market returns, the average stock returns of 12.6% and 13.1% for Canada and the U.S., respectively, based on the increasing average market returns, and the average returns of 11.0% and 12.3% for Canada and the U.S., respectively, based on the increasing average market returns. Furthermore, in all cases, U.S. stock returns have been more risky than their Canadian counterparts based on the observation that the standard deviation of the U.S. stock return series is larger than its Canadian counterpart. Thus, Ms. McShane is recommending a return for an average-risk Canadian utility that is marginally lower than that for the market portfolio over her estimation period as being a fair rate of return.

Q. Please discuss the return series used by Dr. Neri to determine the market or utility-specific risk premium.

[113] Ms. McShane, lines 11-17, page 5, of new evidence.

A. Dr. Neri uses the data available from the CIA for Canada for the period 1924-2001, the data published by Ibbotson Associates for Canada for the period 1936-2002, the data published by Ibbotson Associates for the U.S. for the period 1926-2002, and data from Value Line for the capital gain and dividend yield for the Value Line Composite Index. He also uses annual data on the Moody's Electric Utility Index for the period 1932-2001.[114] The data for Canada from the CIA need to be updated to include 2002.

Like Dr. Evans, Dr. Neri also uses the income return on bonds with the total return on equities to measure the historical risk premium.[115] Please see our previous discussion on the problems associated with this procedure. While Dr. Neri uses Ibbotson Associates as a rationale for not examining the shorter more recent times periods, he does not examine periods that are longer than that for the CIA examined herein. In fact, he argues that the "risk premium analysis should consider the longest period of time for which data are available". [116] In section IV of our evidence, we present evidence for much longer time periods for both Canada and the United States.

To calculate a market equity risk premium from the Value Line data for the Value Line Composite Index, Dr. Neri has to assume that the average annual rates of price appreciation of 14.2% and average dividend yield of 2.1% will remain constant forever. In his implicit constant growth model, the 14.2% also is the rate of growth in dividends and earnings. Specific problems with this calculation are:

- Since the forecasts are bottom-up, they are known to contain substantial optimism bias of 20% or more for one-year out, and an

114 Dr. Neri, lines 8-20, page 28, of evidence.
115 Dr. Neri, lines 18-26, page 28 and lines 11-19, page 33, of evidence.
116 Dr. Neri, lines 12-23, page 29, of evidence.

increasing percentage thereafter. This point is discussed further below.

- The implied average annual price appreciation of 14.2% in the companies that make up the Value Line Composite Index, or the total annual return of 16.3% when dividends are added in, is totally inconsistent with the much lower forecasts of single digit returns by investment professionals and academics for total stock returns.
- The implied growth rates of dividends, earnings and stock price (which are assumed to be equal in this implicit constant growth DCF model) of 14.2% for the U.S. greatly exceed expectations for the growth rates in the underlying economies for both Canada and the U.S. In other words, the corporate growth rate for this selection of public companies is expected to substantially exceed that for the underlying economy forever. To illustrate, if the long-run annual rate of inflation is assumed to be 3% in both Canada and the U.S., then Dr. Neri's estimates assume that the firms in the Value Line Composite Index are expected to grow annually and forever at the astonishing real rate of 11.2%.

According to Dr. Asness, President of AQR Capital Management, based on an analysis of the trailing 20-year real S&P earnings growth plotted for the past 110 years: [117]

> "Those people who actually still assume 10 percent nominal returns on stocks should recognize that such a return would require 5–6 percent real earnings growth over the next 10–20 years. Such growth has happened only a few times in history, and it has happened only after very depressed market conditions, which we are not really experiencing now,

[117] Clifford S. Asness, Theoretical Foundations II, *Equity Risk Premium Forum*, November 8, 2001, p. 10.

> certainly based on the last 10 years. With a 2 percent real earnings growth forecasted, a long-term buy-and-hold investor in the S&P 500 can expect to earn 6–7 percent nominal returns."

Dr. Neri's estimates of the equity risk premium for the Moody's Electric and Gas Utility Indexes also are fraught with serious problems.[118] First, as we show below, since utilities have historical earned abnormal returns or what are called free lunches, their estimated equity risk premia will exceed what is deemed to be a fair rate of return. Second, Dr. Neri calculates the returns on these indexes without reinvesting dividends, as is commonly assumed when examining the total returns on an index. He then subtracts the long-term government bond return available from Ibbotson Associates. Such bond indexes are generally totally return indexes that assume the reinvestment of interest payments. Thus, the correct historical risk premia for the U.S. electric utility and gas distribution industries are likely to be considerably higher, consistent with our evidence of free lunches in the utility sector. Third, for the beta of 0.6 used by Dr. Neri, the implied market risk premia based on his historical risk premium estimates of 5.14% and 5.53% for Electric and Natural Gas indexes, respectively, are the astonishing 8.6% (i.e., 5.14% ÷ 0.6) and 9.2%, respectively.

3. Validity of using a weighting formula of the risk premia from various country markets

Q. Would you please comment on the validity of using a scheme that weights various Canadian and U.S. risk premia in order to estimate the required market equity risk premium for calculating the required own market risk premium for an average-risk utility or an applicant utility.

[118] Dr. Neri, line10, page 33 to line 20, page 34, of evidence.

A. There are at least two serious problems with this approach.

First, this approach ignores the benefits from international diversification. While the expected return of adding markets is linear, the risk is not linear in the risks of the individual markets unless all of the markets are perfectly correlated. In turn, the required equity risk premium for bearing domestic risk is reduced in an international context, as we discussed in Section IV of our evidence.

Second, this approach makes no adjustment for the differences in the non-diversifiable or even in the total risks of the various market proxies used in this process. In Section IV of our evidence, we demonstrated that making an adjustment for differences in total risk makes a material difference in the equity risk premium estimates when we use the Dimson et al. data for the 103-year period 1900-2003. Similarly, the non-diversifiable or priced risks of the S&P/TSX Composite and S&P500 differ, as studies find that the correlation of annual total equity returns with world total equities for Canada is a little more than 70% of that for the U.S.[119] Thus, the reduction in total risk from international diversification is substantially higher for the Canadian market proxy than for the U.S. market proxy.

Q. Please explain your criticism of the evidence of Dr. Evans based on the use of the U.S. market risk premia.

A. Dr. Evans uses the Historical Ibbotson Associates study for the historical rates of return on U.S. shares and historical rates of return on long-term U. S. treasury bonds. We have a number of major criticisms of this evidence.

[119] William F. Sharpe, Gordon J. Alexander and David J. Fowler, 1993, *Investments* (Prentice Hall Canada Inc.), p. 772. Adapted from Roger G. Ibbotson, Richard C. Carr and Anthony W. Robinson, 1982, International equity and bond returns, *Financial Analyst Journal*, July/August, p. 71.

First, Dr. Evans ignores all of the evidence that we presented earlier in Section IV of our evidence that the U.S. equity risk premium has narrowed substantially, and is expected to be lower in the future. The U.S. forward-looking equity risk premium estimates vary from zero or slightly negative to less than 6% and average about 4%. The 2001 keynote speaker at the annual *Canadian Risk Management Conference*, Burton Malkiel from Princeton University, agrees with the consensus view “that the equity risk premium investors will realize in the future is likely to be very small”.[120]

Second, Dr. Evans ignores the adjustments that have to be made when conducting a Market Risk Premium Test when one moves from a Canada-only perspective to an international perspective. When viewed from a Canada-only perspective, the market risk premium can be measured using a domestic market proxy such as the S&P/TSX Composite, which is assumed to be a reasonably well-diversified domestic portfolio. However, when viewed from an international perspective, domestic markets (and their market proxies) are no longer well diversified. This is especially true for very small markets like the Canadian equity market that represents less than 3% of the world market. When viewed from an international perspective, a significant portion of domestic equity market risk becomes diversifiable and is not rewarded.

Thus, we cannot just combine or average equity risk premia from different markets because they may represent different non-diversifiable risks. We can demonstrate this by calculating the investment risk or beta of each of the S&P/TSX Composite and S&P500 indexes in a global context using the following relationship:

[120] Risk Management 2001: Managing risk in a future of single-digit returns, *Canadian Investment Review*, Winter 2001.

$Beta_D = Corr_{D,W} \times (Sig_D / Sig_W)$

where $Beta_D$ is the estimated beta for the domestic market,

$Corr_{D,W}$ is the correlation between the returns for the domestic and world markets, and

Sig_D and Sig_W are the standard deviations of returns for the domestic and world markets, respectively.

Using the data provided by Mr. Robert Auger and Mr. Denis Parisien,[121] for illustrative purposes only, yields:

$Beta_{S\&P/TSX} = 0.5 \times (0.22 / 0.193) = 0.570$

$Beta_{S\&P500} = 0.8 \times (0.185 / 0.193) = 0.767$

If we scale up the betas so that the S&P500 beta is represented by 1, we obtain a S&P/TSX Composite beta of 0.743 or approximately 0.74.

This shows the fallacy of assuming that the risk premium should be the same for the S&P/TSX Composite and the S&P500 because their standard deviations are the same. This is much like assuming that the market risk premium for a utility should be the same as that for the S&P/TSX Composite because the utility and the index have the same standard deviations.

Third, Dr. Evans' method is based on the premise that the risk premium in the U.S. is higher than it is in Canada, and that investment risk for the same investment is equivalent in both markets. In turn, this implies that the cost of capital is higher for shares sold by Canadian firms in the U.S. market than it is when the firms sell shares in the Canadian market. This conforms neither to the beliefs nor the experiences of Canadian firms who generally believe and have found that the cost of equity capital is lower in

[121] Robert Auger and Denis Parisien, 1989, The risks and rewards of global investing, *Canadian Investment Review* 2:1 (Spring).

the U.S. markets than in the Canadian markets. This is often attributed to U.S. investors being more risk tolerant than Canadian investors.

Q. How does ignoring differences in the systematic risks of the various market indexes affect the evidence presented by Dr. Evans?

A. It tends to inflate the final market risk premium estimate. To illustrate, we use the arithmetic mean market risk premium for the S&P/TSX Composite and the S&P500 over their respective long bond yields of 2.85% and 5.63%, respectively, for the 1957-2001 period.

We then adjust for the lower beta for the S&P/TSX Composite versus the S&P500 and we adjust for the Canadian/US bond differential. This risk-adjusted market risk premium (RMRP) difference between the S&P500 and the S&P/TSX Composite that accounts for bond return differences is given by:

RMRP = Risk-adjusted U.S. market premium - Canadian market risk premium – Bond return difference

RMRP = (0.74 x 5.627%) – 2.854% - 1.275% = 4.164% – 2.854% – 1.275% = 0.035% or 3.5 basis points

Properly accounting for systematic risk differences now leads to the conclusion that the Canadian and U.S. markets had similar performances over the 1957-2001 period.

Q. How does Dr. Neri deal with equity risk premia estimates from different markets?

A. Dr. Neri also treats the risk premia estimates for Canada and the U.S. as if they are based on underlying market portfolios with the same risk.[122] As we discussed earlier, the underlying U.S. market portfolio is riskier than the underlying Canadian market portfolio, and the adjusted U.S. equity risk premium needs to be adjusted to neutralize this risk difference.

4. Validity of using the results of the Historical Ibbotson Associates U.S. study

Q. Which experts for the applicant utilities use the results of the Historical Ibbotson Associates U.S. study?

A. Dr. Evans uses the results of the Historical Ibbotson Associates U.S. study.

Q. Please discuss the merits of using the results of the Ibbotson International Study for obtaining an estimate of the required risk premium for an applicant utility?

A. The Historical Ibbotson Associates U.S. study used by Dr. Evans covers the period 1926-2001. Our first observation with this series is that, while Dr. Evans reports an arithmetic mean risk premium for the U.S. for the 1926 to 2001 period of 7.0%,[123] Dr. Siegel reports a considerably lower arithmetic mean risk premium for the U.S. for the same period of 6.2% (please see our schedule 4.4). If Dr. Siegel reports values for a more representative sample of U.S. securities, then this would further reduce Dr. Evans' final estimate of the market risk premium downward. Furthermore, if we add the negative realized risk premium for 2002 to the

[122] Dr. Neri, lines 11-20, page 31, of evidence.
[123] Dr. Evans, page C-10, of the evidence: Epcor Transmission Inc. (ETI), Alberta Energy and Utilities Board, December 2002. Refiled by Epcor for this generic hearing as 012_ETI_Exhibits/012-01/12-01_2003_07_09_App_D_December2002_Rate_of_Return_Evidence

time period to obtain the 1926-2002 time period for the Historical Ibbotson Associates U.S. study, the realized arithmetic risk premium declines by 61 basis points from 7.0% to 6.39%. If we adjust for differences in the higher risk of the ERP for the U.S. of 21.57% versus 19.89% for Canada, the arithmetic equity risk premium is reduced further to 5.89%. In other words, after making only a few required adjustments, the arithmetic ERP used by Dr. Evans moves from 7.0% to 5.89% in the direction of the lower Canadian ERP of 5.03%. As we argue in section IV, a further adjustment is required to remove the effect of equity re-valuation to higher values and for the material decline in trade costs over this period.

If Dr. Evans had used the total time series for the U.S., that is, for the 1802-2001 period, he would have obtained a considerably lower arithmetic mean market risk premium of 4.5% instead of his much higher value of 7.5%. The corresponding weighted average of the arithmetic and geometric mean risk premia for this approximately two hundred year period is 4.0%. Mr. William Bernstein, editor of an online journal of practical asset allocation, believes that the much lower equity risk premium of the low inflation 19th century provides a much better guide to equity risk premium expectations in the 21st century than does the much higher equity risk premium from the much higher inflation 20th century.[124] His conclusion is consistent with the evidence on the forward-looking risk premia that we reviewed in Appendix 4.C of our evidence.

Similarly, if Dr. Evans had used the more representative and complete data module (the Dimson module) from Ibbotson Associates for the 1900-2002 period, he would have obtained the results that we report in Schedule 4.5, and discuss in section IV of our evidence.

[124] William Bernstein, 2002, Only two centuries of data, An online journal of practical asset allocation (Summer). Available at: http://www.efficientfrontier.com/ef/402/2cent.htm.

5. Validity of using the results of the Ibbotson International Study:

Q. Which experts for the applicant utilities use the results of the Ibbotson International Study?

A. Dr. Evans uses the results of the Ibbotson International Study.

Q. Please discuss the merits of using the results of the Ibbotson International Study for obtaining an estimate of the required risk premium for an applicant utility?

A. We presented a number of criticisms on the use of the Ibbotson International Study for that purpose on line 22, page 109 through line 8, page 115 of our evidence before this Board in the matter of UtiliCorp Networks Canada (Alberta) Ltd. (UNCA) in April 2002.[125] For the convenience of the Board, we reproduce that evidence in Appendix 7.A.

Q. Do you have any additional evidence on the validity of using the results of the Ibbotson International Study for obtaining an estimate of the required risk premium for an applicant utility?

A. Yes, we do. While Erb et al. (1996) find a significant negative relationship between future returns and the current Country Credit Rating or CCR, their adjusted R-squares are very small for the full sample of countries and for the sample when it differentiates between developed and emerging markets (adjusted R-square values of 1.76% and 1.80%, respectively).[126] Mr. Aboulamer (2003) re-examined the findings underlying the model used

[125] Prepared testimony of Drs. Kryzanowski and Roberts before the Alberta Energy and Utilities Board, in the matter of UtiliCorp Networks Canada (Alberta) Ltd. (UNCA) 2002 Distribution Tariff Application (DTA) No. 1250392, April 2002. Refiled by Acquila as Ex 004-03-2003-07-09-Aquila-Intervenor Evidence of Drs. Roberts & Kryzanowski.

[126] Claude B. Erb, Campbell R. Harvey and Tadas F. Viskanta, Country risk and global equity selection, *Financial Analysts Journal*, Winter 1995, p. 74.

by Ibbotson Associates using various ratings over the same period and then over the period extended to the end of 2002.[127] He finds that:

- The Country Credit Rating or CCR measure used by Ibbotson Associates is a local and not a global risk measure.
- The explanatory power of the relationship between CCR and future returns for the undifferentiated sample is significant but very low at less than 2% for both time periods, and decreases for the extended time period and for developed markets.
- The risk premia of the emerging markets are higher than in the developed markets.
- The model overprices the risk represented by CCR based on a comparison of its predicted returns to realized returns, with the exception of only a few countries (Finland, France, Germany, Netherlands, Russia, Switzerland, and the U.S.).
- There is significant overpricing of risk for Canada.

Thus, the International Cost of Capital Study from Ibbotson Associates uses a local or domestic measure of risk in a model that has almost no predictive power for developed country markets, and tends to overprice the risk represented by the CCR measure. Furthermore, the estimates from this model do not account for the finding that the CCR risk prema are higher in emerging as opposed to developed markets.

6. Optimism bias in forecasts of analysts:

Q. Ms. McShane uses the forecasts of analysts in her DCF analyses of the aggregate Canadian and U.S. equity markets. Would you comment on the accuracy of such forecasts?

A. Ms. McShane does “not dispute that studies have shown analyst’s forecasts to have been optimistic”. However, she goes on to argue that “as

[127] Anas Aboulamer, 2003, Relationship between country returns and country risk ratings revisited, Masters of Science Thesis, Concordia University.

long as investors believe the forecasts, and price the securities accordingly, the resulting DCF cost of equity will be an unbiased estimate of investors' expected returns".[128] This assumes considerably irrationality among investors in that they would believe forecasts that they know have an optimistic bias. Such irrationality would invalidate a basic assumption of using the DCF method to estimate the cost of equity; namely, that prices are fair. Fair prices are needed to obtain estimates of fair rates of return for utilities.

In support of the relevance of the forecasts, one could refer to a number of dated studies that find that the forecasts of analysts are better than the use of time-series methods to forecast future growth rates. However, this is no longer the case. First, the information disclosure playing field is quickly being leveled in both the U.S. and Canada as companies are being restricted from disclosing information first to financial analysts and then to the general public. Second, as has been discussed at length in the press, analysts have become increasingly optimistic in their forecasts to facilitate the underwriting side of their business. Third, forecasting accuracy has not been a criteria in retaining analysts, at least in recent years where the emphasis has been on the revenue they generate for their employers. Fourth, as is discussed next, the optimism bias in analyst forecasts has increased significantly over time, and there is no evidence that it has moderated recently.

It is well documented in the published literature that the bottom-up market forecasts of financial analysts and top-down market forecasts of market strategists contain a large optimism bias. We discuss three representative studies next. Chopra (1998)[129] finds that the average consensus earnings per share growth forecasts made by analysts for the S&P500 index over

[128] Ms. McShane, lines 15-17, page 31, of new evidence.
[129] V. K. Chopra, Why so much error in analysts earning forecasts? *Financial Analysts Journal*, 54:6 (1998), pp. 35-42.

the 1985-1997 time period is almost twice the actual growth rate. Chung and Kryzanowski (2000)[130] find a significant optimism bias in bottom-up and top-down forecasts of earnings per share by analysts for the S&P500 index for the current fiscal year (FY1) and subsequent fiscal year (FY2).[131] They find that the optimism bias is significantly higher in the bottom-up forecasts compared to the top-down forecasts on average. They examine the 218 months of such annual forecasts over the period from January 1982 through February 2000. The bottom-up forecasts of financial analysts exhibit a statistically significant mean optimism bias of 17.5% and 30.5% for the next and subsequent fiscal years (FY1 and FY2), respectively. They also find that these average biases grew substantially when the period from November 1995 through February 2000 was added to the January 1982 through October 1995 period.

In a paper recently published in the *Journal of Finance*, Drs. Chan, Karceski and Lakonishok conclude that:[132]

> "There is no persistence in long-term earnings growth beyond chance, and there is low predictability even with a variety of predictor variables. Specifically, IBES growth variables are overly optimistic and add little predictive power."

They also observe that (p. 672):

> "Notably, analysts' estimates are quite optimistic over the period 1982 to 1998, the median of the distribution of IBES growth forecasts is about 14.5 percent, a far cry from the median realized five-year growth rate of about 9 percent for income before extraordinary items.

---

[130] R. Chung and L. Kryzanowski, Market timing using strategists' and analysts' forecasts of S&P500 earnings, *Financial Services Review*, 8:3 (2000).

[131] Similarly, Chung and Kryzanowski (1999) find that the quarterly EPS forecasts for the S&P400 and S&P500 are, on average, optimistically biased for the top-down forecasts of market strategists that are reported to I/B/E/S. R. Chung and L. Kryzanowski, Accuracy of consensus expectations for top-down earnings per share forecasts for two S&P indexes, *Applied Financial Economics* 9 (1999), pp. 233-238.

[132] Louis K.C. Chan, Jason Karceski and Josef Lakonishok, 2003, The level and persistence of growth rates, *Journal of Finance* 58:2 (April), p. 643.

They find that the level of over-optimism in the IBES forecasts varies somewhat but is substantial across all their five quintiles of firms. Based on the results presented in their table IX (p. 673), the over-optimism bias is still high at about 4.0% for quintile 1, which consists of the firms in their lowest growth grouping of firms. The actual and forecasted growth rates for income before extraordinary items are 2.0% and 6.0% for their quintile 1 group, where utilities are 25% of the membership in this quintile. This is a 200% overestimate when measured against the actual annual rate of growth of 2.0% for this quintile of firms.

In addition, for the past two years, analysts have been criticized for the aggressive “hyping” of stocks. The research director of the world’s largest securities firm told its analysts to be more critical.[133]

Furthermore, even if the recommendations of analysts influence market prices, this does not mean that investors do not make decisions after removing some or a great part of the bias inherent in such forecasts. Furthermore, the following question comes to mind: Why use earnings growth forecasts of investment analysts to generate extremely noisy and upwardly biased estimates of future return expectations when you can directly obtain the future return expectations of investment professionals from both the buy and sell sides of the market, as we have done in our evidence?

Q. Does Dr. Neri use analyst forecasts to obtain 3-stage DCF estimates, and does he adjust for optimism in the forecasts of analysts?

A. Dr. Neri uses such forecasts but makes no adjustments for the optimism in the forecasts of analysts. In fact, he notes that he is not aware of any

[133] Dave Ebner, Merrill Lynch tells analysts to be more critical, *Globe and Mail*, March 7, 2002, p. B18.

forecast bias in these analyst forecasts.[134] He goes on to state that no adjustments need to be made.[135]

Q. Does Dr. Vilbert also use analyst forecasts to obtain DCF estimates for Canadian and U.S. utilities?

A. Yes, he uses forecasts from IBES for his Canadian sample and from Value Line for his U.S. sample.[136] The above comments about the impact of analyst bias also apply to the analyses conducted by Dr. Vilbert.

Q. Would you please comment on the quality of earnings reported in the recent past and those to be reported in the near future against which the forecast accuracy of financial analysts are judged?

A. The quality of reported earnings during at least the past few years appears not to be very high. As we discussed earlier, more recent reported earnings were inflated due to the use of aggressive accounting practices by firms. Other problems that affect reported earnings include:

- Pension fund accounting where many companies projected higher returns on their pension assets during the bull market of the late 1990s, which allowed firms to reduce corporate contributions and increase company earnings. For example, General Electric was assuming that its pension fund would earn 9.5%.
- Stock options have become a substitute for salary and other forms of remuneration, especially in the high-tech sector. However, they have not historically been costed under Canadian or U.S. GAAP. A Merrill Lynch study estimates that 2000 profits would be 61% lower

[134] Dr. Neri, response to IR CG-EPC-16.
[135] Dr. Neri, response to IR CG-EPC-23.
[136] Dr. Vilbert, lines 6-17, page 49, of evidence.

if technology companies had to account for these options as a cost of doing business.[137]

- Under Canadian GAAP, companies can write off goodwill in one “big bath” quarter. They can record it as a special, one-time charge outside of operating income. A 2000 amendment to U.S. GAAP now allows this practice in the United States. According to estimates by Prudential Financial and Bear Stearns, such write offs in 2002 are expected to raise U.S. corporate profits by 4.4% for large cap firms and 14.6% for small cap firms, and raise corporate profits for the computer-services sector by 14.6%.[138]

Q. What is your opinion on the use of forecasts by analysts to estimate the cost of capital?

A. We are reluctant to use these forecasts because they tend to be optimistic, sometimes excessively optimistic, and the amount of the bias varies in an unknown fashion over time. Some illustrations are:[139]

- Charles Hill, director of research at Thomson Financial/First Call noted that only 1.8% of all current stock recommendations are “sells”, even in a bear market. He went on to complain that the compensation packages of many analysts are tied too closely to the performance of the lucrative investment banking operations of the major brokers.
- Mr. Clément Gignac, chief economist and strategist at National Bank Financial cautioned that the bottom-up consensus expecting S&P 500 earnings growth of 14 per cent in 2003 could turn out to be unrealistic again, and “would be more encouraging had not last

[137] As reported in Larry MacDonald, More fallout from Enron, *The Gazette*, February 27, 2002, p. D-3.
[138] As reported in Larry MacDonald, More fallout from Enron, *The Gazette*, February 27, 2002, p. D-3.
[139] Barrie McKenna, Enron analyst bristles at hoax, *The Globe and Mail*, February 28, 2002, p. B1 and B2; and Marilyn Geewax, We were duped: analysts, *The Gazette*, February 28, 2002, p. E4.

year's similar projections been followed by a 22-per-cent decline in the [Standard & Poor's 500-stock index]".[140]

- Eleven of the 17 leading analysts who followed Enron still rated the stock as a "buy" or "strong buy" as late as November 8, 2001. This was after Enron restated $1 billion in profit as a loss, fired its chief financial officer and was under investigation by the U.S. SEC.
- Lehman Brothers maintained its "strong buy" rating on Enron as its stock price went from $80 a share to less than one dollar last year.

It is important to note that the performance of the rating agencies is often not better, and was not better in the case of Enron.

Q. What conclusion do you draw from this analysis?

A. We conclude that the estimates obtained using the DCF-based risk premium test conducted by Ms. McShane and by Dr. Vilbert result in market risk premium estimates that are too unreliable to be used as a proxy for the fair required return on equity capital. If the optimism bias is removed, such market risk premium estimates provide some very noisy indicative (or secondary) information about the fair required return on equity capital.

7. Use of DCF Estimates of fair return on a sample of utilities:

Q. Ms. McShane also generates DCF estimates of a fair return on equity for a sample of U.S. gas distributors.[141] Please provide a brief discussion of why you do not provide similar DCF estimates of a fair return on equity for a sample of utility firms?

[140] Crystal balls, *The Globe and Mail*, December 24, 2002, p. B12.
[141] Ms. McShane, line 7, page 30 through line 12, page 31, of new evidence.

A. Discounted cash flow (DCF) tests have a number of disadvantages that make them unreliable when applied to specific firms in the same industry. First, the DCF test depends critically on estimating the expected growth rate. Error in capturing the growth rate impacts directly on DCF estimates. Because estimates of the growth rate depend on past growth and/or analyst opinion, it is difficult to achieve any measure of precision. Furthermore, if firms are drawn from the same or similar industries, the growth rate errors will tend to be correlated, and the benefits in terms of forecast precision from an increasing sample size will be greatly reduced. Highly correlated forecast errors across individual firms in the same or similar industries arise due to the fact that the same industry analysts will make such forecasts.

Second, circularity also causes a problem in applying the DCF approach to individual firms in regulated industries. Analysts base their analysis of the future growth in earnings and dividends on the rate of return allowed by regulatory bodies, which translates into a market for the shares. If we, in turn, rely solely on the market price and dividend growth rate for our required return on equity, then we are being influenced by the market, which, in turn, is being influenced by the regulator’s decision. Thus, by employing the DCF method, we would, in effect, be anticipating what the market is expecting the regulators to do thus introducing circularity. The same problem occurs if we use analyst forecasts.

Third, the DCF model assumes that returns are set competitively, and that no excess returns or “free lunches” are possible. If investors are on average overcompensated for the investment risk they bear for investing in regulated utility stocks, then the DCF model will generate implied returns that are too high. We provide evidence of such excess returns to utility investors in the next section of our evidence.

Q. Does any other expert for the applicant utilities use the DCF method to estimate a ROE based on a sample of utilities?

A. Yes, Dr. Neri applies the DCF model to "three peer groups that serve as a proxy to EPC".[142] Our above comments also apply to his application of this model.

Dr. Vilbert also applies the DCF model, although he notes that: "in recent years even the most basic DCF assumption, that the market price of a stock in the absence of growth options is given by the standard present value formula, has been called into question by literature on market volatility".[143] He goes on to state: "the requisite conditions for the sample companies are not fully met at this time", and concludes that:[144]

> "In short, the unavoidable questions about the DCF model's strong assumptions cause me to view the DCF model as *inherently* less reliable than risk positioning approach described above. However, because the DCF method has been widely used in the past and in other forums when the industry's economic conditions were different from today's, I submit DCF evidence in this case. DCF estimates also serve as a check on the values provided by the risk positioning methods."

8. Use of Weighted Average ROE from Various Estimation Methods:

Q. What is the general theory on the use of various estimation methods?

A. The general theory is that one can reduce estimation error by increasing the number or set of estimation methods provided they are not highly correlated and they do not include methods that are known to be relatively

[142] Dr. Neri, lines 14-19, page 37, of evidence.
[143] Dr. Vilbert, lines 12-15, page 28, of evidence.
[144] Dr. Vilbert, line 12, page 29, and line 19, page 30 to line 2, page 31, of evidence, respectively.

inferior with known bias. Adding the estimates from inferior methods to those from superior estimation methods will increase estimation error and bias. This notion appears to be well accepted by this Board given the weight that it has placed on the estimates generated by experts using various ROE estimation methods.

Q. Please critique some of the sets of estimation methods that are used by the experts for the applicant utilities?

A. In this hearing, Dr. Evans derives a fair rate of return on common equity that reflects "an equal weighting on the results of applying the comparable earnings and risk premium methods".[145] As we discuss later in this section, the so-called comparable earnings method relies on a mapping between accounting rates of return (ROEs) and investor expected rates of returns, which does not exist. The comparable earnings method is seriously flawed in comparison to the ERP method. Thus, we recommend that the Board continue not to place any weight on the output of the comparable earnings method in the determination of the 2004 ROE for the applicant utilities.

Dr. Neri averages in obvious outliers when deriving a fair rate of return on common equity. An obvious example is the 11.05% risk premium estimate obtained using the Value Line projected data.[146]

9. Ex Post Performance of Equity Investment in Utilities:

Q. Have the investors in Canadian gas and electric utilities earned a return that is commensurate with the investment risk borne by such an investment?

[145] Dr. Evans, page 4, of evidence on: Re Generic Cost of Capital Proceeding, July 2003.
[146] Dr. Neri, response to IR CG-EPC-20.

A. Yes, and in fact, they have earned a premium return from such investments, or what investment people refer to as a positive alpha or "free lunch".

Q. What is the basis for your conclusion?

A. We used a standard portfolio performance metric, a portfolio's alpha, to evaluate the performance of holding the Gas/Electric sub-group index of the S&P/TSX Composite index over the periods, 1980-2002 and 1991-2002. This performance measure is commonly used to measure the investment performance of a managed portfolio such as a pension or mutual fund. This performance measure is the estimated intercept from a regression of the returns in excess of the risk-free rate for both the sub-index and the market index. In other words, we ran a regression of the excess returns on the Gas/Electric sub-group total return index against those for the TSE 300 total return index.

The results are summarized in Schedule 7.1 and depicted graphically in Schedule 7.2. These results are not materially different than those that we have presented in an earlier case before the Board.[147] Based on these results, we find that the Gas/Electric sub-group outperformed the TSE 300 by 2.7% annually over the 1980-2002 period, and by 6.11% annually over the ten-year period 1993-2002. Thus, investors that invested in a portfolio that mimicked this sub-group achieved an excess return or free lunch of over 6% on an annual basis over the 1993-2002 period. In fact, over this sub-period, the sub-group had both a higher mean return (12.53% versus 10.64%) and a lower standard deviation of return (13.21% versus 16.79%) than the S&P/TSX Composite Index. These results suggest that investors

[147] Prepared testimony of Drs. Kryzanowski and Roberts before the Alberta Energy and Utilities Board, in the matter of UtiliCorp Networks Canada (Alberta) Ltd. (UNCA) 2002 Distribution Tariff Application (DTA) No. 1250392, April 2002.

in these groups of utilities have achieved results significantly higher than that intended by regulators when they determined the allowed returns on equity, and additionally that the allowed returns exceeded what investors required to bear the investment risk of this group of utilities.

In other words, providing generous rates of return allowances to enhance the financial integrity and flexibility of these utilities without requiring these utilities to establish a reserve to account for these insurance premiums, may just over-compensate investors given the high dividend payout practices of many Canadian utilities.

Q. Does any evidence exist that investors in U.S. utilities had a similar superior investment performance where they experienced excess returns from utility investment?

A. Yes, there is similar but not as rigorously conducted evidence for the U.S. market. In a study that has received much media coverage, Mr. Richard Bernstein and Ms. Lisa Kirschner, two prominent strategists at Merrill Lynch in New York, find that the S&P Utility Index outperformed the NASDAQ Index since NASDAQ's inception in 1971.[148] The Utilities outperformed NASDAQ over the 30-year period while incurring less risk. From NASDAQ's inception through the end of September 2001, NASDAQ returned a compound annualized rate of return of 11.2% per year, whereas the S&P Utility Index returned a compound annualized rate of return of 12.0% per year. The authors of this report measure risk using both the standard deviation of rolling 12-month returns (about 26% for NASDAQ versus about 16% for the S&P Utility Index), and alternatively as

[148] Richard Bernstein and Lisa Kirschner, 2001, Believe it or not: Utilities have outperformed NASDAQ since '71, *Quantitative Strategy Update*, October 25.

the percent of the returns that were negative over a 12-month time horizon (over 23% for NASDAQ versus over 15% for the S&P Utility Index).[149]

Q. Does this evidence negate any statements made by buy-side professionals?

A. Yes, it does. For example, Ms. McShane quotes a portion of a recent report by CIBC World Markets entitled "Pipelines and Utilities: Time to Lighten Up", published December 2001. Specifically:[150]

> "The magnitude of the reduction in the case of Newfoundland Power illustrates the flaw in using a brief snapshot of existing rates rather than a forecast of rates that are expected to persist during the upcoming year. More importantly, however, it shows the shortcoming of the formula approach itself. Mechanically tying allowed returns on equity to long bond yields is an approach that is simple for regulators to apply; however, in recent years, with a steady decline in bond yields, it has produced-allowed returns that are out of sync with the cost of capital, and returns that are being achieved with comparable nonregulated companies or regulated returns that are achievable in the U.S."

Our finding of positive abnormal returns for Canadian utilities suggest that this quote is ill informed since the average Canadian utility outperformed the benchmark, which is a difficult task that the average Canadian mutual fund manager can only dream about.

Q. Does Dr. Evans agree that achievement of abnormal returns by utilities negates their use in determining fair rates of return on utilities?

---

[149] This is based on a visual estimation of the values depicted on page 2 of Richard Bernstein and Lisa Kirschner, 2001, Believe it or not: Utilities have outperformed NASDAQ since '71, *Quantitative Strategy Update*, October 25.

[150] Ms. McShane, line 20, page 18 to line 3, page 19, of new evidence.

A. No, he does not. He states that:

> "The fact that publicly-traded shares for companies that owned the U. S. utilities may have performed better or worse than an unspecified benchmark over some unspecified past period provides no indication of whether the rates of return awarded to the subject utilities are fair when tested by reference to the standards of *Hope* and *Bluefield*."[151]

In effect, he is arguing that, if we observe that utilities consistently earn significant and positive abnormal returns over long periods of time, that this does not provide prima facie evidence that the rates of return that were awarded to them was too high.

9. Ex Post performance of a "specially-selected high-quality, low risk" sample of unregulated companies

Q. Please discuss the major problem with using the equity risk premia realized on a "specially-selected high-quality, low risk" sample of unregulated companies.

A. This is one of the approaches used by Dr. Evans in his evidence.[152] Unfortunately, it is just a mutation of the Comparable Earnings Approach where realized market premia are used instead of book ROEs. As we illustrate below, we find that the samples drawn for these two approaches generate abnormal realized returns. In other words, their realized returns plot above the Security Market Line formed by the relationship between the risk-free rate and the market portfolio. Thus, they generate excessive risk premia (i.e., higher than warranted) given the risk level of the selected sample(s). This is not surprising because the dream of most investors is to be able to select their investment portfolios with hindsight (or, stated differently, with full knowledge of what will happen).

[151] Dr. Evans, response to IR CG-ALP/ANCA/EDI/ETI-3.
[152] Dr. Evans, page 21, of his new evidence.

The Relationship Between Accounting and Investor Rates of Return

Q. The Comparable Earnings Test relies on a mapping between accounting rates of return (ROEs) and investor expected rates of returns. In particular, it assumes that higher rates of accounting returns imply higher expected rates of return by investors. Would you please comment on the validity of this assumed relationship?

A. Unfortunately, there is no such mapping since the returns that investors expect depend upon the investment risk they bear, while accounting rates of return depend upon the investment risks that firms bear. This has been aptly stated as follows:

> "A word of caution: We all are accustomed to hearing that well-managed firms will provide high rates of return. We agree this is true if one measures the firm's return on investments in plant and equipment. The CAPM, however, predicts returns on investment in the *securities* of the firm.
>
> Let us say that everyone knows a firm is well run. Its stock price will therefore be bid up and, consequently, returns to shareholders who buy at those high prices will not be excessive. Security prices, in other words, reflect public information about a firm's prospects, but only the risk of the company (as measured by beta in the context of the CAPM) should affect expected returns. In a rational market investors receive high expected returns only if they are willing to bear risk."[153]

Fair Rate of Return Estimates Based on the Comparable Earnings Methodology

[153] Zvi Bodie, Alex Kane, Alan J. Marcus, Stylianos Perrakis and Peter J. Ryan, *Investments* (McGraw-Hill Ryerson, 3rd Canadian edition, 2000), p. 249.

Q. Please explain your criticism of the evidence of Dr. Evans and Ms. McShane based on the use of the Comparable Earnings Method.[154]

A. This test arises from the notion that capital should not be committed to a venture unless it can earn a return commensurate with that available prospectively in alternative ventures of comparable risk. While capital needs to be allocated efficiently so that the risk-adjusted returns are equivalent across firms and uses, the Comparable Earnings Test does not measure if this is the case. The Comparable Earnings Test measures rates of return but does not compare them with the opportunity cost of capital as is commonly done with measures such as Economic Value Added. Thus, we conclude that this Test should not be used as a tool to estimate a fair rate of return on equity for a utility.

Drs. Brigham, Shome and Vinson state that the comparable earnings method "has now been thoroughly discredited (see Robichek [15]), and has been replaced by three market-oriented (as opposed to accounting-oriented) approaches …".[155] Furthermore, there is widespread agreement among utility and intervener witnesses and Boards that the Comparable Earnings Test is not appropriate for determining a fair rate of return.[156] For example, in 1999, this Board stated:[157]

> "In the Board's view, the comparable earnings test is sensitive to accounting practices of the sample firms, the sample selection, the selected business cycle and discontinuities caused by mergers, divestiture or restructuring. Given the

[154] Ms. McShane, beginning on line 9, page 27, of new evidence.
[155] E. F. Brigham, D. K. Shome and Steve R. Vinson, 1985, The risk premium approach to measuring a utility's cost of equity, *Financial Management* (Spring), pp. 33-45. See CG-AUI/AE/AG/AP-5(a).
[156] The direct testimony of Dr. M.J. Vilbert for TransAlta Utilities Corporation, May 2000, is an example of a utility witness, and the direct testimony of Drs. L.D. Booth and M.K. Berkowitz for TRANSCO, August 2000, is an example of an intervener witness.
[157] Alberta Energy Utilities Board Decision U099099, November 25, 1999, p. 326.

historical corporate restructuring and economic uncertainty, which may adversely affect the test results, the Board gives little weight to the comparable earnings test in this proceeding for the purposes of determining an appropriate rate of return."

The Board has re-iterated its position on the merits of the Comparable Earnings Method in its recent decision on the application by AltaLink and TransAlta as follows:[158]

"Accordingly, for all of the above reasons, the Board continues to consider that the comparable earnings method is not appropriate and, hence, gives no weight to the comparable earnings method in this proceeding for the purposes of determining the appropriate equity rate of return."

Despite this widespread agreement against its use, Dr. Evans places a significant weight on the results of applying the Comparable Earnings Method when determining his recommended fair rate of return on common equity for his applicant utilities. Dr. Evans states that his conclusions "respecting fair rate of return on common equity reflect an equal weighting on the results applying the comparable earnings and risk premium methods".[159]

The widespread agreement against the use of the comparable earnings test is based on a number of problems with its use.

Q. What is the basic problem with the use of the Comparable Earnings Test for fair rate of return determination for utilities?

---

[158] Alberta Energy and Utilities Board, August 2003, Decision 2003-061: AltaLink Management Ltd. and TransAlta Utilities Corporation Transmission Tariff for May 1, 2002 – April 30, 2004, TransAlta Utilities Corporation Transmission Tariff for January 1, 2002 – April 30, 2002, p.115.
[159] Dr. Evans, page 4, of new evidence.

A. The basic problem is that there is neither a theoretical underpinning nor any empirical support for the comparable earnings approach to estimating a regulated fair rate of return for a utility. As an *ad hoc* approach to estimating a regulated fair rate of return, there are no agreed-upon rules for deciding upon how the Comparable Earnings Test should be implemented.

Q. Would you discuss some of the problems encountered in implementing a Comparable Earnings Test for fair rate of return determination?

A. We will review some of the problems encountered in implementing a Comparable Earnings Test.

First, there is no agreement on how long and what time period should be used in the test. Some analysts use a full business cycle while others use a fixed time period of five or ten years. The results tend to be sensitive to the choice of the time period.

Second, there is no agreement on how structural changes in the economy or a number of economic sectors should be dealt with. Furthermore, structural changes may invalidate the usefulness of past rate of return series for predicting future expected rates of return.

Third, the predictive usefulness of historical time series of rates of return on equity appears to remain untested. Unlike equity returns that are forward looking in that they incorporate expectations, rates of return on equity are backward looking.

Fourth, as an accounting-based measure, comparable earnings will only coincide with the investor's opportunity cost (desired rate of return) by accident. There is no conceptual reason to expect that comparable earnings represent a rational expectation of an investor's desired rate of return from investing in the firm.

Fifth, as an accounting-based measure, comparable earnings are subject to variations in the quality of earnings caused by accounting reinstatements, business combinations and divestitures, accounting choice of what is extraordinary, accounting choices of what is expensed and what is capitalized, and managerial choices about accounting practice. Our discussion in Section IV about the increasing use of "aggressive accounting" by firms documents why earnings numbers are not very reliable information for determining equity risk premia.

Sixth, Comparable Earnings Tests suffer from survivorship bias since they tend to be retrospective. This tends to inflate the average rates of return found for the comparable sample.

Seventh, the Comparable Earnings Test is very dependent upon the criteria or screens used to select the sample members. Most analysts use accounting-based risk proxies to screen possible candidate firms. These screens are an attempt to identify a sample that is similar in risk to the low risk utilities. These accounting-based risk proxies measure total risk and not the systematic risk which is important to diversified investors. Thus, some firms with a high systematic risk survive the screening process. Some of the screens, such as ones that screen out firms with a high coefficient of variation for book returns, bias performance upwards. The coefficient of variation of book (or accounting) returns measures the uncertainty of returns divided by the mean return. Its inverse is a Sharpe-like measure of performance that provides the mean return per unit of standard deviation. High Sharpe-like ratios indicate better performance. For example, the CAPM (Capital Asset Pricing Model) assumes that the

Market Risk Premium per unit of standard deviation of return (essentially the Sharpe ratio) is positive and constant.[160] Thus, screening out firms with high coefficients of variation tends to screen out firms with low performance based on the Sharpe-like measure. Stated differently, the coefficient of variation of book returns screen retains firms that are most desired from an investor's viewpoint given their high return-to-variability ratios. Such firms include those with market power to earn sustainable economic rents.

Eighth, the screens used by some experts produce comparable samples with an average price-to-book ratio and an average price-to-earnings ratio that exceeds that of a typical utility. We know from basic valuation theory that the price-to-earnings ratio increases with increasing return-on-equity, and that the price-to-book ratio also increases with increasing return-on-equity. Thus, given this positive relationship between return-on-equity and both the price-to-earnings ratio and the price-to-book ratio, it should not be surprising that the average return-on-equity for the comparable sample exceeds that of the sample of utilities. A higher price-to-book ratio is an indication that investors think a firm has opportunities to earn a rate of return on their investment that exceeds the market capitalization rate. While Canadian Boards have appeared to be generous to utilities when viewed in hindsight, there is still an upper cap on how much their rate of return can exceed their true cost of capital. A higher price-to-earnings ratio is an indication that investors think that a firm has considerable and profitable future growth opportunities.

[160] The literature using the Sharpe ratio to measure portfolio performance using market (not accounting) data is extensive. This literature includes S. Lalancette, L. Kryzanowski and M.C. To, Performance attribution using an APT with pre-specified macrofactors and time-varying risk premia," *Journal of Financial and Quantitative Analysis* 32:2 (June 1997), pp. 205-224; S. Lalancette, L. Kryzanowski and M.C. To, Performance attribution using a multivariate intertemporal asset pricing model with one state variable," *Canadian Journal of Administrative Sciences* 11:1 (March 1994), pp. 75-85; and L. Kryzanowski and A.B. Sim, Hypothesis testing with the Sharpe and Treynor portfolio performance measures given non-synchronous trading," *Economic Letters* 32 (1990), pp. 345-352.

Ninth, while the current cost of new capital is based on current market values and inflation causes deviations between book and market values on the asset side, inflation also decreases the real value of long-term liabilities and part of the interest payment that represents a payment to debt holders for the depreciation of the real value of their holdings (i.e., a return of capital) is tax deductible. Thus, if the comparable earnings test were to be used, one would have to remove the benefit that utilities receive from the decrease in the real value of their liabilities resulting from inflation, and the tax benefit the utilities receive from the "interest" payments which represent a return of capital and not a return on capital. As firms with relatively higher debt ratios, the sum of both of these items is likely to be material.[161] Furthermore, much of the deviation between book and market values of assets for firms, including utilities, is caused by rates of return exceeding the cost of capital. The abnormal returns identified for Canadian utilities supports this statement.

Q. Would you please illustrate the net effect of these problems using the samples used by one of the experts for the applicant utilities?

A. We have demonstrated such for the 17/14 samples used by Dr. Evans in the Aquila application to this Board. For the Board's convenience, we have extracted that demonstration and placed it in Appendix 7.B.[162] We provide a similar demonstration of a 17 sample used by Ms. McShane in the NSPI application to the Nova Scotia Utility and Review Board.[163] We do not conduct a similar test on the samples used by Dr. Evans and Ms.

[161] These items are totally ignored by Ms. McShane, lines 6-18, page 22, of new evidence.
[162] Drs. Kryzanowski and Roberts, line 12, page 102 through line 12, page 109, Alberta Energy and Utilities Board, UtiliCorp Networks Canada (Alberta) Ltd. (UNCA). Refiled by Acquila as Ex 004-03-2003-07-09-Aquila-Intervenor Evidence of Drs. Roberts & Kryzanowski.
[163] Drs. Kryzanowski and Roberts, line 25, page 123 through line 31, page 128, Nova Scotia Utility and Review Board, Nova Scotia Power (NSPI) Ltd., March 2002.

McShane in this hearing in order to conform to the Board's concern about hearing costs.

However, we do note that Ms. McShane includes Rothman Inc. in her sample with its mean ROE of 40.2% and range of 34.4% to 45.2% over the evaluated period, as being an indication of the ROE one would expect on an applicant utility. Furthermore, the numbers of ROEs that are less than the risk-free rate indicate that the return distribution of her sample contains significantly higher downside risk than an average-risk utility. For example, over 50% (8 out of 15) of the utilities had an ROE less than the risk-free proxy in 1992.[164] Thus, the resulting ROE estimate needs to be adjusted downwards to account for the higher downside risk of her sample.

Q. What recommendation do you draw from this analysis?

A. We recommend that the Board should continue to apply no weight to the Comparable Earnings evidence submitted by witnesses as it did in its Decision U099099. The method is not only devoid of scientific merit and theoretical underpinnings but its substantive implementation difficulties make it unsuitable to play a role in the determination of a fair rate of return for a utility.

<u>Comparison of Witnesses' Rate of Return Evidence Against Adjustment Formulas</u>

Q. Did you conduct any further analysis of the equity rate of return evidence submitted by the other witnesses in this hearing?

[164] Ms. McShane, response to CG-AUI/AE/AG/AP-12, in file: CG-AUI-AE-AG-AP-12.xls.

A. Yes, we compared their recommendations for the equity risk premium for the applicant companies against the generic formulas used for groups of utilities by Canadian regulators discussed earlier in our evidence. These regulators include the National Energy Board, British Columbia Utilities Commission, Ontario Energy Board, the Manitoba Public Utilities Board and the Newfoundland Public Utilities Board.

Q. Please explain the rationale for making these comparisons.

A. As explained earlier in this evidence, in its RH-2-94 Multi-Pipeline Cost of Capital Decision issued in March 1995, the National Energy Board adopted a formula to compute an equity risk premium over the consensus forecast of the long-Canada rate. While this formula was adopted as an administrative convenience, it has been used by the NEB since 1995 and reaffirmed in June 2002 in the NEB's RH-4-2001 decision on TransCanada Pipelines. The formula has been adopted, in modified form, by a number of provincial regulatory boards. Thus, these formulas provide benchmarks of the levels of equity risk premiums that regulators have previously regarded as reasonable.

As we explain in detail in Section VI of this evidence, we do not endorse these formulas. Our recommendation to the Board embraces an adjustment mechanism incorporating a different variable. Nevertheless, we believe that, despite their limitations, these formulas provide useful benchmarks of the thinking of regulators in a number of Canadian jurisdictions. With these benchmarks, we can assess the extent to which recommendations offered by particular witnesses lie within or beyond what these regulators regard as a reasonable range.

We begin with the NEB formula. This procedure takes the average 3-month out and 12-month out forecasts of 10-year Government of Canada bond yields as reported in the November issue of *Consensus Forecasts* (Consensus Economics, Inc., London, England.) To this is added the average daily spread between 10-year and 30-year Government of Canada bonds as reported in the *National Post* for October. An equity risk premium of 300 basis points was determined to be appropriate for the particular group of pipeline companies in 1995. This equity risk premium is added to the determined 30-year Canada rate to give a final allowed return on equity.

In order to acknowledge the NEB's belief that equity risk premiums decrease when rates are rising and increase when rates are falling, an adjustment mechanism allows for the cost of capital to be adjusted upwards or downwards by 75% of the increase in the long Canada rate occurring after 1995. The NEB decision also notes that the adjustment mechanism is not restricted to the range of rates in its table.

However, it should be noted that the NEB acknowledged that the adjustment mechanism which it had approved "... should produce fair results and prove durable during the target period *for at least three years*."[165] [Emphasis added]. As we note earlier, the NEB reaffirmed its formula in June 2002. The only variable reflected in the adjustment mechanism relates to changes in forecast long-term Government of Canada bond yields. It does not in effect reflect changes in the level of risk premiums and, in particular, the lower levels currently being experienced and forecast into the future.

We can illustrate the workings of the NEB formula using our forecast of 5.60% for Long Canada's. The forecasted long-Canada rate for 1995 was 9.25%, resulting in an allowed return on equity of 12.25%. For our

[165] RH-2-94, p. 31.

forecast of 5.60%, the new rate is 9.51%.[166] Put into words, the NEB formula states that as rates fall from 9.25% to 5.60% (a drop of 365 basis points), 75% of that drop is reflected by lowering the new rate, and the remaining 25% of the drop is added to the risk premium. In this case, the risk premium increases by 91 basis points (.25 *x* (9.25 – 5.60)). These figures appear in Schedule 7.3.

The formula provides an upwardly biased estimate of the allowed return on equity of 9.51% using our forecast of 5.60%. The reason is that not only has the forecasted long-Canada rate dropped by 365 basis points since 1995 but the current and future expected risk premiums are considerably lower (not higher) than they were in 1995.

Following similar logic, we calculate the recommended equity returns and risk premiums for the other regulatory bodies. The Ontario Energy Board formula for Consumers Gas provided for a risk premium of 340 basis points when the long Canada rate was at 7.25%. The OEB formula follows the NEB in employing a 75% adjustment for changes in interest rates. Using a similar formula, the Public Utility Board of Manitoba set a risk premium of 300 basis points at a long Canada yield of 9.12% with an 80% adjustment factor. Further, the most recent position of the BC Utilities Commission calls for an equity risk premium of 350 basis points to accompany a forecasted long Canada rate of 6.0%. The Commission applies an 80% adjustment factor when rates rise and no adjustment for falling rates. For our forecast of 5.6%, the risk premium remains at 350 basis points. Similarly, the Newfoundland Public Utilities Board set its equity risk premium at 350 basis points for a long-Canada rate of 5.75% with an 80% adjustment factor in both directions. Based on this formula, at our 5.6% forecast rate, the risk premium is 345 basis points.

---

[166] 9. 51% = 5.60 + 3.00 + .25 (9.25 – 5.60).

In summary, Schedule 7.3 shows that applying the five adjustment formulas using our forecasted rate of 5.60% produces an average equity risk premium of 367 basis points with a relatively narrow range of 347 – 391 basis points.

Q. What does your summary of regulatory formulas tell us about the reasonableness of the recommendations of other witnesses in this hearing?

A. In order to draw on the results of the regulatory formulas, we must first establish that the risk of the utilities for which the formulas were designed is comparable to the risk of the applicant companies taken as a group. We believe that this is the case for reasons discussed at length in other parts of our evidence.

Turning to the numbers in Schedule 7.3, it is apparent that the risk premium numbers recommended by the witnesses in this hearing and those resulting from regulatory formulas vary significantly. That said, the schedule reveals that the numbers fall into three distinct sets. At the high end are the recommendations of the other witnesses, which are clearly substantially higher than the results of regulatory formulas. In the middle, lie the regulatory formulas. Below them are our own recommendations. Our point estimate for the market equity risk premium of 4.7% is closer than any of the estimates recommended by the experts for the applicant utilities to the 5.3% determination of the Board in its recent decision on the applications by AltaLink and TransAlta.[167]

Q. What do you conclude from this comparison?

[167] Alberta Energy and Utilities Board, August 2003, Decision 2003-061: AltaLink Management Ltd. and TransAlta Utilities Corporation Transmission Tariff for May 1, 2002 – April 30, 2004, TransAlta Utilities Corporation Transmission Tariff for January 1, 2002 – April 30, 2002, p. 115.

A. The regulatory formulas are drawn from the era of significantly higher risk premiums. Our earlier evidence presented a large body of argument showing that the equity risk premium is expected to be considerably lower in the future. Because they do not take this important trend into account, recommended returns drawn from regulatory formulas should be regarded as a generous upper bound. Our own recommendation reflects the current trend towards a lower equity risk premium. Our recommendation represents a reasonable choice should the Board wish to embrace our argument and adjust to the new market regime. If, however, should the Board wish to move more cautiously, it could choose to set the allowed equity return in the range between our recommendation and the average of the regulatory formulas. Either way, our examination of the regulatory formulas and other evidence suggests that the Board should attach little weight to the rate of return recommendations of the other witnesses.

CAPITAL STRUCTURE

Q. Drs. Kolbe and Vilbert employ formulas for ATWACC and estimate a cost of capital for NGTL's requested capital structure of 40% equity as well as for its present structure. Please comment on the validity of ATWACC.

A. ATWACC is based on the static trade-off model of capital structure. Dr. Kolbe discusses the trade-off between the corporate tax advantages of debt and increased risk in his responses to Q42–Q49 starting on page 54 and running to page 66 of his evidence.

We believe that the static trade-off theory can serve as a useful tool in qualitative analysis of capital structures. However, Dr. Kolbe badly miscasts the theory when he assigns it a role as a precise equation. As we state in section V of this evidence:

> "The first thing we can learn [from finance theory] is to be suspicious of attempts to determine an appropriate equity ratio using a formula. Unlike other areas in finance, research on capital structure can offer only qualitative advice."

In Appendix 7.C, we review current literature on capital structure encompassing theoretical models, empirical academic research and surveys of corporate best practices. The appendix concludes:

- Among academic researchers, the trade-off theory enjoys reasonable support but faces serious challenges from a number of competing theories.
- While it has moderate support among financial executives, a recent survey in the U.S. shows that executives look outside the implications of this theory when setting capital structures for their firms.
- While the trade-off theory can offer useful qualitative guidance, it is a mistake to treat capital structure as if it were amenable to precise analysis by a formula.

The third conclusion clearly shows the erroneous nature of ATWACC. This conclusion is consistent with the rejection of ATWACC by the National Energy Board. In RH-4-2001, pages 43-44, the NEB discussed the ATWACC methodology as follows:

> "In summary, in the Board's view, the lack of regulatory precedent is not a barrier to the adoption of a new approach to regulation. However, in the absence of such precedent and in the absence of any support from stakeholders for the proposed change, the Board's analysis of the proposal should show a clear benefit to be derived from the new approach when compared with previous acceptable approaches.

> The Board has carefully considered the evidence provided with respect to the appropriateness of using the ATWACC methodology in determining the cost of capital for the Mainline and has not been persuaded that the approach offers significant advantages."

Q. Please comment on the cost of equity ranges for alternative capital structures derived by Dr. Vilbert and presented in Table 2 on page 76, lines 9-15 of Dr. Kolbe's evidence.

A. These numbers are based on the formula for the cost of equity illustrated on page 74, lines 11-23 of Dr. Kolbe's evidence. On pages 70-75 he provides a formula and example which warn that NGTL's cost of equity would be inflated to a range of 11 ¾ % - 13 ½% if the Board were to maintain the company's equity ratio at 32%. Given that current thinking in finance has discredited the notion that capital structure is amenable to precise analysis by a formula, we recommend that the Board attach no weight to this warning.

Q. Beyond ATWACC, what analytical framework underlies the capital structure recommendations of other witnesses in this hearing.

A. The framework employed by other witnesses consists of the S&P rating guidelines coupled with the argument that the company in question must maintain an S&P credit rating of A- or better in order to access capital markets. We find this framework employed by Mr. Lackenbauer starting on line 8, page 3 and running to line 26, page 5 of his evidence. It is evident in Mr. Murphy's evidence and summarized there starting at line 44, page 20 and continuing to line 6 on page 21. In Mr. Falconer's evidence, we find the framework laid out starting on line 18, page 13 and continuing through line 14 on page 20. Dr. Neri employs S&P guidelines throughout Section 4 of his evidence, pages 15-23. Ms. McShane also bases her analysis on S&P guidelines in her Prepared Testimony for ATCO and for AltaGas.

Dr. Evans draws heavily on the S&P guidelines reflecting practice in the U.S. in forming his recommendations starting on page 10 and running through page 14 of his evidence. He highlights their role in his advice to the Board on page 14:

> "To avoid undue 'rate shock', I do not recommend that Canadian utilities and regulators 'instantly' move to the levels of debt and equity used by their U.S. and international counterparts. Nevertheless, Canadian utilities should begin to meaningfully reduce the significant 'leverage gap' that now exists as debt market globalization intensifies".

Q. What are your views on the validity of the common practice by other witnesses in this hearing of basing capital structure recommendations on S&P guidelines?

A. We address this question in detail in Section V of our evidence and conclude that S&P guidelines have little relevance for setting target capital structures in this hearing for the following reasons:

- Our study shows that S&P does not consistently follow its own ratio and business risk guidelines in setting ratings.
- Respected capital market participants have criticized the guidelines as lacking relevance for Canada.
- When companies have been downgraded to the range of BBB, they have continued to conduct their businesses profitably.

THE AUTOMATIC ROE ADJUSTMENT MECHANISM

<u>Advocates of an Adjustment Formula</u>

Q. Dr. Kolbe argues that since customers support a standardized approach while companies generally oppose adoption of a standardized approach to cost of equity and capital structures, this suggests that the standardized approaches are biased in favor of those desiring such formulas?[168] Please comment on his assertion?

A. An alternative interpretation of the revealed preferences of companies and customers for a standardized approach is that the customers prefer the least costly of the fair approaches since they ultimately end up paying for more costly regulatory procedures. Based on the evidence presented by Ms. McShane and Dr. Neri, which is reviewed in more detail in the next sub-section of our evidence, there is little evidence that the average authorized ROE in the U.S. has reflected either changes in the risk-free rate or risk premia over time. This is hardly what one would expect from a well-functioning regulatory process, and is probably due to an over-reliance on the DCF approach in the U.S. regulatory environment. A standardized approach is designed to deal with a variable environment by using well defined and clearly specified rules for determining changes to the ROE, and by holding generic hearings to update the rules and/or starting ROE and capital structures when there are regime shifts in the underlying risks of the applicant utilities or in the risk premia requirements of investors.

Proposed Adjustment Formula

Q. Please describe what adjustment formulas are proposed by the various ROE experts for the applicant utilities.

[168] Dr. Kolbe, lines 13-19, page 8, of evidence.

A. Dr. Evans proposes that the Board adopt the adjustment formula that is used by the National Energy Board (NEB).[169] As stated in section VI of our evidence, this formula adjusts for 75% of the change in the forecast of long Canada rates, and makes a questionable adjustment for changes in the equity risk premium.

Ms. McShane concurs with this recommendation.[170] She emphasizes the importance of rate stability, which we agree has importance.[171] Earlier in her evidence, she provides evidence that U.S. regulators appear to place a large weight on ROE stability over ROE reality than Canadian regulators since the average allowed ROE for U.S. utilities has varied little over the period from 1994 to 2003 (in the extremely tight range of 11.0% to 11.6%, except for the 10.7% in 1999).[172] In other words, the representative U.S. regulator has acted as if the decline in the risk-free rate over this period has been essentially offset by an increasing risk premium. This is counter to conventional belief that both the risk-free rate and the risk premium have declined over the period. The low variability in the average ROE in the U.S. also suggests that the DCF approach provides considerable noise and little direction in terms of what is happening to the expected return requirements of investors. In contrast, the Canadian regulators have reduced the average allowed ROE for Canadian utilities by 180 basis points from 11.6% in 1995 to 9.8% in 2003 to partially reflect the decline of 3.2% in the risk-free rate over this period of time. This has resulted in a somewhat stable (or increasing?) risk premium for utilities over this period, which is counter to the conventional belief that the risk premium has also declined. The behavior of the dividend yield (i.e., a variable commonly

[169] Dr. Evans, page 4, of new evidence.
[170] Ms. McShane, lines 16-22, page 43, of new evidence.
[171] Ms. McShane, lines 3-24, page 44, of new evidence.
[172] Ms. McShane, table 2 page 15, of new evidence. She acknowledges that these ROE are not risk-adjusted to account for differences in risk across markets. Ms. McShane, response to IR CG-AUI/AE/AG/AP-1.

used to model changes in risk premia) over the period would suggest that risk premia have declined.

Ms. McShane argues that the equity risk premium is sensitive to the long-term government bond yield.[173] However, as we show in section VI, this cannot be the case conceptually since a reward for bearing risk cannot be related to a risk-free rate. We also show that the alleged sensitivity is not supported empirically. For these reasons, we support the earlier position of the Board when it stated that: "the Board is not convinced that the historical data relating equity risk premium to long-term bond yields demonstrates a readily identifiable relationship between the two factors…" [EUB Decision 2000-9 (March 2, 2000)].

Dr. Neri makes a similar argument to that made by Ms. McShane based on a similar comparison of average authorized ROEs for utilities in Canada and the U.S.[174] Our discussion above also applies to his discussion of this issue. Dr. Neri proposes a variant of the NEB formula where the full change in the risk-free rate as proxied by Long Canada yields is reflected in the ROE and the full change in the risk premium as proxied by changes in the default spread for 'A' rated utilities also is reflected in the ROE.[175] While conceptually it seems plausible to condition changes in the equity risk premium on changes in the default premium, the empirical support for doing so is much weaker than it is for changes in the dividend yield.

Q. Do you have any comments on the triggers recommended for a review of any formula for determining the equity return?

[173] Ms. McShane, line 25, page 44 to line 3, page 45, of new evidence.
[174] Dr. Neri, line 25, page 46 to line 12, page 49, of evidence.
[175] Dr. Neri, lines 1-24, page 50, of evidence.

A. Yes, we do. Dr. Neri recommends a review if "any utility in the Province suffers a bond rating downgrade".[176] We believe that this is too fine of a trigger, and would lead to an excessive number of generic reviews. Further, we show in section V that bond rating downgrades are typically non-events for utilities provided that they remain investment grade.

Q. Dr. Kolbe recommends that corporate equity be linked to corporate bond rates and not to Government bond rates.[177] Discuss his recommendation?

A. This recommendation would result in the measurement of a return differential that is inconsistent with the notion of a risk premium. It would essentially result in the measurement of the differential return between two instruments (namely, corporate equity and corporate bonds) where the risk of both instruments changes over time.

[176] Dr. Neri, lines 21-26, page 51, of evidence.
[177] Dr. Kolbe, lines 5-13, page 13, of evidence.

Schedule 3.1

Yields and Expected Returns for a Sample of Income Funds

Fund	Expected Return 2003-4	Cash Yield
Algonquin Power Income Fund	-4.5%	9.3%
Clean Power Income Fund	3.0%	9.4%
Great Lakes Hydro Income Fund	5.7%	8.1%
Northland Power Income Fund	5.7%	8.6%
Pembina Pipeline Income Fund	8.2%	8.9%
Average	**3.6%**	**8.9%**

Data are from Scotia Capital, Income Fund Monitor, August 2003.

Schedule 3.2

Forecasts for Interest Rates for June 30, 2004

The table sets out data from Consensus Economics and from three banks: BNS and TD. Our forecast is simply the average.

Source	10-year Canada's	30-Year Canada's
Consensus Economics	5.10%	--
Bank of Montreal	5.40	5.60%
Bank of Nova Scotia	4.30	5.00
Toronto Dominion Bank	4.75	5.40
Kryzanowski and Roberts	**4.82**	**5.33**

Sources: Consensus Economics, June 2003, McShane, page 27, line 10; www.bmo.com/economic, North American Outlook, June 17, 2003; http://www.scotiacapital.com/English/bns_econ/forecast.pdf, Forecast Update, Q2 forecast, August 1, 2003; and TD Quarterly Economic Forecast, June 27, 2003.

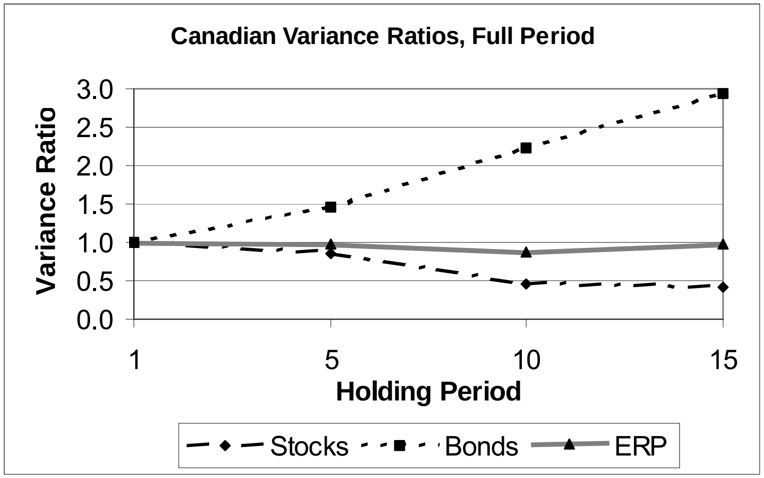
Schedule 4.1

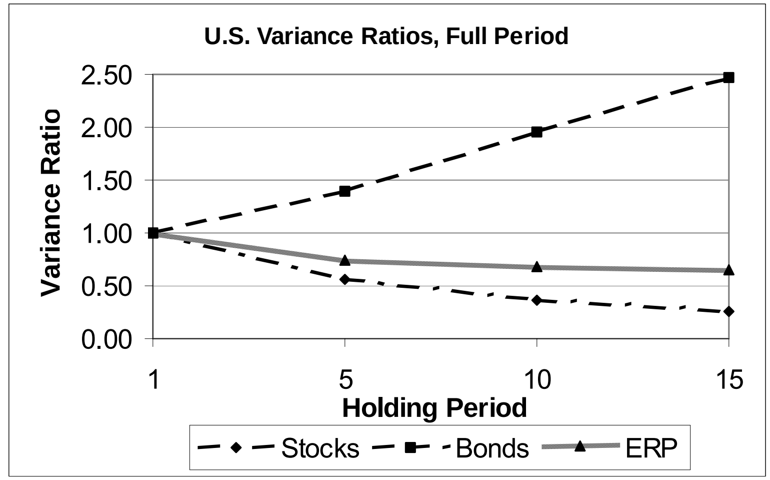
This schedule reports the variance ratios for holding periods of 5, 10 and 15 years relative to a benchmark holding period of 1 year for stocks, long bonds and risk premia for Canada and the United States. The Canada data are annual from the Canadian Institute of Actuaries for the period 1924-2002. The US data are annual from Ibbotson for the period 1927-2002. A variance ratio of one indicates no aversion or reversion of the mean of the series. A variance ratio less than one indicates mean reversion, and a variance ratio greater than one indicates mean aversion.

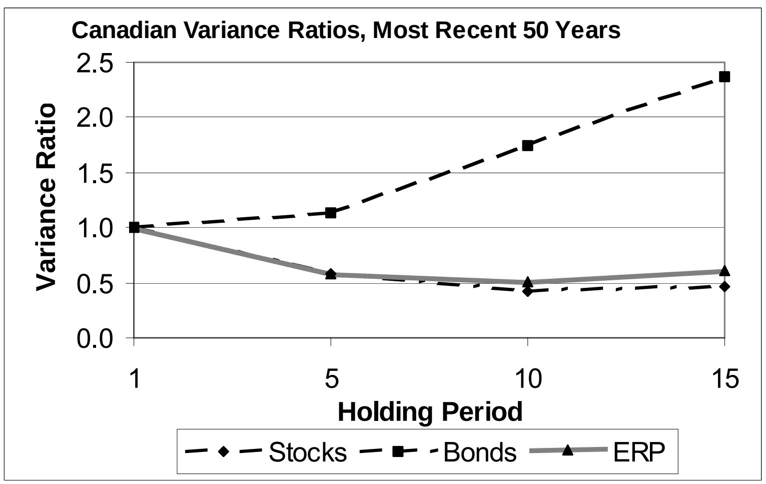
	1 year Holding Periods			5 Year Holding Periods			10 Year Holding Periods			15 Year Holding Periods		
	Stocks	Bonds	ERP	Stocks	Bonds	ERP	Stocks	Bonds	ERP	Stocks	Bonds	ERP
Panel A: CIA data, 1924-2002 (79 years)												
Var.	0.0348	0.0080	0.0415	0.1476	0.0581	0.2012	0.1563	0.1791	0.3614	0.2127	0.3533	0.6031
Var. Ratio	1.0000	1.0000	1.0000	0.8475	1.4487	0.9698	0.4487	2.2327	0.8710	0.4070	2.9363	0.9689
Panel B: CIA data, 1953-2002 (Most recent 50 years)												
Var.	0.0271	0.0108	0.0370	0.0767	0.0749	0.1381	0.1007	0.2112	0.2522	0.1043	0.4002	0.3605
Var. Ratio	1.0000	1.0000	1.0000	0.5648	1.3856	0.7472	0.3711	1.9541	0.6821	0.2560	2.4684	0.6500
Panel C: Ibbotson data, 1927-2002 (76 years)												
Var.	0.0425	0.0090	0.0465	0.1223	0.0510	0.1353	0.1812	0.1561	0.2353	0.3011	0.3172	0.4231
Var. Ratio	1.0000	1.0000	1.0000	0.5749	1.1391	0.5816	0.4259	1.7436	0.5059	0.4718	2.3628	0.6063
Panel D: Ibbotson data, 1953-2002 (Most recent 50 years)												
Var.	0.0317	0.0121	0.0379	0.0885	0.0664	0.0941	0.1931	0.1846	0.1201	0.3312	0.3660	0.1609
Var. Ratio	1.0000	1.0000	1.0000	0.5585	1.0992	0.4964	0.6094	1.5267	0.3168	0.6971	2.0184	0.2829

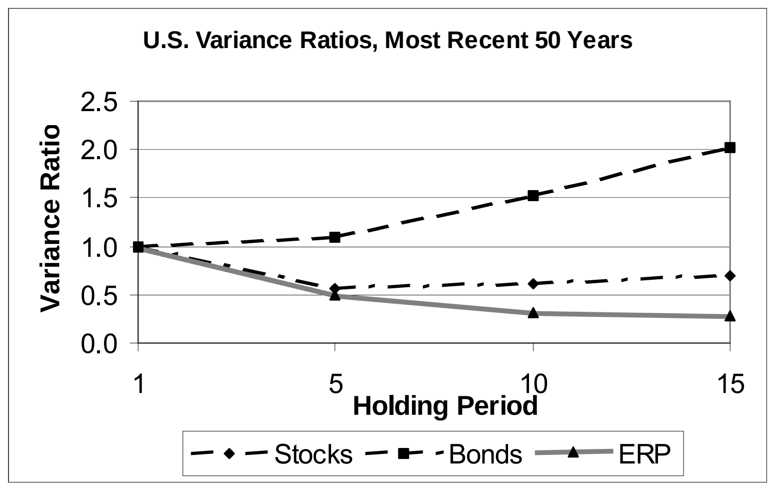
Schedule 4.2

The following are plots of the variance ratios presented in Schedule 4.1. A variance ratio of one indicates no aversion or reversion of the mean of the series. A variance ratio greater than one indicates mean aversion, and a variance ratio less than one indicates mean reversion.









Schedule 4.3

This table contains various estimates of the historical annual risk premia of stocks over the risk-free rate for various time periods. Stocks are proxied by the returns on the S&P/TSX Composite index or its counterpart for more distant time periods. The risk-free rate is proxied by the returns on Long Canada's or its counterpart for more distant time periods.

Time Period	Arithmetic Mean			Geometric mean			Weighted Risk Premium[a]
	Stock Returns	Long Canada Returns	Risk Premium	Stock Returns	Long Canada Returns	Risk Premium	
Panel A: Based on Dimson et al. data							
1900-2002 (103 yrs)			5.5			4.0	5.1
1900-2002 (103 yrs) with their revaluation adjustment[b]			4.9			3.2	4.4
Panel B: Based on CIA Data							
1924-2002 (79 yrs)	11.42	6.40	5.03	9.80	6.04	3.76	4.71
1936-2002 (67 yrs)	11.13	6.41	4.73	9.89	6.02	3.87	4.51
1951-2002 (52 yrs)	11.14	7.24	3.89	9.93	6.78	3.15	3.71
1957-2002 (46 yrs)	10.29	8.00	2.29	9.06	7.51	1.55	2.10
1965-2002 (38 yrs)	10.25	8.98	1.27	9.09	8.44	0.65	1.12
1977-2002 (26 yrs)	12.10	11.05	1.05	10.91	10.45	0.47	0.91

[a]The weighed risk premium is found by taking 75% of the arithmetic mean risk premium plus 25% of the geometric mean risk premium.
[b]These are the estimated expected risk premiums, as in Dimson et al. (2003).The calculations follow the procedure specified in Dimson et al. (2003). The estimated impact of the re-valuation of equities from their historical premiums for the world index is used for Canada. As in Dimson et al. (2003), the arithmetic mean then is found as the geometric mean + 0.5 *x* Variance of historical ERP relative to bonds. For Canada, this variance is obtained by multiplying the standard deviation of 18.2% by itself.

Source: Canadian Institute of Actuaries (CIA), *Report on Canadian Economic Statistics, 1924-2002*. Available at the CIA website at: http://www.actuaries.ca/publications/documents%5Freports%5Fe.html. Elroy Dimson, Paul Marsh and Mike Staunton, Global evidence on the equity risk premium, forthcoming *Journal of Applied Corporate Finance* 15:4 (Summer 2003).

Schedule 4.4

This schedule reports historical real returns and equity risk premia for the United States for the period, 1802-September 2001. “Comp.” refers to the compound or geometric mean annual rate of return; “Arith.” refers to the arithmetic mean annual rate of return; and “Weighted” refers to our equal-weighted average of the geometric and arithmetic mean annual rates of return. The data are drawn from Table 1 in Jeremy J. Siegel, Historical results I, *Equity Risk Premium Forum*, November 8, 2001, p. 31, available on the AIMR website.

	Real Return				Equity Risk Premium Over Bonds		
	Stocks		Bonds				
Period	Comp.	Arith.	Comp.	Arith.	Comp.	Arith.	Weighted
1802-2001	6.8	8.4	3.5	3.9	3.4	4.5	4.0
1871-2001	6.8	8.5	2.8	3.2	3.9	5.3	4.6
Major Subperiods							
1802-1870	7.0	8.3	4.8	5.1	2.2	3.2	2.7
1871-1925	6.6	7.9	3.7	3.9	2.9	4.0	3.5
1926-2001	6.9	8.9	2.2	2.7	4.7	6.2	5.5
Post World War II							
1946-2001	7.0	8.5	1.3	1.9	5.7	6.6	6.2
1946-1965	10.0	11.4	-1.2	-1.0	11.2	12.3	11.8
1966-1981	-0.4	1.4	-4.2	-3.9	3.8	5.2	4.5
1982-1999	13.6	14.3	8.4	9.3	5.2	5.0	5.1
1982-2001	10.2	11.2	8.5	9.4	1.7	1.9	1.8

Schedule 4.5

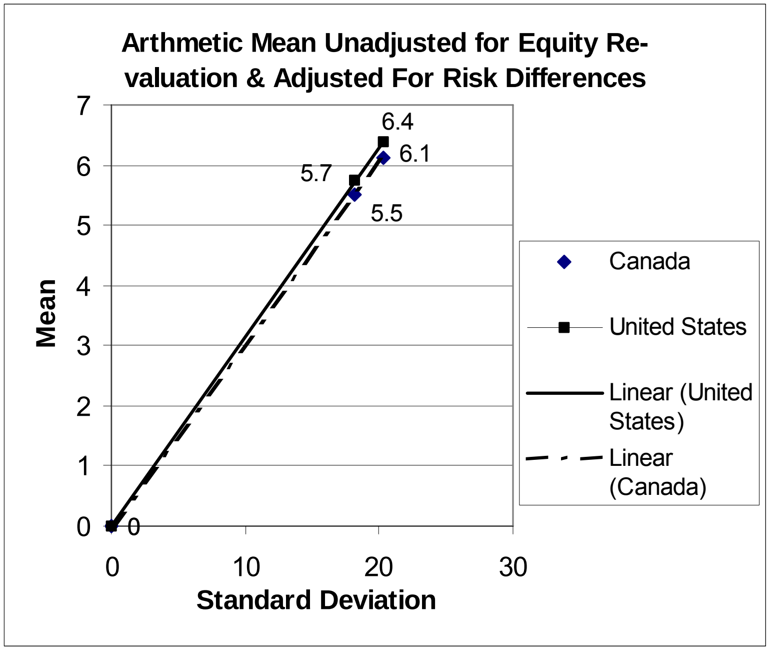
This schedule reports historical returns for stock and long governments and equity risk premia for the United States for the period, 1900-2002, and various subsets thereof. The data are from Dimson et al. (2003) and Ibbotson Associates.

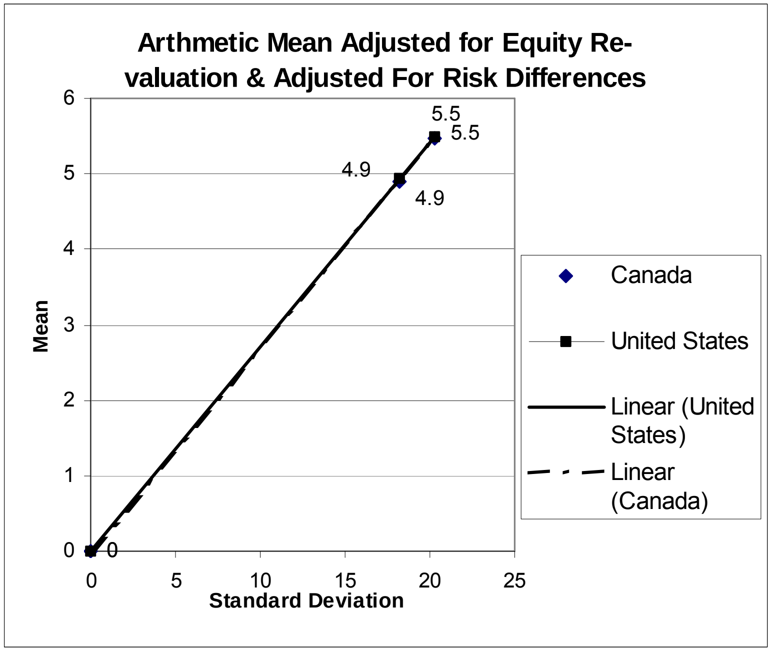
Time Period	Arithmetic Mean Returns			Geometric Mean Returns			Weighted Risk Premium[a]
	Stock	Long Gov't	Risk Premium	Stock	Long Gov't	Risk Premium	
Panel A: Based on Dimson et al. (2003) for the United States							
1900-2002 (103 yrs)			6.4			4.4	5.4
1900-2002 (103 yrs) with their revaluation adjustment[b]			5.5[c]			3.4	4.4
Panel B: Based on Ibbotson data for the United States							
1927-2002 (76 yrs)	12.21	5.82	6.39	10.19	5.42	4.76	5.58
1936-2002 (67 yrs)	12.41	5.95	6.46	10.87	5.53	5.34	5.90
1951-2002 (52 yrs)	12.83	6.66	6.17	11.44	6.14	5.30	5.73
1957-2002 (46 yrs)	11.63	7.50	4.13	10.27	6.95	3.32	3.72
1965-2002 (38 yrs)	11.38	8.41	2.97	10.02	7.80	2.22	2.60
1977-2002 (26 yrs)	13.32	10.37	2.96	12.12	9.65	2.48	2.72
Panel C: Based on Dimson et al. (2003) for the World Index							
1900-2002 (103 yrs)			4.90			3.80	
1900-2002 (103 yrs) with their revaluation adjustment[d]			4.13[e]			3.00	

[a]The weighed risk premium is found by taking 50% of the arithmetic mean risk premium plus 50% of the geometric mean risk premium.
[b] These are the estimated expected risk premiums, as per Dimson et al. (2003). Their calculations use the estimated impact of the re-valuation of equities from their historical premiums of 1% for the U.S.
[c]Dimson et al. (2003) calculate the adjusted arithmetic mean as follows: geometric mean of 4.4% less the equity re-valuation factor of 1% plus one-half of the variance of the risk premium (0.5 times 20.3% times 20.3%). They report results for risk premia relative to bills and not bonds.
[d] These are the estimated expected risk premiums, as per Dimson et al. (2003). Their calculations use the estimated impact of the re-valuation of equities from their historical premiums of 0.8% for the World Index.
[e]Dimson et al. (2003) calculate the adjusted arithmetic mean as follows: geometric mean of 3.8% less the equity re-valuation factor of 0.8% plus one-half of the variance of the risk premium (0.5 times 15% times 15%). They report risk premia relative to bills and not bonds.

Schedule 4.6

The following are plots of the Security Market Lines for Canada and the United States using the historical data for the 103-year period as reported in Dimson et al. (2003). The unadjusted arithmetic mean and standard deviation combinations for Canada are 5.5% and 18.2%, respectively. The corresponding values for the United States are 6.4% and 20.3%, respectively. The adjusted arithmetic mean and standard deviation combinations for Canada are 4.9% and 18.2%, respectively. The corresponding values for the United States are 5.5% and 20.3%, respectively.





The linear lines depict the SMLs for Canada and the United States in terms of excess returns. Note that there is little difference between the American and Canadian means (5.7% and 5.5%) for a standard deviation equal to that of Canada (18.2%) when no adjustment is made for equity re-valuations, and that there is no difference between the American and Canadian means (4.9% and 4.9%) for a standard deviation equal to that of Canada (18.2%) when an adjustment is made for equity re-valuations over this 103 year period.

Schedule 4.7

This table provides the rolling five-year betas for our sample of three utilities that are cross-listed on the TSE and on the NYSE, and have at least five years of data for each market. We do not calculate the rolling betas for the first two rolling five-year periods for Enbridge to conform to our later treatment of these periods for this utility. All betas are calculated using monthly returns for the utility from the NYSE and for the S&P500 index, and from the TSE and for the S&P/TSEX Composite. The data are drawn from CFMRC and CRSP, respectively.

Five-year period	Canadian market (TSE)				U.S market (NYSE)			
	TransCanada Pipelines	Westcoast Energy	Enbridge Inc. [a]	Mean	TransCanada Pipelines	Westcoast Energy [a]	Enbridge Inc.	Mean
1990-1994	0.574	0.571			0.338	0.402		
1991-1995	0.540	0.557			0.361	0.339		
1992-1996	0.489	0.611	0.498		0.430	0.318	0.259	
1993-1997	0.338	0.531	0.440		0.213	-0.259	-0.165	
1994-1998	0.544	0.453	0.478		0.389	0.260	0.013	
1995-1999	0.224	0.253	0.237		0.184	0.079	-0.097	
1996-2000	0.170	0.128	0.046		-0.104	-0.048	-0.192	
1997-2001	-0.068	-0.098	-0.128		-0.081	0.043	-0.052	
1998-2002	-0.079		-0.199		-0.133		0.000	
Mean of nine rolling 5-year periods	0.304	0.376	0.196	0.292	0.177	0.142	-0.034	0.095

[a]The shorter period of 1992-2002 is used for Enbridge, and the shorter period of 1990-2001 is used for Westcoast since the last month of data for this firm on CRSP is February 2002.

Schedule 4.8

This schedule reports the implied equity risk premia for the S&P/TSX Composite index using various growth rates and both the one- and two-stage dividend growth models. The implied Risk Premium or IRP is found by subtracting the then Long Canada rate from the implied rate of return generated from solving the specific DDM. g(D) and g(GNP) are the trailing annual growth rates in index dividends and in nominal GNP, which are smoothed by using a 10-year equally-weighted average. g_1(D) and g_2(GNP) are the growth rates for the first and second stage of the DDM, respectively. D/P adj. is equal to 1.5 times the dividend yield to adjust for nondividend cash distributions. L10yrs and L20yrs refer to the most recent 10 and 20 years of IRPs.

	1-stage DDM			2-stage DDM		1-stage DDM			2-stage DDM
	Using g(D) & No D/Padj.	Using g(GNP)		Using g_1(D) & g_2(GNP)		Using g(D) & No D/P adj.	Using g(GNP)		Using g_1(D) & g_2(GNP)
Year		No D/P adj.	D/P adj.	No D/P adj.	Year		No D/P adj.	D/P adj.	No D/P adj.
1971	1.48	6.05	7.78	5.43	1989	-0.01	2.70	4.47	2.32
1972	-0.19	5.21	6.64	4.61	1990	-2.09	1.55	3.62	0.96
1973	0.79	6.27	8.02	5.54	1991	-2.90	1.10	2.79	0.55
1974	3.38	8.85	11.95	7.64	1992	-2.44	1.04	2.67	0.58
1975	1.02	7.70	10.45	6.39	1993	-2.71	1.12	2.32	0.74
1976	1.16	8.75	11.37	7.35	1994	-5.12	-1.11	0.15	-1.53
1977	1.12	8.79	11.44	7.36	1995	-3.11	0.20	1.40	-0.13
1978	1.33	7.64	10.12	6.51	1996	-2.85	0.22	1.18	-0.04
1979	1.51	5.88	8.13	5.15	1997	-2.57	0.62	1.47	0.38
1980	1.42	4.68	6.75	4.17	1998	-3.77	0.74	1.60	0.41
1981	0.88	3.48	6.03	2.99	1999	-6.39	-0.77	-0.09	-1.09
1982	2.70	5.86	8.13	5.31	2000	-5.23	0.57	1.23	0.25
1983	0.09	3.75	5.55	3.24	2001	-3.52	0.88	1.69	0.58
1984	-0.59	3.59	5.64	2.93	2002	-1.29	1.92	2.92	1.64
1985	0.48	4.08	5.81	3.59					
1986	1.19	3.76	5.40	3.42	Mean, full	-0.79	3.46	5.18	2.88
1987	0.21	2.67	4.36	2.34	Mean, L20 yrs	-2.10	1.57	2.94	1.18
1988	0.65	2.86	4.70	2.53	Mean, L10 yrs	-3.66	0.44	1.39	0.12

Schedule 4.9

This schedule reports the implied equity risk premia for the S&P500 index using various growth rates and both the one- and two-stage dividend growth models. The implied Risk Premium or IRP is found by subtracting the then Long bond rate from the implied rate of return generated from solving the specific DDM. g(D) and g(GNP) are the trailing annual growth rates in index dividends and in nominal GNP, which are smoothed by using a 10-year equally-weighted average. g_1(D) and g_2(GNP) are the growth rates for the first and second stage of the DDM, respectively. D/P adj. is equal to 1.5 times the dividend yield to adjust for nondividend cash distributions. L10yrs and L20yrs refer to the most recent 10 and 20 years of IRPs.

	1-stage DDM			2-stage DDM		1-stage DDM			2-stage DDM
	Using g(D) & No D/Padj.	Using g(GNP)		Using g_1(D) & g_2(GNP)		Using g(D) & No D/P adj.	Using g(GNP)		Using g_1(D) & g_2(GNP)
Year		No D/P adj.	D/P adj.	No D/P adj.	Year		D/P adj.	No D/P adj.	No D/P adj.
1971	1.88	4.96	6.62	4.54	1989	2.81	3.32	5.11	3.25
1972	0.57	4.88	6.34	4.38	1990	2.76	2.67	4.67	2.69
1973	1.63	5.68	7.68	5.04	1991	2.96	3.01	4.67	3.00
1974	2.01	6.92	9.86	5.85	1992	2.63	3.10	4.64	3.03
1975	-0.85	5.20	7.45	4.18	1993	3.20	3.15	4.59	3.15
1976	1.23	6.48	8.62	5.63	1994	0.90	1.16	2.70	1.12
1977	2.86	7.29	10.08	6.37	1995	2.48	2.43	3.65	2.44
1978	2.31	6.89	9.85	5.89	1996	2.12	1.65	2.71	1.69
1979	2.00	6.21	9.26	5.27	1997	1.39	1.55	2.40	1.54
1980	-0.30	3.23	5.85	2.53	1998	1.53	2.12	2.82	2.08
1981	0.43	2.87	5.94	2.31	1999	-1.47	0.27	0.87	0.17
1982	3.01	4.64	7.34	4.30	2000	-1.13	1.49	2.14	1.34
1983	-0.03	3.10	5.48	2.53	2001	-1.68	1.57	2.29	1.36
1984	1.38	3.81	6.39	3.33	2002	0.21	2.88	3.83	2.66
1985	3.22	4.46	6.58	4.25					
1986	3.46	5.59	7.43	5.27	Mean, full	1.47	3.72	5.58	3.35
1987	1.61	3.74	5.75	3.39	Mean, L20 yrs	1.52	2.70	4.18	2.55
1988	1.97	2.91	4.90	2.76	Mean, L10 yrs	0.75	1.83	2.80	1.76

Schedule 4.10

This schedule reports the implied risk premia or IRP for the S&P/TSX Composite and S&P500 index using various growth rates based on forecasts of future GNP growth and of S&P500 index returns and the one-stage dividend discount model or DDM. The implied Risk Premium or IRP is found by subtracting a long-term bond rate estimate from the implied rate of return generated from solving the constant growth or one-stage DDM. Div. Yield is the dividend yield for the respective index from Bloomberg as of August 5, 2003. The growth estimates for case 1 are the forecasted growths in nominal GNPs from Economist.com and the current rates on ten-year Governments as of August 2, 2003 for each country. The growth estimate for case 2 is the forecast of the next five year's earnings growth for the S&P500 index taken from Zacks as of August 5, 2003. Since no growth estimate is available for the S&P/TSX Composite, the S&P500 index forecast is used for the S&P/TSX Composite. The growth estimate for case 3 is the earnings growth estimate for case 2 reduced by 15% to partially reflect the optimism bias inherent in analyst forecasts of market earnings. Cases 2 and 3 use the same long bond rates as in case 1. Cases 4 and 5 are the same as cases 2 and 3 except that the long bond rate for Canada is taken as the 30-year benchmark yield, as reported in the Globe & Mail for August 5, 2003, and that for the U.S. is the U.S. 30-year benchmark yield, as reported in Economist.Com, as of August 2, 2003. There are minor changes in the IRPs when our 30-year forecasts are used instead in cases 4 and 5. The one-stage or constant growth DDM assumes that the growth rates in dividends, earnings and price growth are all equal and constant over time. The implied market return (%) is the long bond rate plus the IRP.

Case	Div. Yield %	Growth Estimate %	Long Bond Rate %	Implied Risk Premium or IRP %	Implied Market Return %
S&P/TSX Composite					
1	2.09	5.20	4.86	2.54	7.40
2	2.09	7.43	4.86	4.82	9.68
3	2.09	6.32	4.86	3.68	8.54
4	2.09	7.43	5.41	4.27	9.68
5	2.09	6.32	5.41	3.14	8.54
S&P500					
1	1.93	4.90	4.31	2.62	6.93
2	1.93	7.43	4.31	5.20	9.51
3	1.93	6.32	4.31	4.06	8.37
4	1.93	7.43	5.24	4.27	9.51
5	1.93	6.32	5.24	3.13	8.37

Schedule 4.11

This table provides the rolling five-year betas for our sample of ten utilities. If thin or no trading plagues any five-year period, we do not calculate a beta for that utility. This was the case for Emera for the first three rolling five-year time periods, for Pacific Northern Gas for the first six rolling five-year time periods, and Enbridge for the first two rolling five-year time periods. All betas are calculated using monthly total returns for the utility and the S&P/TSX Composite index.

Five-year period	Terasen[c]	Cdn Utilities	Emera[a]	Pacific Northern Gas	TransAlta Corp.	Trans Canada Pipe	Duke[b]	Enbridge Inc.	Atco Ltd.	Fortis Inc.	Mean	Mean, w/o Duke	Mean, w/o Atco	Mean, w/o Duke & Atco
1990-94	0.608	0.592			0.558	0.574	0.571		0.715	0.462	0.583	0.585	0.561	0.559
1991-95	0.635	0.498			0.606	0.540	0.557		0.712	0.533	0.583	0.587	0.561	0.562
1992-96	0.562	0.561			0.585	0.489	0.611	0.498	0.600	0.390	0.537	0.526	0.528	0.514
1993-97	0.474	0.634	0.405		0.462	0.338	0.531	0.440	0.546	0.310	0.460	0.451	0.449	0.438
1994-98	0.479	0.616	0.564		0.536	0.544	0.453	0.478	0.623	0.484	0.531	0.540	0.519	0.529
1995-99	0.352	0.530	0.414		0.265	0.224	0.253	0.237	0.509	0.320	0.345	0.357	0.325	0.335
1996-00	0.243	0.361	0.276	0.457	0.048	0.170	0.128	0.046	0.377	0.216	0.232	0.244	0.216	0.227
1997-01	0.168	0.249	0.276	0.437	0.061	-0.068	-0.098	-0.128	0.280	0.133	0.124	0.149	0.107	0.132
1998-02	0.115	0.184	0.155	0.453	0.082	-0.079	-0.011	-0.199	0.210	0.132	0.104	0.117	0.093	0.106
Mean	0.404	0.469	0.337	0.449	0.356	0.304	0.333	0.196	0.508	0.331	0.389	0.395	0.373	0.378
										First four rolling periods	0.541	0.537	0.525	0.518
										Last five rolling periods	0.267	0.281	0.252	0.266

[a]Holding company for Nova Scotia Power. [b]Holding company for Westcoast Energy. [c]Formerly B.C. Gas.

Schedule 4.12

This table provides the rolling five-year correlations for our sample of ten utilities with the market. If thin or no trading plagues any five-year period, we do not calculate a correlation for that utility. This was the case for Emera for the first three rolling five-year time periods, for Pacific Northern Gas for the first six rolling five-year time periods, and Enbridge for the first two rolling five-year time periods. All correlations (rhos) are calculated using monthly total returns for the utility and the S&P/TSX Composite index. The mean relative standard deviations (MRSD) of the sample of utilities to the market are also presented. The MRSD is run with and without TransCanada to examine the impact of its restructuring difficulties on relative risk during the period examined.

Five-year period	Terasen	Cdn Utilities	Emera	Pacific North. Gas	Trans Alta Corp.	Trans Canada Pipe	Duke	Enbridge Inc.	Atco Ltd.	Fortis Inc.	Mean Rho All In	Mean Rho Atco Out	Mean Rho Duke Out	Mean Rho Atco & Duke Out	MRSD TransCanada In	MRSD TransCanada Out
1990-94	0.571	0.581			0.458	0.492	0.407		0.468	0.485	0.495	0.483	0.509	0.517	1.193	1.198
1991-95	0.544	0.485			0.523	0.506	0.362		0.447	0.494	0.480	0.490	0.500	0.510	1.232	1.260
1992-96	0.513	0.512			0.579	0.481	0.415	0.440	0.439	0.391	0.471	0.476	0.479	0.486	1.148	1.166
1993-97	0.476	0.619	0.445		0.456	0.310	0.414	0.325	0.451	0.361	0.429	0.426	0.430	0.428	1.082	1.081
1994-98	0.557	0.655	0.605		0.553	0.464	0.440	0.442	0.571	0.603	0.543	0.540	0.556	0.554	0.986	0.963
1995-99	0.363	0.554	0.427		0.229	0.171	0.282	0.221	0.480	0.424	0.350	0.334	0.359	0.341	1.017	0.980
1996-00	0.238	0.358	0.300	0.289	0.043	0.117	0.114	0.042	0.291	0.311	0.210	0.201	0.221	0.212	1.134	1.098
1997-01	0.167	0.274	0.236	0.233	0.050	-0.049	-0.085	-0.110	0.237	0.188	0.114	0.101	0.136	0.124	1.146	1.120
1998-02	0.114	0.204	0.180	0.224	0.068	-0.058	-0.008	-0.201	0.173	0.180	0.087	0.078	0.098	0.089	1.161	1.141
Mean	0.394	0.472	0.366	0.249	0.329	0.270	0.260	0.165	0.395	0.382	0.353	0.348	0.365	0.362	1.122	1.112
First four rolling periods											0.469	0.469	0.480	0.485	1.164	1.176
Last five rolling periods											0.261	0.251	0.274	0.264	1.089	1.060

Source: *CFMRC*.

Schedule 4.13

This table reports the % issue fees for Canadian utilities based on issues over the five-year period, 1997-2001

Type of financing	Maturity[a]	Number of issues	Median %Fee	Amortization period in years	Annual Amortized % Fee
Debt	< 10 years	52	0.37		
Debt	> 10 years	52	0.50	20	0.025
Preferred		16	3.00	50	0.06
Common		15	4.00	50	0.08

Issuers with following SIC codes: 4612 (crude petroleum pipelines), 4911 (electric services), 4922 (natural gas transmission), 4923 (natural gas transmission and distribution), and 4924 (natural gas distribution). Debt maturity is measured as maturity date compared to announcement date of the issue.

Source: *Financial Post Data Group*.

Schedule 5.1

Debt Ratings for the Sample of Canadian Utilities
All ratings carry a stable trend unless otherwise noted.

Corporate Issuer	DBRS		Standard & Poor's Rating
	Rating	Debt Rated	
Canadian Utilities	A	Corporate	A+[1]
Emera Incorporated	BBB (high)	MTN	BBB+[1]
Enbridge Inc.	A	MTN and Debentures	A-[2]
Fortis Inc.	BBB (high)	Unsecured Debentures	A-[1]
Pacific Northern Gas	BB (high)[3]	Secured Debentures	NR
Terasen Gas	A	Corporate MTN and Debentures	BBB
TransAlta Corp.	BBB (high)[2]	Unsecured debt/ MTN	BBB-
TransCanada Corporation	A	Unsecured Debentures & Notes	A-[2]
Average	A (low)		BBB+

Sources: Dominion Bond Rating Service website: www.dbrs.com; Standard & Poor's website: www.standardandpoors.com, August 13, 2003.

[1] Watch list, negative
[2] Negative
[3] Positive

Schedule 5.2

Debt Ratings for a Broader Sample of Canadian Utilities
All ratings carry a stable trend unless otherwise noted. Sources: Dominion Bond Rating Service website: www.dbrs.com; Standard & Poor's website: www.standardandpoors.com, August 13, 2003.

Corporate Issuer	DBRS		Standard & Poor's Rating
	Rating	Debt Rated	
AltaGas Services	BBB (low)	MTN	BBB-[4]
AltaLink	A (high)	Senior Secured	BBB
Aquila Networks Canada (British Columbia) Inc.	BBB (high)	Secured Debentures	NR
Enbridge Gas Distribution	A	Senior Unsecured	A-[4]
Epcor Utilities	A (low)	Senior Unsecured	BBB+
Gaz Metropolitain	A	First Mortgage Bonds and Secured Debt	A-
Hydro One	A[4]	Senior Unsecured	A-[4]
Maritime Electric	NR		A-[5]
Newfoundland Power	A	First Mortgage	A-[5]
NOVA Gas Transmission	A	MTN and Unsecured Debentures	A-[4]
Union Gas	A	Unsecured Debentures	BBB+[4]
Westcoast Energy	A (low)	Senior Unsecured	BBB+
Average	A (low)		BBB+

[4] Negative
[5] Watch list, negative

Schedule 5.3

Capital Structures for the Sample of Canadian Utilities 2000-2002 (percentage of long-term capital)

Utility:	Long-term debt & debentures			Preferred Shares			Common Equity		
	2002	**2001**	**2000**	**2002**	**2001**	**2000**	**2002**	**2001**	**2000**
CANADIAN UTILITIES	54.23%	56.09%	56.50%	9.64%	7.46%	7.85%	36.14%	36.45%	35.66%
EMERA INCORPORATED	51.61%	54.03%	54.16%	0.00%	0.00%	0.00%	48.39%	45.97%	45.84%
ENBRIDGE INC.	63.83%	67.76%	68.53%	1.32%	1.43%	1.54%	34.84%	30.81%	29.93%
FORTIS INC.	61.98%	64.19%	63.93%	0.00%	0.00%	0.00%	38.02%	35.81%	36.06%
PACIFIC NORTHERN GAS	55.73%	50.75%	53.36%	3.09%	3.19%	3.25%	41.18%	46.06%	43.39%
TERASEN GAS	64.66%	75.22%	72.09%	0.00%	0.00%	0.00%	35.34%	24.78%	27.91%
TRANSALTA CORPORATION	57.66%	58.73%	56.18%	0.00%	0.00%	0.00%	42.34%	41.27%	43.82%
TRANS CANADA CORPORATION	63.69%	66.26%	68.22%	2.41%	2.37%	2.31%	33.90%	31.37%	29.47%
Average	**59.17%**	**61.63%**	**61.62%**	**2.06%**	**1.81%**	**1.87%**	**38.77%**	**36.56%**	**36.51%**

Source: Calculated with data from *Stock Guide*.

Schedule 5.4

Total Debt to Total Assets Ratio for sample utilities 2000-2002.

Utility	Total Debt/Total Assets		
	2002	2001	2000
CANADIAN UTILITIES	55.46%	56.37%	60.42%
EMERA INCORPORATED	54.05%	58.52%	57.39%
ENBRIDGE INC.	58.94%	67.22%	62.81%
FORTIS INC.	63.87%	65.43%	61.11%
PACIFIC NORTHERN GAS	55.79%	49.20%	60.54%
TERASEN GAS	65.68%	74.67%	75.35%
TRANSALTA CORPORATION	52.84%	54.28%	59.34%
TRANS CANADA CORPORATION	61.72%	63.99%	51.53%
Average	**58.54%**	**61.21%**	**61.06%**

Source: Calculated with data from *Stock Guide*.

Schedule 5.5

Coverage ratios, allowed and earned ROEs for selected utilities 2000-2002

Utility	Interest Coverage			Cash Flow to Debt			ROE		
	2002	2001	2000	2002	2001	2000	2002	2001	2000
CANADIAN UTILITIES	3.79	3.10	3.15	0.17	0.19	0.18	17.56	14.96	15.44
EMERA INCORPORATED	1.67	2.15	2.09	0.13	0.11	0.15	6.65	10.58	10.88
ENBRIDGE INC.	2.11	2.15	2.01	0.10	0.09	0.09	20.08	18.85	18.11
FORTIS INC.	2.32	2.28	2.00	0.11	0.13	0.10	12.23	12.44	9.73
PACIFIC NORTHERN GAS	2.50	2.31	2.33	0.15	0.17	0.16	5.94	7.50	9.75
TERASEN GAS	2.09	1.99	2.07	0.09	0.08	0.09	10.82	12.09	16.60
TRANSALTA CORP.	2.41	4.33	4.46	0.14	0.18	0.19	9.43	10.87	14.75
TRANS CANADA CORP.	2.38	2.24	2.00	0.16	0.13	0.12	13.37	11.62	13.56
Average	**2.41**	**2.57**	**2.51**	**0.13**	**0.14**	**0.14**	**12.01**	**12.36**	**13.60**

Source: *Stock Guide*.

Schedule 5.6

Comparison of Predicted versus Actual Bond Ratings

.

	Predicted Bond Rating						
Actual Bond Rating		**AAA**	**AA**	**A**	**BBB**	**Lower**	**Total**
	AAA	0	0	0	0	0	0
	AA	0	1	4	0	0	5
	A	15	9	24	23	13	84
	BBB	3	4	15	31	40	93
	Lower	0	0	0	0	0	0
	Total	18	14	43	54	53	182

This schedule summarizes predicted vs. actual bond ratings for 182 U.S investment grade utilities drawn from Schedules 3-6 in Ms. McShane's capital structure evidence. These tables provide the actual debt rating, S&P business profile score, and total debt / capitalization ratio for each utility. We compared the debt ratio against the target debt ratio for the business profile score in Standard & Poor's *Corporate Rating Criteria* for U.S. utilities. We then assigned a predicted rating based on this comparison.

Schedule 5.7

Allowed Common Equity Ratios for a Broader Sample of Canadian Utilities 2003
Sample utilities are in **bold.** Source: Board decisions.

Utility	Allowed	Decision
ALTAGAS UTILITIES	41.00%	AEUB2002-027
ALTALINK	34.00%	AEUB2003-061
AQUILA NETWORKS CANADA (BRITISH COLUMBIA) INC.	40.00%	L-46-02
CANADIAN UTILITIES		
ATCO ELECTRIC	35.70%	U97065
ATCO GAS & PIPELINES	39.23%	2001-96
EMERA INCORPORATED	**35.00%**	**NSUARB-P-875**
ENBRIDGE GAS DISTRIBUTION	35.00%	RP-2001-0032
ENBRIDGE INC.	**35.00%**	**RP-2000**
FORTIS INC.		
NEWFOUNDLAND POWER	44.55%	PU 19(2003)
GAZ METROPOLITAIN	38.50%	D-2002-196
MARITIME ELECTRIC	40.00%	EC2001-608
PACIFIC NORTHERN GAS	**36.00%**	**G-109-1**
TERASEN GAS	**33.00%**	**G-109-1**
TRANSALTA CORPORATION	**41.00%**	**U99099**
TRANS CANADA CORPORATION	**33.00%**	**RH-4-2001**
TRANSQUEBEC & MARITIMES PIPELINE	30.00%	RH-2-94
UNION GAS	35.00%	RP-1999-0017
WESTCOAST ENERGY	35.00%	RH-2-94
Average of broader sample (18 companies)	**36.72%**	
Average of Stock Guide sample (8 regulated companies)	**36.94%**	

Schedule 5.8

Risk Ranking and Capital Structures by Utility Sector

This table ranks sectors of the utilities industry in Alberta by business risk from the highest at the top of the table to the lowest at the bottom.

Sector	*Recommended Equity*
Electricity generation	N/A
Integrated electricity	N/A
Gas distribution	37%
Electricity distribution	35%
Gas transmission	32%
Electricity transmission	30%

Schedule 5.9

Recommended Equity Percentages by Company

Sector	Recommended	*Board Award*
Gas distribution	*37%*	
Altagas Utilities	40%	41%
ATCO Gas	37%	37%
Electricity distribution	*35%*	
Aquila (ANCA) Distribution	35%	Settled-no award
ATCO Electric Distribution	35%	Settled – no award
ENMAX Distribution	35%	
EPCOR Distribution	35%	
Gas transmission	*32%*	*32%*
ATCO Pipelines	40%	45.5% (South)
NGTL	32%	32%
Electricity transmission	*30%*	
Altalink	30%	34%
ATCO Transmission	30%	
EPCOR Transmission	30%	

Drs. Kryzanowski and Roberts, Generic Hearing, September 2003.

Schedule 5.10

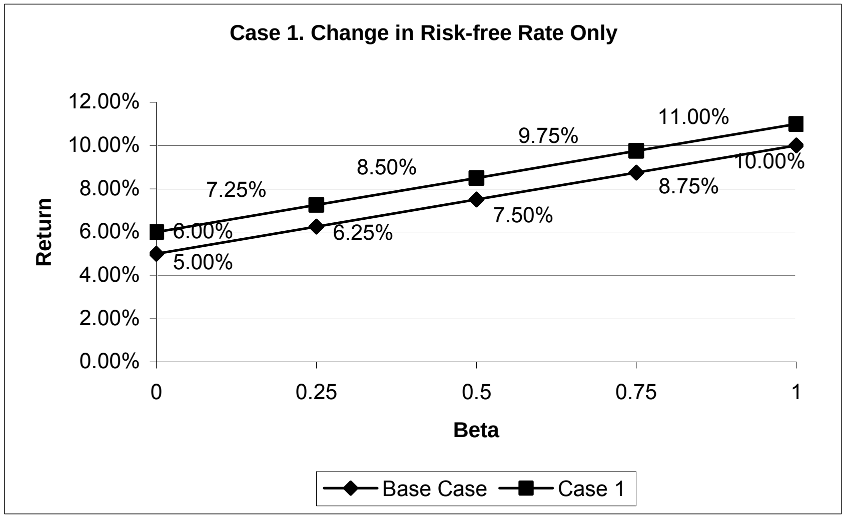
Parent Company 2002 Capital Structures for Selected Applicants

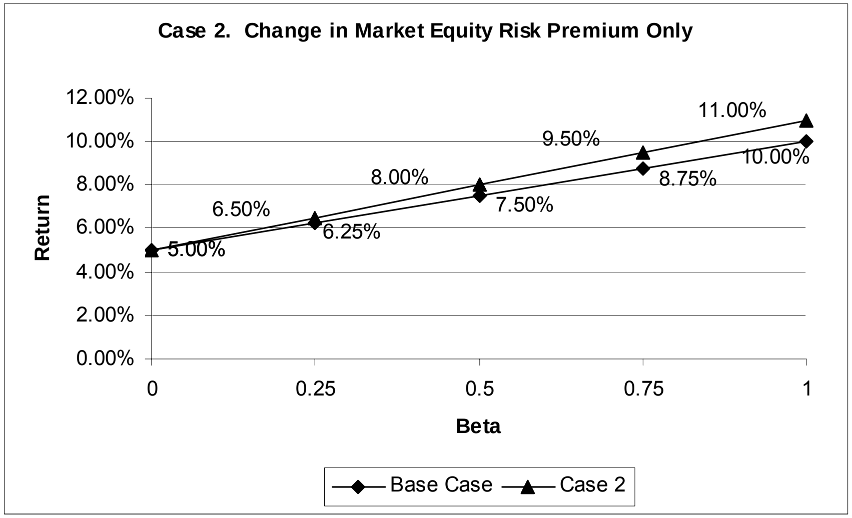
Applicant Company	*Recommended Common Equity*	*Listed Parent*	*Parent Common Equity Ratio*
Altagas Utilities	40%	Altagas Services	44.59%
ATCO			
ATCO Gas	37%	Canadian Utilities	36.14%
ATCO Electric DISCO	35%		
ATCO Pipelines	40%		
ATCO Electric TRANSCO	30%		
Aquila Networks Canada Alberta DISCO	35%	Aquila Inc.	33.2%
NGTL	32%	TransCanada Corp.	33.90%

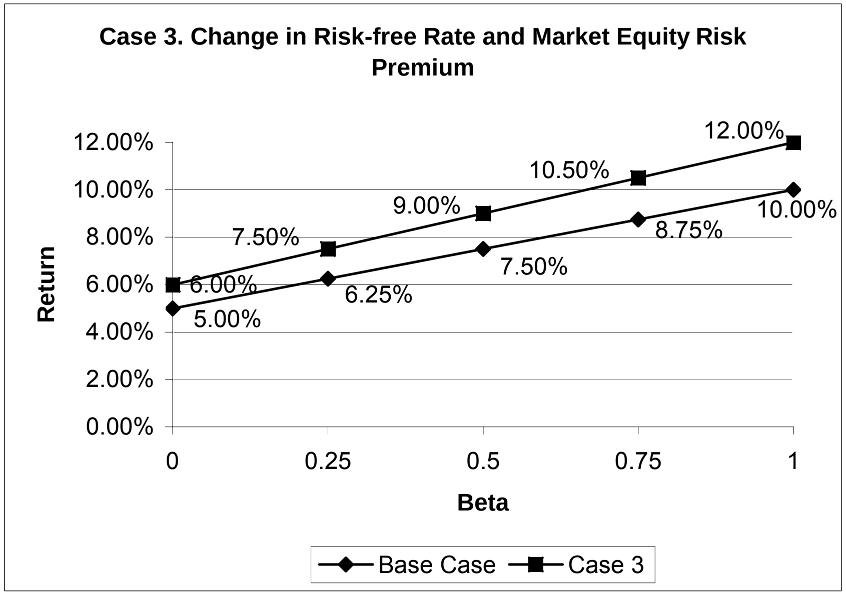
Drs. Kryzanowski and Roberts, Generic Hearing, September 2003.

Schedule 6.1

This schedule depicts the changes in the Security Market Line or SML when only the risk-free rate changes, when only the market equity risk premium or ERP changes, and with both of these changes.







Drs. Kryzanowski and Roberts, Generic Hearing, September 2003.

Schedule 6.2

This schedule reports summary results for OLS regressions of changes in annual market equity risk premium for Canada against various potential determinants. The market equity risk premiums (ERP) are obtained using the data available from the Canadian Institute of Actuaries. DivYld refers to the Dividend Yield on the S&P/TSX Composite (Cansim v122628 - Table 176-0047), LtCanYld refers to the Long-Term Canada Yield (Cansim v122544 - Table 176-0043), DefPrem refers to the Default Premium and is obtained by subtracting the yield on Long-term Canada (Cansim v122544 - Table 176-0043) from the Scotia McLeod Long-term Corporate (Cansim v122518 - Table 176-0043), 1mTbYld refers to the One-month T-bill Yield (Cansim v122529 - Table 176-0043), and1yTbYld refers to the One-year T-bill Yield (Cansim v122533 - Table 176-0043). The data are for the 25-year period 1978-2002. *, ** and *** indicate significance at the 0.10, 0.05 and 0.01 levels, respectively. Reg. refers to the regression run number.

Reg.	Determinant	Coefficient Estimate	Coefficient P-value	Adj. R^2
1	ΔDivYld	-40.2082	0.0009***	0.3626***
2	ΔLtCanYld	3.1556	0.4462	-0.0169
3	ΔDefPrem	-29.6273	0.0970*	0.0767*
4	Δ1mTbYld	-1.3363	0.6272	-0.0356
5	Δ1yTbYld	0.7085	0.7955	-0.0442

Schedule 6.3

This schedule reports summary results for OLS regressions of changes in monthly market equity risk premium for Canada against various potential determinants. The market equity risk premiums (ERP) are obtained using the data available from the CFMRC. The potential determinants and their data sources are as described in Schedule 6.2. In the multivariate regressions, Δ1yTbYld is omitted due to its high correlation with both ΔltCanYld and Δ1mTbYld.

		02/1982-12/2002			02/1982-12/1990			02/1991-12/2002		
		Coefficient			Coefficient			Coefficient		
Reg	Determinant	Estimate	P-value	Adj. R^2	Estimate	P-value	Adj. R^2	Estimate	P-value	Adj. R^2
Panel A: Simple or Univariate Regressions										
1	ΔDivYld	-9.3329	0.0020	0.0308	-8.4915	0.0193	0.0343	-13.5588	0.0458	0.0209
2	ΔLtCanYld	1.5510	0.0933	0.0067	1.2529	0.2604	0.0021	3.0296	0.1386	0.0084
3	ΔDefPrem	-7.8631	0.0094	0.0209	-12.9223	0.0005	0.0833	9.8271	0.0938	0.0127
4	Δ1mTbYld	-0.7618	0.2089	0.0021	-0.9402	0.2299	0.0035	-0.2955	0.7782	-0.0065
5	Δ1yTbYld	0.4877	0.4031	-0.0011	0.4137	0.5796	-0.0054	0.7040	0.4965	-0.0038
Panel B: Multivariate Regressions										
6	ΔDivYld	-9.1996	0.0040	0.0531	-6.1595	0.1038	0.1001	-17.5831	0.0109	0.0619
	ΔLtCanYld	2.1013	0.0306		1.1623	0.3147		4.0944	0.0481	
	ΔDefPrem	-4.3628	0.1659		-10.8488	0.0061		14.5731	0.0173	
	Δ1mTbYld	-0.7417	0.2225		-1.0650	0.1648		-1.1274	0.3055	

Schedule 6.4

This schedule provides summary statistics on the historical simulation of various automatic ROE adjustment mechanisms. The three adjustment formulas simulated herein are:

$\Delta ROE = \{X\ x\ (LtCanYld_t – LtCanYld_{BaseYear})\}$ (1)

$\Delta ROE = \{X\ x\ (LtCanYld_t – LtCanYld_{BaseYear})\} + \{Y\ x\ (DivYld_t – DivYld_{BaseYear})\}$ (2)

$\Delta ROE = \{X\ x\ (LtCanYld_t – LtCanYld_{BaseYear})\} + \{Y\ x\ \text{of}\ (DefPrem_t – DefPrem_{BaseYear})\}$ (3)

where X and Y are the adjustment factors; $LtCanYld_t$, $DivYld_t$ and $DefPrem_t$ are the forecasts of the yield for long Canadas, the dividend yield for the S&P/TSX Composite and the default premium, respectively, for year t subsequent to the base year; and $LtCanYld_{BaseYear}$, $DivYld_{BaseYear}$ and $DefPrem_{BaseYear}$ are their corresponding values, as determined by the Board for the base year 1997 . Since the Board has not determined $LtCanYld_{BaseYear}$, $DivYld_{BaseYear}$, or are future forecasts currently available for these variables, we use their actual realized values for each of the years. The current NEB formula is given by equation (1) when X = 0.75. The data sources are as in given in Schedule 6.2. The data are annual for the 25-year period 1978-2002. The base year is 1977 for this simulation. * indicates the NEB formula.

					X = Y = 1; ERP Determinant =			X = Y = 0.75; ERP Determinant =			X = Y = 0.50; ERP Determinant =		
Year	ERP	DivYld	DefPrem	LtCanYld	None	DivYld	DefPrem	None*	DivYld	DefPrem	None	DivYld	DefPrem
1977	4.74%	4.73%	0.60%	9.22%									
1978	28.43%	4.42%	0.47%	9.95%	0.73%	0.42%	0.60%	0.55%	0.31%	0.45%	0.36%	0.21%	0.30%
1979	47.39%	3.99%	0.45%	11.60%	2.38%	1.64%	2.23%	1.79%	1.23%	1.67%	1.19%	0.82%	1.12%
1980	28.08%	3.66%	0.59%	13.04%	3.82%	2.75%	3.81%	2.87%	2.06%	2.86%	1.91%	1.38%	1.91%
1981	-7.23%	4.49%	1.02%	15.52%	6.30%	6.06%	6.72%	4.73%	4.55%	5.04%	3.15%	3.03%	3.36%
1982	-37.44%	4.03%	1.01%	11.92%	2.70%	2.00%	3.11%	2.03%	1.50%	2.33%	1.35%	1.00%	1.56%
1983	25.89%	3.22%	0.66%	12.29%	3.07%	1.56%	3.13%	2.30%	1.17%	2.35%	1.54%	0.78%	1.57%
1984	-17.49%	3.70%	0.41%	11.99%	2.77%	1.74%	2.58%	2.08%	1.31%	1.94%	1.39%	0.87%	1.29%
1985	-0.20%	3.13%	0.87%	9.99%	0.77%	-0.83%	1.04%	0.58%	-0.62%	0.78%	0.39%	-0.42%	0.52%
1986	-8.58%	2.99%	1.38%	8.90%	-0.32%	-2.06%	0.46%	-0.24%	-1.55%	0.34%	-0.16%	-1.03%	0.23%
1987	5.43%	3.08%	0.84%	10.29%	1.07%	-0.58%	1.31%	0.80%	-0.44%	0.98%	0.53%	-0.29%	0.66%
1988	0.64%	3.36%	1.13%	10.00%	0.78%	-0.59%	1.31%	0.59%	-0.44%	0.98%	0.39%	-0.30%	0.66%
1989	5.08%	3.25%	1.38%	9.37%	0.15%	-1.33%	0.93%	0.11%	-1.00%	0.70%	0.07%	-0.67%	0.46%
1990	-18.14%	3.83%	1.34%	10.40%	1.18%	0.28%	1.92%	0.89%	0.21%	1.44%	0.59%	0.14%	0.96%
1991	-12.41%	3.18%	1.17%	9.00%	-0.22%	-1.77%	0.35%	-0.17%	-1.33%	0.26%	-0.11%	-0.89%	0.17%
1992	-14.51%	3.05%	1.34%	8.36%	-0.86%	-2.54%	-0.12%	-0.65%	-1.91%	-0.09%	-0.43%	-1.27%	-0.06%

Schedule 6.4 Continued.

					X = Y = 1; ERP Determinant =			X = Y = 0.75; ERP Determinant =			X = Y = 0.50; ERP Determinant =		
Year	ERP	DivYld	DefPrem	LtCanYld	None	DivYld	DefPrem	None*	DivYld	DefPrem	None	DivYld	DefPrem
1993	9.67%	2.26%	0.74%	7.28%	-1.94%	-4.41%	-1.80%	-1.46%	-3.31%	-1.35%	-0.97%	-2.21%	-0.90%
1994	10.28%	2.39%	0.82%	9.13%	-0.09%	-2.43%	0.13%	-0.07%	-1.82%	0.10%	-0.04%	-1.22%	0.06%
1995	-11.75%	2.27%	0.49%	7.63%	-1.59%	-4.05%	-1.70%	-1.19%	-3.04%	-1.28%	-0.80%	-2.03%	-0.85%
1996	14.05%	1.83%	0.26%	7.09%	-2.13%	-5.03%	-2.47%	-1.60%	-3.77%	-1.85%	-1.07%	-2.52%	-1.24%
1997	-2.47%	1.64%	0.47%	5.95%	-3.27%	-6.36%	-3.40%	-2.45%	-4.77%	-2.55%	-1.64%	-3.18%	-1.70%
1998	-15.72%	1.66%	0.83%	5.23%	-3.99%	-7.06%	-3.76%	-2.99%	-5.30%	-2.82%	-2.00%	-3.53%	-1.88%
1999	38.86%	1.31%	0.99%	6.23%	-2.99%	-6.41%	-2.60%	-2.24%	-4.81%	-1.95%	-1.50%	-3.21%	-1.30%
2000	-6.23%	1.26%	1.48%	5.56%	-3.66%	-7.13%	-2.78%	-2.75%	-5.35%	-2.09%	-1.83%	-3.57%	-1.39%
2001	-16.50%	1.54%	1.36%	5.69%	-3.53%	-6.72%	-2.77%	-2.65%	-5.04%	-2.08%	-1.77%	-3.36%	-1.39%
2002	-22.53%	1.90%	1.31%	5.42%	-3.80%	-6.63%	-3.09%	-2.85%	-4.97%	-2.32%	-1.90%	-3.32%	-1.55%
Mean	1.05%	2.86%	0.91%	9.11%	-0.11%	-1.98%	0.21%	-0.08%	-1.48%	0.15%	-0.05%	-0.99%	0.10%
Median	-1.34%	3.08%	0.87%	9.13%	-0.09%	-1.77%	0.46%	-0.07%	-1.33%	0.34%	-0.04%	-0.89%	0.23%
Std. Dev.	20.20%	0.99%	0.37%	2.71%	2.71%	3.62%	2.65%	2.03%	2.71%	1.99%	1.35%	1.81%	1.33%
Max	47.39%	4.49%	1.48%	15.52%	6.30%	6.06%	6.72%	4.73%	4.55%	5.04%	3.15%	3.03%	3.36%
Min	-37.44%	1.26%	0.26%	5.23%	-3.99%	-7.13%	-3.76%	-2.99%	-5.35%	-2.82%	-2.00%	-3.57%	-1.88%

Schedule 6.5

This schedule provides summary statistics on the historical simulation of our recommended automatic ROE adjustment mechanism given by equation (2) below where X is equal to 0.75 and Y is equal to 0.50, and one that is somewhat more aggressive in terms of adjusting the equity risk premium so that Y is now equal to 0.75. It also provides the ROE values using the NEB formula (1) below, where X is equal to 0.75. The adjustment formulas simulated herein are:

$$\Delta ROE = \{X\ x\ (LtCanYld_t - LtCanYld_{BaseYear})\} \quad (1)$$

$$\Delta ROE = \{X\ x\ (LtCanYld_t - LtCanYld_{BaseYear})\} + \{Y\ x\ (DivYld_t - DivYld_{BaseYear})\} \quad (2)$$

where X and Y are the adjustment factors; $LtCanYld_t$, and $DivYld_t$ are the forecasts of the yield for long Canadas and for the dividend yield for the S&P/TSX Composite, respectively, for year t subsequent to the base year; and $LtCanYld_{BaseYear}$ and $DivYld_{BaseYear}$ are their corresponding values, as "determined by the Board" for the base year 1995. Since the Board has not determined $DivYld_{BaseYear}$ or are future forecasts currently available for these variables, we use their actual realized values for each of the years. The data sources are as in given in Schedule 6.2, and are obtained from various decisions of the NEB on the ROE for class 1 pipelines. The data are annual for the period 1995-2002. The base year is 1995 for this simulation. * indicates the NEB formula.

	NEB Determination				Our Proposed Formula, X = 0.75; Y = 0.5		More Aggressive Version of Our Proposed Formula, X = Y = 0.75	
Year	LongCanada Yield Forecast	ΔROE Over Base Year	Allowable ROE	DivYld Forecast	ΔROE Over Base Year	Allowable ROE	ΔROE Over Base Year	Allowable ROE
1995	9.25		12.25	2.27				
1996	7.92	-1.00	11.25	1.83	-1.22	11.03	-1.33	10.92
1997	7.14	-1.58	10.67	1.64	-1.90	10.36	-2.05	10.20
1998	6.53	-2.04	10.21	1.66	-2.35	9.91	-2.50	9.75
1999	5.69	-2.67	9.58	1.31	-3.15	9.10	-3.39	8.86
2000	6.12	-2.35	9.90	1.26	-2.85	9.40	-3.11	9.15
2001	5.73	-2.64	9.61	1.54	-3.01	9.25	-3.19	9.06
2002	5.63	-2.72	9.53	1.90	-2.90	9.35	-2.99	9.26
2003	5.98	-2.46	9.79	???				

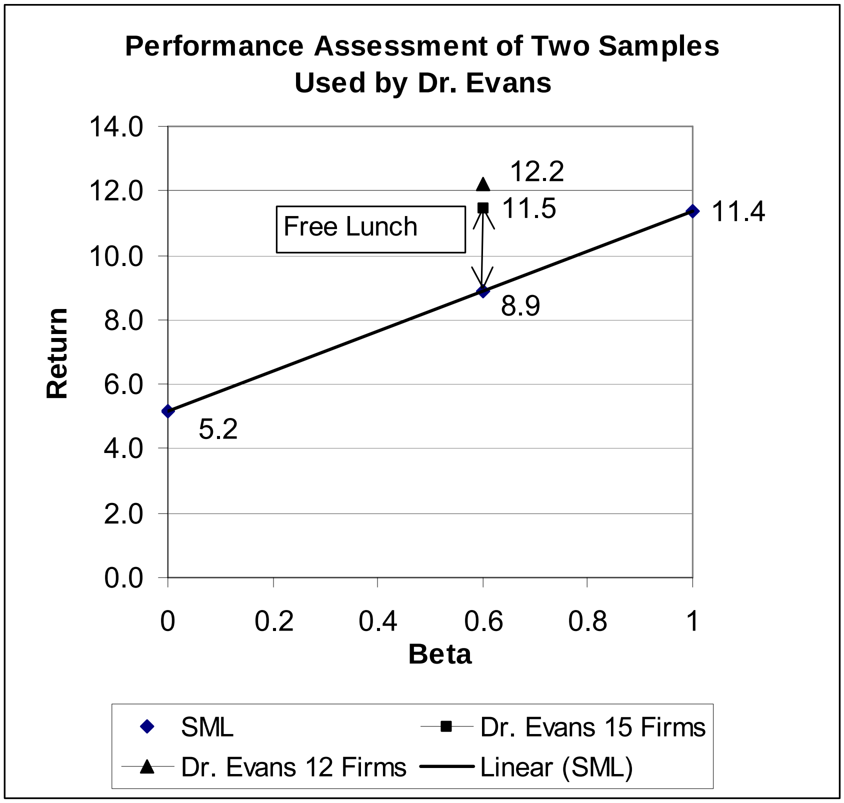
Schedule 7.1

The investment performances of the two samples of firms used by Dr. Evans to calculate realized risk premia are reported in this schedule. The abnormal returns are based on the actual return of each sample less the return that one would have expected given a beta of 0.6. Using our estimate of the average-risk utility beta of 0.5 would have produced larger abnormal returns for each sample.

	Raw returns				Abnormal Returns	
			Evans Sample		Evans Sample	
Year	T-bill	Market	15 Firms	12 Firms	15 Firms	12 Firms
1992	6.50	-1.43	7.5	9.5	5.76	7.76
1993	5.28	32.55	10.3	11.5	-11.34	-10.14
1994	5.33	-0.18	14.6	14.9	12.58	12.88
1995	7.44	14.53	13.2	12	1.51	0.31
1996	4.49	28.35	15.5	14.2	-3.30	-4.60
1997	3.30	14.98	13.7	12.5	3.39	2.19
1998	4.81	-1.58	12.3	11.5	11.33	10.53
1999	4.83	31.71	11.2	9.8	-9.76	-11.16
2000	5.63	7.41	9.5	15	2.80	8.30
2001	4.14	-12.6	6.9	11	12.79	16.89
Mean	5.17	11.38	11.47	12.19	2.58	3.30

Schedule 7.2

The investment performances of the two samples of firms used by Dr. Evans to calculate realized risk premia are reported in this schedule. Please see Schedule 7.1 for greater details.



Schedule 7.3

Comparison of Witnesses Rate of Return Evidence Against Adjustment Formulas

Source	Long-Canada Forecast	Recommended Return	Risk Premium (Basis Points)
I. Witnesses			
Kryzanowski/ Roberts	5.60%	8.05%	245
Evans	5.60%	10.50 – 11.25%	490 - 565
McShane	5.75%	11.00 – 11.50%	525 - 575
Neri	6.15%	10.75 – 11.25%	460 - 510
Vilbert/Kolbe	5.65%	10.25 – 11.25%	460 - 585
II. Regulatory Boards			
NEB[6]	5.60%	9.51%	391
OEB[7]	5.60%	9.41	381
BCUC[8]	5.60%	9.10%	350
Manitoba PUB[9]	5.60%	9.27	367
Newfoundland PUB[10]	5.60%	9.07	347
Average for Boards	**5.60%**	**9.27**	**367**

[6] 5.60 + 3.00 +.25(9.25 – 5.60)
[7] 5.60 + 3.40 +.25(7.25 – 5.60)
[8] 5.60 + 3.50
[9] 5.60 + 3.00 + .20(9.12 – 5.75)
[10] 5.60 + 3.50 + .20(5.60- 5.75)

APPENDICES

APPENDIX 1.A

BRIEF CURRICULUM VITAE FOR LAWRENCE KRYZANOWSKI

Dr. Lawrence Kryzanowski is currently a Full Professor of Finance and Ned Goodman Chair in Investment Finance at Concordia University. He also was until June 2002 the Co-Director of the Concordia-McGill-Xiamen (CMX) Project of the Canada-China University-Industry Partnership Program in Financial Services. He is currently a Fellow at CIRANO, a member of CIRPÉE, a Principal Researcher at CREF, and a scientific committee member of Institut de Finance Mathématique de Montréal (IFM2). He has been a visiting scholar at the University of British Columbia, a research associate at the University of Rochester, and a resident consultant at the Federal Department of Finance.

Dr. Kryzanowski has extensive experience teaching undergraduates, MBA, MSC and Ph.D. students, and executives for the Institute of Canadian Bankers, Shanghai Banking Institute, CMX, Concordia University, Dalhousie University, McGill University and York University. Dr. Kryzanowski has extensive experience in developing or managing the development of instructional textbooks for the Institute of Canadian Bankers (ICB) and the Canadian Securities Institute (CSI), which includes the *Investment and Portfolio Management* text for the ICB, and the *Canadian Securities Course* text for the CSI.

Dr. Kryzanowski is an active educator, mentor, consultant and expert witness in financial economics, including investment management, risk pricing and management, and regulation and operations of global financial markets, institutions and participants. He is author or co-author of over 80 refereed journal articles and seven books or monographs. Dr. Kryzanowski is the first recipient of Prix ACFAS/Caisse de dépôt et placement du Québec, which recognizes an exceptional contribution to research in finance. During the past few years, Dr. Kryzanowski was inaugural recipient, with co-authors, of the BGI Canada Award and OSFI Award (latter with Dr. Roberts) for excellence in research on capital markets and on regulation of financial institutions, respectively. His eleven other paper awards for co-authored work are from the *Multinational Finance Journal* and various North American academic conferences. Dr. Kryzanowski is a former co-editor of finance with Dr. Roberts at the *Canadian Journal of Administrative Studies*, and founding chairperson of the Northern Finance Association. Dr. Kryzanowski is currently an Editor of the *Multinational Finance Journal*, an Associate Editor of the *International Review of Financial Analysis*, and is on the editorial boards of the *Canadian Investment Review* and *Finance India*.

Dr. Kryzanowski has experience in preparing evidence as an expert witness in utility rate of return applications, stock market insider trading court proceedings, and confidential final offer arbitration hearings for setting of fair rates for the movement of various products by rail. Together with Dr. Roberts, he prepared a report and briefed counsel on rate of return considerations in the pipeline application in 1997 of Maritimes and Northeast, and prepared evidence on the fair return on equity and the recommended capital structure for the 2001/2002 Distribution Tariff Application (DTA) of Atco Electric and the 2001/2002 DTA and the 2002 DTA (No. 1250392) of Utilicorp Networks Canada (Alberta) Ltd. before the Alberta Energy and Utilities Board. Together with Dr. Roberts, and on behalf of the Province of Nova Scotia, he provided evidence and testified before the Nova Scotia Utility and Review Board in the matter of Nova Scotia Power Inc. in 2002. Together with Dr. Roberts, and on behalf of the Fédération canadienne de l’entreprise indépendante (“FCEI”) / Union des municipalities du Québec (“UMQ”) & Option consommateurs (“OC”), he prepared testimony and testified on capital structure and fair return on equity in the matter of Hydro Québec Distribution before the Régie de l’Energie du Québec in 2003.

Dr. Kryzanowski is often sought for his technical ability and advice on various matters in financial economics. He has consulted for the Superintendent of Financial Institutions, Federal Department of Finance, CMHC, CDIC, External Affairs Canada, Canada Investment and Savings, Hydro Quebec, National Bank, Bombardier, and others.

Dr. Kryzanowski received a B.A. in Economics and Mathematics from the University of Calgary and earned his Ph.D. in Finance at the University of British Columbia.

BRIEF CURRICULUM VITAE FOR GORDON S. ROBERTS

Dr. Gordon S. Roberts is currently CIBC Professor of Financial Services and Area Coordinator, Finance Area, at York University's Schulich School of Business. Prior to joining York University, he was Bank of Montreal Professor of Finance at the School of Business, Dalhousie University. Dr. Roberts has held positions as Visiting Professor and Visiting Scholar at Tilburg University (the Netherlands), Deakin University (Melbourne, Australia), University of Toronto, University of Arizona, Xiamen University (China) and the University of Zimbabwe.

In addition to teaching undergraduates, MBA and Ph.D. students at these universities, Dr. Roberts has extensive experience in executive teaching for the Institute of Canadian Bankers and in the Pension Investment Management School sponsored by the Schulich School jointly with pension consulting firms William Mercer Inc. and Frank Russell.

An active researcher in the areas of corporate finance, bond investments and financial institutions, Dr. Roberts is author or co-author of over forty journal articles and three corporate finance textbooks. In 2000, he shared with Dr. Kryzanowski the OSFI award for excellence in research on the regulation of financial institutions. Dr. Roberts is a former co-editor of finance with Dr. Kryzanowski of the *Canadian Journal of Administrative Studies*. He is currently an Associate Editor of the *Journal of Banking and Finance*, and serves on the editorial boards of *FINECO* and the *Banking and Finance Law Review*.

Dr. Roberts is experienced in preparing evidence for utility rate of return hearings. From 1995–1997 he submitted prefiled testimony as a Board witness in rate hearings for Consumers' Gas. In 1996, he served as an expert advisor to the Ontario Energy Board in its Diversification Workshop. In 1997, he co-prepared (with Dr. Kryzanowski) a report for the Calgary law firm, MacLeod Dixon, on rate of return considerations in the pipeline application by Maritimes and Northeast. With Dr. Kryzanowski, he filed evidence on three electricity regulatory matters in Alberta in 2001, evidence on regulatory matters before the Alberta Energy and Utilities Board and the Nova Scotia Utility and Review Board in 2002, and evidence on regulatory matters dealing with Hydro Quebec Distribution in 2003.

Often sought for his advice on financial policy, Dr. Roberts has consulted for the Superintendent of Financial Institutions, the federal Department of Finance, Canada Investment and Savings, Canada Mortgage and Housing Corporation, and Canada Deposit Insurance Corporation, among others.

Dr. Roberts received a B.A. in Economics from Oberlin College and earned his Ph.D. at Boston College. He has been listed in the Canadian Who's Who since 1990.

APPENDIX 4.A

SHOULD THE ARITHMETIC OR GEOMETRIC MEAN BE USED TO ESTIMATE IMPLIED RISK PREMIA USING HISTORICAL REALIZED RETURNS?

1. The Choice:

It is preferable to use the geometric average (mean) historical risk premium when measuring historical holding period performance. The reason is that the geometric mean exactly represents the constant rate of return that is needed in each year to exactly match actual performance over that past investment period.[1] This is the reason why Canadian mutual funds are required to disclose compound rates of return, which is just a different name for a geometric mean return. Similarly, the annual yield-to-maturity quoted on a long-term bond is an annual geometric return.

It is preferable to use the arithmetic mean historical market risk premium when making investment decisions for a one-period investment horizon when the investment horizon is identical to the interval of time over which the historical returns are measured. The reason is that the arithmetic mean is an unbiased estimate of an investment's expected future risk premium for a single period investment horizon. Thus, if historical market equity risk premia are measured using annual returns, then the future investment horizon should be one year.

The arithmetic mean also is preferred when historical returns are normal IID or independently and identically distributed over the estimation period. This is the assumption implicitly invoked by the advocates of the use of the arithmetic average, such as Drs. Brealey and Myers, and Drs. Dimson, Marsh and Staunton (2003), and

---

[1] The superiority of the geometric mean over the arithmetic mean is easily shown using an example drawn from L. Kryzanowski, *Investment and Portfolio Management* (Montreal: Institute of Canadian Bankers, 1996), p. 82. The example concerns the investment portfolio of Mr. John Velco whose investment portfolio increases from $200,000 to $400,000 during the first year for an annual return of 100%, and then returns to its original $200,000 value during the second year for an annual return of –50%. The arithmetic and geometric mean annual returns are 25% and 0%. Of course, the correct constant annual return has to be 0% since the beginning and ending portfolio values are identical.

others, when they recommend the use of the arithmetic mean of historical premiums as the looking-forward expected equity risk premium.[2] Unfortunately, the normal IID assumption is not appropriate for asset returns over long estimation periods. This assumption suffers from various important drawbacks. First, even if single-period returns are assumed to be normal, then multiperiod returns cannot also be normal since they are products (not sums) of the single-period returns. Second, several studies using longer-horizon or multi-year returns conclude that there is substantial mean-reversion (i.e., negative serial correlation) in stock market prices at longer horizons.[3] Third, the plausibility of the assumption that returns are IID diminishes as the estimation time period gets longer. Drs. Campbell, Lo and MacKinlay state this as follows:[4]

> "…the assumption of identically distributed increments is not plausible for financial asset prices over long time spans. For example, over the two-hundred-year history of the New York Stock Exchange, there have been countless changes in the economic, social, technological, institutional, and regulatory environment in which stock prices are determined. The assertion that the probability law of daily stock returns has remained the same over this two-hundred period is simple implausible."

The geometric mean or some weighted-average of the geometric and arithmetic mean are preferred when returns are not normal IID due to, for example, long-run mean reversion in some asset returns (as has been found for stocks) and in market equity risk premia, and mean aversion in others (as has been found for bonds). Dr. Siegel notes that his work on the risk premium using data for the period 1802-2001 provides support for mean reversion for a 30-year horizon (i.e., the horizon used for Long Canada's in rate of return regulation).[5] We provide further empirical support for mean reversion in both Canadian and American equity risk premia in section IV of our evidence.

---

[2] Elroy Dimson, Paul Marsh and Mike Staunton, Global evidence on the equity risk premium, forthcoming *Journal of Applied Corporate Finance* 15:4 (Summer 2003), p. 15.
[3] For examples, see E. Fama and K. French, 1988, Permanent and Temporary Components of Stock Prices, *Journal of Political Economy* 96, pp. 246-273; and J. Poterba and L. Summers, 1986, Mean reversion in stock returns: Evidence and implications, *Journal of Financial Economics* 22, pp. 27-60.
[4] John Y. Campbell, Andrew W. Lo and A. Craig MacKinlay, 1997, *The Econometrics of Financial Markets* (Princeton, New Jersey: Princeton University Press), pp. 32-33.
[5] Jeremy J. Siegel, Historical results: Discussion, *Equity Risk Premium Forum*, November 8, 2001, p. 46.

Dr. John Campbell at a recent *Equity Risk Forum* has aptly stated this argument as follows:[6]

> "Which is the right concept, arithmetic or geometric? Well, if you believe that the world is identically and independently distributed and that returns are drawn from the same distribution every period, the theoretically correct answer is that you should use the arithmetic average. Even if you're interested in a long-term forecast, take the arithmetic average and compound it over the appropriate horizon. However, if you think the world isn't i.i.d., the arithmetic average may not be the right answer.
>
> I think that the world has some mean reversion. It isn't as extreme as in the highway example, but whenever any mean reversion is observed, using the arithmetic average makes you too optimistic. Thus, a measure somewhere between the geometric and the arithmetic averages would be the appropriate measure."

Similarly, Dr. Damordaran, author of numerous books on valuation, states:[7]

> "The conventional wisdom is that the arithmetic mean is the better estimate. This is true if
> (1) you consider each year to be a period (and the CAPM to be a one-period model)
> (2) annual returns in the stock and bond markets are serially uncorrelated
> As we move to longer time horizons, and as returns become more serially correlated (and empirical evidence suggests that they are), it is far better to use the geometric risk premium. In particular, when we use the risk premium to estimate the cost of equity to discount a cash flow in ten years, the single period in the CAPM is really ten years, and the appropriate returns are defined in geometric terms.

---

[6] John Campbell, Historical results: Discussion, Equity Risk Premium Forum, November 8, 2001, p. 45.
[7] Aswath Damodaran, Discussion issues and derivatives, found on his website at: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/AppldCF/derivn/ch4deriv.html#ch4.3.

> In summary, the arithmetic mean is more appropriate to use if you are using the Treasury bill rate as your riskfree rate, have a short time horizon and want to estimate expected returns over that horizon.
> The geometric mean is more appropriate if you are using the Treasury bond rate as your risk free rate, have a long time horizon and want to estimate the expected return over that long time horizon."

Dr. Jay Ritter in his keynote address at the 2001 meetings of the Southern Finance Association states that "with mean reversion, the multiperiod arithmetic return will be closer to the geometric return".[8] He notes that stock returns show a tendency towards mean reversion and bond returns show a tendency towards mean aversion in the U.S. In turn, based on the standard deviations of returns for data starting in 1802 (the Siegel data set), he shows that stocks are twice as risky as bonds for one-year holding periods, and stocks are less risky than bonds for holding periods of twenty or more years.

The use of the geometric mean is supported empirically. Fama and French estimate the nominal cost of capital for U.S. nonfinancial corporations for 1950-1996 as 10.72%. Since this is smaller than the nominal return on investment of 12.11%, average corporate investment has been profitable.[9] If the arithmetic mean of the simple annual returns is used instead to obtain an estimate of the nominal cost of capital, the resulting value of 12.12% is about the same as the return of investment of 12.11%. This implies that average investment by corporate U.S. has added no value over the 1950-1996 period, which seems unreasonable to Fama and French and ourselves given stock market performance over this period of time. Thus, Fama and French conclude that the

[8] Jay R. Ritter, The biggest mistakes we teach, *The Journal of Financial Research* 25:2, Summer 2002, pp. 159-168.
[9] These two values are the IRRs on value and on cost, respectively. The geometric mean of simple annual returns on cost is almost identical. Eugene F. Fama and Kenneth R. French, 1999, The corporate cost of capital and the return on corporate investment, *The Journal of Finance* December, pp. 1939-1967. As in Copeland et al. (1990), the return on value is an estimate of the cost of capital when the cost of capital is taken to be an expected compound return. Tom Copeland, Tim Koller and Jack Murrin, 1990, *Valuation in measuring and managing the value of companies* (John Wiley and Sons, New York).

geometric mean estimate of the cost of capital is more consistent with the data than the arithmetic mean estimate of the cost of capital over this period of time.

The expected one-period simple return (i.e., the arithmetic mean of the one-period simple return) is only an appropriate return concept for the cost of equity capital for a short future time horizon of one period (usually a year).[10] For multiple-period horizons, expected return estimates enter the present value expressions in a nonlinear manner. Thus, numerous articles have documented the biases in using arithmetic or geometric means of one-period returns or risk premia to assess long-run expected rates of return or risk premia.

Other studies have documented the biases in using arithmetic or geometric means of one-period returns or risk premia to assess long-run expected rates of return or risk premia, without any reference to mean-reversion.

The first group of studies that examine which type of mean is appropriate for long horizon decision-making examines the biases caused by the fact that discount factors involve powers of the reciprocal of the rate of return. Blume (1974) and Indro and Lee (1997) show mathematically that for long-run expected returns and risk premia, the arithmetic average produces an estimate that is upwardly biased, and that the geometric average produces an estimate that is downwardly biased.[11] The simulation results of Indro and Lee (1997) support the use of a horizon-weighted average of the arithmetic and geometric averages proposed by Blume (1974). In the Blume average, the arithmetic average receives all the weight when the time horizon or project life (denoted by N) is one period, and the geometric average receives all the weight when the time horizon is equal to the number of time periods (denoted by T) used to obtain a historical estimate of average returns or risk premia.

[10] Eugene F. Fama, 1996, Discounting under uncertainty, *Journal of Business* 69, pp. 415-428.
[11] M.E. Blume, Unbiased estimators of long-run expected rates of return, *Journal of the American Statistical Association* 69:347 (September 1974), pp. 634-638; and D.C. Indro and W.Y. Lee, Biases in arithmetic and geometric averages as estimates of long-run expected returns and risk premia, *Financial Management* 26:4 (Winter 1997), pp. 81-90.

To illustrate, if we deem that 30 years constitutes the long-run as is assumed for the cost of debt and we use the longest available time period without serious measurement errors to estimate the market risk premium in Canada (namely, the 45 year period, 1957-2001), the weight placed on the geometric average, w_G, is:

$w_G = (N – 1) / (T – 1) = (30 – 1) / (45 – 1) = 29 / 44 = .66$ or 66%.

Similarly, if we use the longest available time period for which we have data in Canada to estimate the market risk premium (namely, the 78 year period, 1924—2001), the weight placed on the geometric average, w_G, is:

$w_G = (N – 1) / (T – 1) = (30 – 1) / (78 – 1) = 29 / 77 = .38$ or 38%.

Of course, the long run is longer than 30 years, and we would use it for bonds if such maturities were available.

The second group of studies that examine which type of mean is appropriate for long horizon decision-making assesses the effect of estimation errors when the estimate is used for multi-period forecasting or decision-making. Drs. Jacquier, Kane and Marcus show that the use of the sample arithmetic mean produces an upward-biased forecast, and that this bias does not disappear, even if the sample mean is computed using long data series and returns come from a stable distribution with no serial correlation.[12] They show that, while a weighted-average of the arithmetic and geometric average returns provides an unbiased estimate of long-term returns, the best estimate of cumulative returns is even lower. They conclude that this “further compounds the recent sobering message in Fama-French (2002) and Jagannathan et al. (2000) who suggest that the equity risk premium is lower than once thought”. They further conclude that:

> “Strong cases are made in recent studies that the estimate of the market risk premium should be revised downward. Our result compounds this argument by stating that even these lower estimates of mean return should be adjusted further downward when predicting long-term cumulative returns.”

---

[12] Eric Jacquier, Alex Kane and Alan J. Marcus, 2003, Optimal forecasts of long-term returns: Geometric, arithmetic, or other means?, *Financial Analysts Journal* (forthcoming August).

Thus, until the issue is resolved, a weighted-average of the arithmetic and geometric means is best. To err on the side of being conservative, a weighted average that places an equal or greater weight on the arithmetic mean appears to be most reasonable.

2. The Choice and Financial Integrity:

Although we do not believe that any additional return needs to be added to ensure the financial integrity of a utility, the use of a weighted average of the geometric and arithmetic mean historical market risk premia does provide some unspecified premium to that effect because the chosen weighted average is still likely to be optimistic.

A further benefit of using a weighted average, or what equivalently is equal to adding the weight placed on the arithmetic mean multiplied by the difference in the two averages to the geometric mean, is that it provides a premium that increases or decreases with the level of investment risk as measured by the standard deviation of the market. When the market has no risk, the two means are identical. Thus, for the extreme case of no market risk, the use of the weighted average instead of the annual geometric market risk premium provides no extra risk premium that will ensure financial integrity, as none is needed. When market risk is present, the weight placed on the arithmetic mean multiplied by the positive numerical difference between the arithmetic mean market risk premium and the geometric mean market risk premium grows with higher levels of risk. Thus, the use of the annual geometric mean market risk premium plus the weight placed on the arithmetic mean multiplied by the difference between the annual arithmetic and geometric mean market risk premia provides more risk premium coverage for ensuring financial integrity for greater levels of market risk.

This is best illustrated by referring to the example in Schedule 4.A1. In this example, we show what happens to the final wealth position of two typical investors who each invest $6,592.58 in two different utilities at the end of 1989. For ease of presentation, we assume that each utility is well diversified and has the same investment risk and return as the market. The first investor invests in the first utility whose value compounds at the annual geometric mean return for the S&P/TSX Composite over the ten-year period 1990-1999. As expected, the terminal value of the investment in the first utility by the first investor is equal to the ending value of $17,960.99 for the S&P/TSX Composite index for 1999. Thus, the first investor receives the same return as given by the market on his utility investment. In contrast, the second investor invests in the second utility whose value compounds at the annual arithmetic mean return for the S&P/TSX Composite over the ten-year period 1990-1999. As expected, the terminal value of the investment in the second utility by the second investor of $19,759.06 is now greater than the terminal value of $17,960.99 for the S&P/TSX Composite index at year-end 1999. Thus, this second investor has achieved what finance professionals refer to as an abnormal return or "free lunch", and investment professionals refer to as a positive alpha. In fact, the second investor has achieved an above market return per dollar of initial investment without incurring any additional risk when performance is benchmarked against the performance of the market.

From the perspective of the second utility, the difference between the annual geometric and arithmetic mean returns of approximately 106 basis points represents the amount of return that it can forego before it begins to disappoint its equity investors. In a rating setting forum, the full 106 basis points would represent a very expensive insurance premium to pay annually to ensure that a utility is guaranteed financial integrity.

Schedule 4.A1

This table contains a comparison of the wealth implications for equity investors of using arithmetic versus geometric mean returns based on an assumed investment of $6592.58 by two different investors in two different utilities. For ease of exposition, the two utilities are assumed to have the same investment risk as the market (i.e. their betas are one) and to be well diversified.

Year end	For the total return S&P/TSX Composite index:			Portfolio value when promised annual return is:	
	Index value	Annual return	Annual return relative	Geometric mean	Arithmetic mean
1989	6592.58			6592.58	6592.58
1990	5617.01	-0.14798	0.85202	7287.57	7357.44
1991	6291.90	0.120151	1.120151	8055.83	8211.03
1992	6201.72	-0.014333	0.985667	8905.08	9163.65
1993	8220.23	0.325476	1.325476	9843.86	10226.80
1994	8205.73	-0.001764	0.998236	10881.60	11413.29
1995	9397.97	0.145294	1.145294	12028.75	12737.43
1996	12061.95	0.283463	1.283463	13296.82	14215.20
1997	13868.54	0.149776	1.149776	14698.58	15864.41
1998	13648.84	-0.015842	0.984158	16248.11	17704.97
1999	17960.99	0.315935	1.315935	17960.99	19759.06

The annual arithmetic and geometric mean returns are 0.116018 and 0.10542, respectively.

APPENDIX 4.B

SIX ADDITIONAL FUNDAMENTAL CHANGES THAT HAVE IMPACTED THE MARKET EQUITY RISK PREMIUM

Six other fundamental factors that have had an impact on the market ERP are discussed in this appendix.

A first fundamental change is the introduction of a capital gains tax in Canada in 1972. All else held equal, the introduction of a capital gains tax results in Canadian taxable investors increasing their required market risk premium on a before-tax or gross basis.

A second fundamental change is the more recent successive reductions in the capital gains inclusion rate. All else held equal, the successive reductions in the capital gains inclusion rate reduce the tax bite on an important component of investor returns from equity investment, and change the relative tax bite between equity returns and fixed income returns in favour of equity returns. Thus, all else held equal, the successive reductions in the capital gains inclusion rate result in Canadian taxable investors decreasing their required equity market risk premia on a before-tax or gross return basis.

A third fundamental change is the increased willingness or tolerance of Canadian investors to bear risk. All else held equal, an increase in investor tolerance to bear risk lowers the required market equity risk premium. This is easily seen in the world of the CAPM where the intercept and slope of the capital market line (CML) are the “price of time” and the “price of risk or market equity risk premium”, respectively. If all else is held constant, then the slope of the CML increases (decreases) as the market becomes less (more) risk tolerant.

A fourth fundamental change is the large inflow of funds into the market without a corresponding increase in viable investment opportunities. Based on data from the U.S. Federal Reserve Board, the number of shareholders increased by 32 million between

1989 and 1998, and stood at 84 million in the late 1990s. Based on a study conducted in 2000 for the Toronto Stock Exchange and World Investor Link, the proportion of Canadians that are shareowners is 23% in 1989, 37% in 1996 and 49% at the time of the study.[13] This large influx of capital chasing a set of viable investment opportunities that is growing at a slower rate led to a rapid increase in equity prices and a concurrent decline in the market equity risk premium. According to Diamond,[14] widening the pool of investors in the stock market through greater investor participation rates should lower the required risk premium.

David Rosenberg, Chief Canadian Economist and Strategist at Merrill Lynch, acknowledges this over-investment in the more recent past as follows:[15]

> "In our view, what triggered this bear market, in contrast to prior bear markets, was a recession induced by years of over-investment in technology, triggering massive excessive capacity, …"

A fifth fundamental change is the more recent use of very aggressive accounting practices by firms to maintain or enhance their earnings growth. To illustrate public concern with this issue, Mr. Paul Volcker, a former Federal Reserve chairman, stated in testimony before the U.S. Senate that Enron's collapse exposed just one symptom of the accounting industry's problems. He went on to state that: "We have had too many restatements of earnings, too many doubts about 'pro-forma' earnings, too many sudden charges of billions of dollars to 'good will,' too many perceived auditing failures accompanying bankruptcies to make us at all comfortable." He went on to urge the adoption of international accounting standards "that reasonably reflect underlying

[13] As reported in William Hanley, Bear market shakes our faith in stocks, *National Post*, February 2002, p. SM11.
[14] Peter A. Diamond, What stock market returns to expect for the future?, *An Issue in Brief*, Centre for Retirement Research at Boston College, No. 2, September 1999, p. 2.
[15] As reported in David Rosenberg, Analysis: Not your average bear, *National Post*, February 2002, p. SM4.

economic reality".[16] Mr. Donald Coxe, Chairman and Chief Strategist of Harris Investment Management, describes aggressive accounting as follows:[17]

> "What does "aggressive accounting" mean? Well, the Nasdaq 100 companies reported $82.3 billion in combined losses to the SEC for the first three quarters of last year, but told shareholders they'd had profits of $19.1 billion, (according to SmartStockInvestor.com). The Big Five on Nasdaq (Microsoft, Intel, Cisco, Oracle, and Dell), reported $4.4 billion in net earnings to the SEC, while pleasing stockholders with reported earnings of $13.4 billion."

Coxe (p. 12) goes on to note:

> "Estimates for earnings on the S&P500 this year range from $37 to $57, depending on which accounting numbers are used. The stock market is, therefore, either wildly overpriced, or a bargain, depending on whether one uses pro forma, reported, adjusted, or GAAP earnings."

Other examples of aggressive accounting are reported in Schedule 4.B1.

A sixth fundamental change is the continual evolution of the industrial composition of our economy and markets. This is neither unique nor confined to our more recent past. These changes are captured, albeit not perfectly, by market indexes such as the S&P/TSX Composite where the relative index weightings of industrial sectors with above-average and below-average economic prospects increase and decline over time. Since stock prices are based on the perceptions of the future economic prospects of firms, these prospects are reflected in the current prices, and thus, index weightings of firms in indexes such as the S&P/TSX Composite index. This is why the stock market is used as a leading indicator to forecast the economy in both Canada and the U.S.

[16] Kellman, Laurie, Associated Press, Volcker says Enron only one symptom of problems in accounting industry, 2/14/2002.
[17] BMO Nesbitt Burns, *Basic Points*, February 8, 2002, p. 5.

Current stock prices also can reflect investor exuberance or false or misleading corporate information. This leads to what many investment professionals refer to as bubbles or mania. Bubbles can be firm-specific or market-wide. Since the list is long, three more recent firm-specific bubbles are Bre-X, Enron and Nortel (more than a $350-billion drop in market cap). Market-wide bubbles include the U.S. (and other) markets in 1928-29, the Japanese market in the early 1990s, and the high-tech (or dot.com) bubble in 1998-2000. Some quotes from professional commentaries describing the latest up and down movements in high-tech prices as a bubble or mania are summarized in Schedule 4.B1.

Schedule 4B.1 (page 1 of 4)

This table contains some quotes describing the behavior of high-tech stock prices as being a bubble or mania in panel A, and some quotes describing examples of “aggressive” accounting by firms when reporting their financial performance in panel B.

Panel A: Quotes dealing with high-tech stock prices as being a bubble or mania

“Educated observers have been confidently predicting the end of the go-go market for years, only to wind up like roadkill at Pamplona: run over by the charging bulls. But the seemingly tireless market has created a paradox. The more it rises, the more people think it can continue rising, a belief that becomes more implausible with each upward tick. As a result, the market has never looked so dangerous and investors have rarely appeared so overconfident, inviting comparisons to the stock market crashes of 1929 and 1987. ``People have the feeling right now that they can't lose in the market,'' says Robert Shiller, professor of economics at Yale University and author of the forthcoming book *Irrational Exuberance*. ``The typical thing people will say is: `Sure it will go down, of course there will be a correction, but if you hold on for the long term you can't lose.' And that's really a mistake to think that you can't lose.'' ….

Is this a rational market, or is it beginning to resemble some sort of pyramid scheme? ``The name we have for that, and we've had it for quite a long time, is the `greater fool theory,''' says Lawrence Kryzanowski, professor of finance at Concordia University in Montreal. ``It's okay to buy one of these stocks as long as there is a greater fool in the line behind you.' ….

What does it all mean? For many observers, it spells big trouble. ``Most experienced investors fully understand that the tech stocks are in a bubble, but they are hoping that they will be able to reach the exits early enough to avoid major pain when the inevitable burst occurs,'' says a recent report from Martin Barnes, managing editor of Montreal-based *The Bank Credit Analyst*. ``Of course, history tells us that very few will reach the exits in time and most will get trampled underfoot.'' This is why Greenspan commented in January that the market could turn into one of history's ``euphoric speculative bubbles,'' making an implicit connection to the heady days of 1929….

By most opinions, Research In Motion has great potential and its earnings are indeed soaring, but that sort of growth may be an awful lot to expect. ``People are not mad,'' says Shiller. ``But history shows that there are times of excessive optimism.'' Says Kryzanowski: ``Every time we have a period of a hot market, people say `It's different.' And every time it corrects, you never hear from these people again.'' [David Berman, 2000, Market overboard: we're living through history's greatest stock market boom, but investors are getting jittery. What happens when the party's over?, *National Post Business*, April, pp. 54-60.]

Schedule 4.B1 cont'd (page 2 of 4)

"The global high-tech stock markets ran up from the summer of 1998 to an apex in March, 2000, and then had a spectacular fall to an apparent nadir on Sept. 21, 2001. This wild swing in valuations, representing the seeming creation and then destruction of hundreds of billions of dollars of wealth, seems like yet another bubble, the most recent in the long history of *Extraordinary Popular Delusions and the Madness of Crowds* as depicted by Charles MacKay in his seminal 1841 book of that title. [Duncan Stewart, We have a habit of blowing bubbles, *National Post*, February 2002, p. SM1.]

"Jeremy Siegel, author of the best-selling book *Stocks For The Long Run* and a strong advocate of equity investing, says this decade will not be a replay of the 90's, as some people think. The bubble bursting and the end of the bull market was no "little hiccup" and it is "manifestly ridiculous" to believe that earnings growth – which drives stock prices – can average 8% to 12% this decade." [William Hanley, Bear market shakes our faith in stocks, *National Post*, February 2002, p. SM11].

"The Triple Waterfall collapse of technology stocks was history's most egregious financial mania. [Donald Coxe, Chairman and Chief Strategist, Harris Investment Management Inc., in: BMO Nesbitt Burns, *Basic Points*, February 8, 2002, p. 1.]

"What makes the business cycle unique is that it created the most extraordinary asset bubble in history. Perhaps not unique but nonetheless worth noting is that the Federal Reserve did little to stop it. True, Mr. Greenspan famously warned of irrational exuberance (that, hard as it is to believe, was five years ago). Yet interest rates were left unchanged for three months and even then he took only a feeble shot, tightening credit supply by a thin 25 basis points." [Vox, 2002, Where was the Fed as bubble grew?, *The Globe and Mail*, March 8, p. B10.]

Panel B: Quotes dealing with examples of "aggressive" accounting by firms when reporting their financial performance

"Another short-selection technique is to doggedly analyze financial statements with an eye toward companies that may be using aggressive accounting." [Gary Weiss, How to soar with falling stocks, *Business Week*, December 29, 1997.]

""Aggressive accounting practices are a problem in most industries, but the high tech industry is particularly vulnerable," says Michael Young, partner at Willkie, Farr & Gallagher in New York, who represents companies sued by shareholders after accounting restatements." [Brendan Barrett, Time for show-and-tell, *Techway*, July 24, 2000.]

Schedule 4B.1 cont'd (page 3 of 4)

"Fourthly, there are concerns about aggressive accounting practices, both here and in the US, indeed perhaps more so in the US. I am talking of circumstances where the financial performance of a company is presented in an unrealistically favourable light in an attempt to meet market expectation, reduce tax liabilities, comply with loan covenants or meet legal or regulatory thresholds. This can lead to the market being misled about a company's profitability or performance. The Auditing Practices Board issued a consultation paper on aggressive accounting practices just a couple of weeks ago which recognises both the potential significance of the problem and the role auditors can play in managing it. I am sure we can all think of examples of companies which have engaged in somewhat imaginative accounting, capitalising R & D expenditure one year and reclassifying it the next, recognising contracts in a year where heads of agreement only have been signed and minimising disclosure relating to financial instruments, thereby failing to give shareholders sufficient information about financial risk." [Howard Davies, Chairman, Financial Services Authority (FSA), Information and market regulation, presentation at Investor Relations Conference, Kensington, England, July 9, 2001. FSA is the regulator of financial institutions in the United Kingdom.]

"Investors are jaded as the hype of the late nineties gives way to reality. 'We're in a post-bubble era,' says Jeremy Batstone, head of research at Natwest Stockbrokers. 'In the Nineties a huge amount of money was invested as people bought into the idea of the new paradigm. There was the idea of the Goldilocks economy, where everything was not too hot and not too cold. Companies thought they could expand and there would always be demand.' But the increase in capacity became overcapacity, which led to falling prices. As a result, firms were forced to embark on reckless acquisition sprees or use 'aggressive accounting' tactics to meet their massively optimistic earnings forecasts." [Jamie Doward, The enemy within USA Inc., *The Observer*, February 3, 2002.]

"The FBI and federal prosecutors … have opened a preliminary inquiry into …software company's books… Former employees have said that Computer Associates began using pro forma accounting, a practice that can make profits seem larger, because it ran out of ways to inflate its results under standard accounting rules and had to find a new method…. Computer Associates…has reported its financial results on a pro forma basis since October, 2000." [Associated Press, Computer Associates falls on inquiry news, *The Globe and Mail*, February 21, 2002, p. B26.]

Schedule 4B.1 cont'd (page 4 of 4)

"The global association that oversees equity analysts [AIMR] is calling for major changes in accounting practices and the end to political and corporate interference with bodies that set accounting standards…. It described Enron's failure as "a deplorable but all-too-natural consequence of the erosion of the financial reporting system in the U.S."" [Richard Blackwell, Group pushes greater independence for accounting, *The Globe and Mail*, February 23, 2002, p. B3.]

"The Ontario Securities Commission will use its powers to override accounting principles set by self-regulatory organizations if they do not makes changes to ensure an Enron-style collapse doesn't happen in Canada, OSC chairman David Brown said yesterday. There needs to be a much more "robust" set of accounting rules that gives investors an accurate picture of the financial condition of every company, Mr. Brown said. … Accounting rules have drifted from a general statement of principles, to a more rules-based approach, Mr. Brown said. Particularly in the United States, this had allowed auditors to approve financial reports that comply with the rules, but don't necessarily reflect reality." [Richard Blackwell, 2002, OSC warns on accounting principles, *The Globe and Mail*, March 8, p. B4.]

"Lots of accounting issues will continue to surface," Mr. Graham [investment director at Guardian Group of Funds in Toronto] said. "Most of this is not fraud but companies were aggressive in their reporting . . ." [Luciw, Roma, Key stock indexes fall as techs retreat, *Globe and Mail*, March 13, 2002, p. B14. Our insert in brackets.]

APPENDIX 4.C
RECENT THINKING AND ESTIMATES OF U.S. AND OTHER COUNTRY EQUITY RISK PREMIA

1. Estimates on a Point-forward Basis:

There are three approaches to estimating the equity risk premium on a point-forward basis. The first approach extrapolates historical returns based on the premise that realized and expected returns are equivalent, and that the future will be like the past. The second approach uses a theoretical model to determine what the equity premium should be based on plausible assumptions about investor risk tolerance. The third approach uses forward-looking information on current dividend yields and interest rates to forecast expected risk premia.

Reichenstein (2001) summarizes the predictions of several academic and professional scholars that long-run real stock returns will be below historical standards and that the equity risk premium will be well below historical standards, and even negative according to some scholars.[18] The academic studies are by Jagannathan, McGrattan and Scherbina (2000), Siegel (1999) and Fama and French (2001). The practitioner studies are by Brown (2000) and by Arnott and Ryan (2001). The real stock return estimates are 2.9% to 4.4% for Fama and French, 3.2% for Arnott and Ryan, 3.3% for Siegel, 4.8% for Jagannathan et al, and 5.2% for Brown.

Fama and French (2001) obtain estimates of the U.S. equity risk premium of 2.55% and 4.32% for 1951-2000 when they use rates of dividend and earnings growth to measure the expected rate of capital gain. These equity risk premium estimates are much lower than the 7.43% estimate produced by using the average stock return over this period of time. They conclude that their evidence shows that the high average realized return for 1951-2000 is due to a decline in discount rates that produces large

[18] Cited articles in this appendix are listed in the references found between the text and the tables to this appendix.

unexpected capital gains. Their main conclusion is that the stock returns (and realized equity risk premia) of the last half-century is a lot higher than what was expected by investors ex ante. The lower estimates of expected stock returns are less than the income return on investment that suggests that investment by corporate U.S. is on average profitable. In contrast, the much higher estimates of expected stock returns from using the traditional time-series means suggests that investment by corporate U.S. is on average unprofitable (its expected return is less than its cost of capital).

According to Fama and French (2001), “many papers suggest that the decline in the expected stock return is in part permanent, the result of (i) wider equity market participation by individuals and institutions and (ii) lower costs of obtaining diversified equity portfolios from mutual funds (Diamond, 1999; Heaton and Lucas, 1999; Siegel, 1999)”.

Jagannathan et al (2000) demonstrate that the U.S. equity risk premium has declined significantly during the last three decades. They calculate the equity premium using a variation of a formula in the classic Gordon stock valuation model. While the premium averaged about 7 percentage points during 1926-70, it only averaged about 0.7 of a percentage point after that. They support this result by demonstrating that investments in stocks and consol bonds of the same duration would have earned about the same return between 1982 and 1999, a period over which the equity risk premium estimate is about zero.

There are a number of studies not reviewed by Reichenstein (2001). These are reviewed next.

In a conference presentation on October 15, 2001, Mr. Robert A. Arnott of First Quadrant estimates the U.S. equity risk premium for the 75 years from December 1925 to be 4.7%, and to have oscillated around zero beginning in the early 1980s.[19] He estimates the forward-looking U.S. equity risk premium from October 2001 to be 0.3%±.

[19] Specifically, Exhibit 4a on page 21 of Arnott (2001).

In a study (undated) by Deutsche Asset Management, the expected long-run equity risk premia are 2.5% over government bonds or 3.0% over cash for the U.S., Euroland, Japan and the U.K. (see Schedule 4.C1). These equity risk premia are based on two approaches, where the first estimates what equities can return based on free cash flows that they generate, and the second estimates what equities need to return to get investors to hold them instead of less risky assets.

McGrattan and Prescott (2000) conclude that the case for a positive equity premium appears weak based on a model that measures the value of corporate capital. They show that including intangibles reduces corporate profits. Since the values of overall productive assets and equity are nearly equal in the United States, they conclude that the equity risk premium is close to zero percent.

Drs. Claus and Thomas (2001) use the implied risk premium methodology to derive an upper bound for the ERP for Canada, France, Germany, Japan, U.K., and the U.S. over the period from 1985-1998. Drs. Claus and Thomas find that ERP estimates are close to three percent rather than the eight percent ERP that have been reported based on the data from Ibbotson & Associates. They consider their estimates as being an upper bound because they use the earnings forecasts of analysts, which are typically optimistic, to forecast the ERP.

Based on reasonable priors and allowing for structural breaks, Drs. Pastor and Stambaugh (2002) obtain estimates of the equity risk premium of between 3.9 and 6.0 percent over the period from January 1834 through June 1999. The estimated premium rises through much of the nineteenth century and the first few decades of the twentieth century. It declines fairly steadily after the 1930's except for a brief period in the mid 1970's. The estimated premium exhibits its sharpest decline to 4.8% during the decade of the 1990's.

Drs. Ibbotson and Chen (2001) forecast the equity risk premium through supply side models using historical information. They conclude that "contrary to several recent studies on equity risk premium that declare the forward looking equity risk premium to be close to zero or negative, we find the long-term supply of equity risk premium is only slightly lower than the straight historical estimate". Based on his co-authored paper with Dr. Chen, Dr. Ibbotson concluded that:[20]

> "My estimate of the average geometric equity risk premium is about 4 percent relative to the long-term bond yield. It is, however, 1.25 percent lower than the pure sample geometric mean from the risk premium of the Ibbotson and Sinquefield study (Ibbotson Associates 2001)."

Dr. Ibbotson goes on to state:[21]

> "The 4 percent (400 bps) equity risk premium forecast that I have presented here today is a geometric return in excess of the long-term government bond yield. It is a long-term forecast, under the assumption that today's market is fairly valued."

Hunt and Hoisington (2003, p. 28) conclude that their study "sheds new light on the risk premium of stocks over U.S. Treasury bonds, which indicates most research overstates the advantages of stocks over bonds". They go on to note that:

> "While results may be overstated due to the beginning-period bias, studies based upon past data have conclusively shown that stock returns are superior to bonds over very long time periods. On average, during these time periods, the better performance of stocks is due to inflationary situations, spreads between dividend and bond yields, and P/E ratios that currently do not exist."

Drs. Jacquier, Kane and Marcus (2003) show that, while a weighted-average of the arithmetic and geometric average returns provides an unbiased estimate of expected

---

[20] Roger Ibbotson, Moderator, Implications for asset allocation, portfolio management, and future research: Discussion, Equity Risk Premium Forum, November 8, 2001, p. 103.

[21] Roger Ibbotson, Summary comments, *Equity Risk Premium Forum*, November 8, 2001, p. 108.

long-term returns, the best estimate of cumulative returns is even lower. They conclude that:

> "Strong cases are made in recent studies that the estimate of the market risk premium should be revised downward. Our result compounds this argument by stating that even these lower estimates of mean return should be adjusted further downward when predicting long-term cumulative returns."

Using the third approach to estimating equity risk premia, Dr. Ritter estimates that the risk premium is only about 0.7% or 1 percent rounded up. He points out that lower future real stock returns have squeezed the equity premium from the top and a higher real return on bonds has squeezed the equity premium from the bottom.[22]

2. Actual versus Expected Equity Risk Premia:

A few studies examine whether or not actual or realized equity risk premia are a good proxy for expected or required equity risk premia. The findings of two of these studies are summarized in Schedule 4.C2. The study (undated) by Deutsche Asset Management aptly summarizes these findings as follows:

> "In sum, a wealth of theoretical and empirical evidence suggests that the historical, realized equity premium (5% - 7%) exceeded what equities were expected to deliver in the past, and very likely exaggerates what they should be expected to deliver in the future. An equity premium of 3% - 4% may have been closer to the true, ex-ante premium in the past, and the lower end of that range seems the most that we should anticipate (and that investors will require) now that economic/political conditions are more stable and people are more 'plugged in' to the benefits of equity investing. So we take 3% as an upper bound for the equity premium going forward."

[22] Jay R. Ritter, The biggest mistakes we teach, *The Journal of Financial Research* 25: 2, Summer 2002, p. 163.

It should also be kept in mind that these equity risk premia are calculated in reference to short-term government bonds (such as T-bills) and **not long-term government bonds**.

Mr. Arnott and Mr. Bernstein (2002) show that the realized equity risk premium over the last 75 years in the U.S. is overstated due to various accidents. Equity and bond investors obtained returns higher and lower than what they expected, respectively, due to a series of favourable accidents for equity holders and one major unfavourable accident for bondholders.

Mr. Oliver and Mr. Doyle of AMP Henderson Global Investors Limited note:

> "A strong case can be made that favourable forces now justify a lower share-risk premium than the 5% or 6% that prevailed over the past 100 years … The favourable forces include low inflation and a more stable business cycle that are expected to result in higher-quality and steadier earnings and share prices. As well, baby boomers saving for their post-work lives are buying shares. They are arguably less fearful of shares than previous generations and have (hopefully) longer-investment horizons….
>
> Our assessment is that the appropriate risk premium for US shares is about 3% [relative to bonds]. For the Australian shares, fewer opportunities for diversification justify a slightly higher premium of about 4%." [our insertion]

This was re-enforced by Mr. Dyer (2003) of the same firm more recently as follows:

> "For these reasons, **the historically realised ERP of the last 50 years or so is probably an exaggeration of what investors actually require and is absolutely no guide to what the likely ERP will be going forward."** [his emphasis]

Drs. Clarke and de Silva (2003) note that all of the expected equity risk premiums by practitioners from such firms as Frank Russell (3%), Goldman Sachs (3%), Ibbotson (4%) and Alliance Bernstein (4.5%) are lower than the historical experience in the U.S. Drs. Clarke and de Silva conclude their study by noting: "What seems clear from the historical evidence is that a reasonable expectation for the long-run equity risk premium is probably in the 3-6% range." Interesting, the **expected ERP estimates** of Drs. Clarke and de Silva and the others are based on **geometric means**.

3. Synthesis:

All of the studies conclude that the U.S. equity risk premium has narrowed (most conclude substantially), and is expected to be lower in the future. The U.S. equity risk premium estimates vary from zero or slightly negative (Jagannathan et al, 2000) to about 6 % (Ibbotson and Chen, 2001). These studies strongly suggest that any forecast **for the U.S.** over 5% based on T-bills is in the optimistic tail of the distribution of possible equity risk premium estimates.

The two studies dealing with realized and expected equity risk premium find that the expected equity risk premium when measured **against short-term** government bonds in the U.S. has ranged between 3.4% and 4.2% depending on the time period considered, and has averaged 3.5% over 101 years for a sample of 15 developed countries.

4. Relative Risk of Equities Versus Bonds

It would appear on the surface that a zero or negative required equity risk premium going forward is inconsistent with the belief that equities are more risky than bonds. However, some market professionals believe that equities may not be more risky than bonds in terms of investment risk. Many studies find that the ratio of the standard deviations of returns on equities to bonds is above one, approaches one, and goes below one as the measurement period over which returns are measured gets longer. The ratio would remain constant, as the measurement period over which returns are measured gets longer, if stock and bond returns did <u>not</u> exhibit mean reversion/aversion.

In a 2001 study, W.M. Mercer evaluated the investment riskiness of Canadian stocks, bonds and cash over varying time horizons.[23] These results confirm existing U.S. results that:[24]

- Stocks are riskier than both bonds and cash over shorter time horizons, such as one year;
- Stock returns exhibit decreasing variability (measured by the standard deviation of returns) over time;[25]
- For 20-year rolling time periods, stocks outperform bonds in terms of returns, and both asset classes have about the same risk;
- For 30-year rolling time periods, stocks outperform both bonds and cash, and stocks are less risky than both bonds and cash.

In their recent book, Campbell and Viceira (2002, pp. 108 and 109) provide evidence that the annualized standard deviation of K-period returns is lower for equities than T-bills (rolled) or long bonds (rolled) for long holding periods in the United States. Campbell and Viceira (2002, p. 108) state that: "We see that stocks are mean-reverting – their long-horizon returns are less volatile than their short-horizon returns – while bills are mean-averting – their long-horizon returns are actually more volatile than their short-horizon returns." Campbell and Viceira (2002, p. 108) draw the following inference from their analysis: "These effects are strong enough to make bills actually riskier than stocks at sufficiently long investment horizons, a point emphasized by Siegel (1994)".

Thus, based on the long-run perspective underlying rate-of-return rate-setting, equities may in fact not be more risky than traditional debt instruments from an

---

[23] William M. Mercer Limited, Are stocks riskier than bonds? New Mercer research indicates that stocks become less risky in the long run, news release, February 15, 2001. Available at www.wmmercer.com/Canada/english/resource/resource_news02152001.html.

[24] The historical results reported by the CIA suggest that the standard deviation results are obtainable for periods as short as 5 years. Over 5-year periods, they report standard deviations of returns of 6.75%, 5.69% and 3.53% for stocks, long Canadas and 91-day T-bills, respectively. Over 10-year periods, the corresponding standard deviations are 2.98%, 4.59% and 3.26%. Canadian Institute of Actuaries, *Report on Canadian Economic Statistics*, 1924-2000, September 2001, Table 2A, p. 8.

[25] This is consistent with mean reversion in stock returns.

investment risk perspective. Since the equity risk premium is based on the notion that stocks are riskier than bonds, these results attack the validity of a fundamental notion behind the existence and magnitude of an equity risk premium.

References:

Arnott, Robert D., 2001, Is the risk premium still dead?, Microsoft PowerPoint Presentation, YMG Conference, October 15. Available at: http://www.ymg.ca/news/Conferences/Conference2001/Rob%20Arnott%20-%20First%20Quadrant.pdf.

Arnott, Robert D. and Peter L. Bernstein, 2002, What risk premium is "normal"?, *Financial Analysts Journal* 58:2 (March/April), pp. 64-85.

Arnott, Robert D. and Ronald J. Ryan, 2001, The death of the risk premium, *Journal of Portfolio Management*, Summer, pp. 61-74.

Brown, Anthony, 2000, What's next for the S&P 500?, *Journal of Investing*, Winter, pp. 60-66.

Campbell, John Y. and Luis M. Viceira, 2002, *Strategic Asset Allocation: Portfolio Choice for Long-Term Investors* (Oxford University Press).

Clarke, Roger and Harindra de Silva, 2003, Reasonable expectations for the long-run U.S. equity risk premium, Risk Management PERSPECTIVES, April.

Deutsche Asset Management, undated, What can we expect for asset returns in the long term? *Deutsche Asset Management's view*.

Diamond, Peter A., 1999, *What stock market returns to expect for the future?* Center of Retirement Research at Boston College, September, Number 2.

Dimson, Elroy, Paul Marsh, and Mike Staunton, 2000, *Millennium Book II: 101 Years of Investment Returns*, London Business School and ABN-AMRO.

Dyer, Paul, 2003, The equity risk premium – what is it and is it enough?, *Investment Insights*, AMP Henderson Global Investors (New Zealand) Limited, March 5, 2003.

Fama, Eugene F. and Kenneth R. French, 2001, The equity premium, Working Paper no. 522, The Center for Research in Security Prices, Graduate School of Business, University of Chicago, April.

Heaton, John, and Deborah Lucas, 1999, Stock prices and fundamentals, In: *Macroeconomics Annual 1999*, Ben Bernanke and Julio Rotemberg (eds.), National Bureau of Economic Research, MIT Press, Cambridge, MA, pp. 213-242.

Hunt, Lacy H. and David M. Hoisington, 2003 Estimating the stock/bond risk premium: An alternative approach, *The Journal of Portfolio Management* (Winter), pp. 28-34.

Ibbotson, Roger G. and Peng Chen, 2001, The supply of stock market returns, working paper, June.

Jagannathan, Ravi, Ellen R. McGrattan and Anna Scherbina, 2000, The declining U.S. equity premium, *Quarterly Review of Federal Reserve Bank of Minneapolis*, Fall, pp. 3-19.

Jacquier, Eric, Alex Kane and Alan J. Marcus, 2003, Optimal forecasts of long-term returns: Geometric, arithmetic, or other means?, *Financial Analysts Journal* (forthcoming August).

McGrattan, E. R., and E. C. Prescott, 2000. Is the stock market overvalued?, *Quarterly Review*, Federal Reserve Bank of Minneapolis 24: 4 (Fall), pp. 20–40.

Oliver, Shane and Simon Doyle, Share-risk premium: What is the appropriate level?, 2001, *Oliver's Insights*, AMP Henderson Global Investors Limited, August.

Pastor, Lubos and Robert F. Stambaugh, 2002, The equity premium and structural breaks, Forthcoming *Journal of Financial Economics*.

Reichenstein, William, 2001, The investment implications of lower stock return prospects, *AAII Journal*, October, pp. 4-7.

Rozeff, M.S., 1984, Dividend Yields are Equity Risk Premiums, Journal of Portfolio Management 11, pp. 68-75.

Siegel, Jeremy J., 1999, The shrinking equity premium, *Journal of Portfolio Management*, Fall, pp. 10-17.

Siegel, Jeremy J., 1994, *Stocks for the Long Run* (New York: McGraw-Hill.

Schedule 4.C1. Expected long-run returns in local currency terms (annualized, percent)

	Cash		Gov't Bonds		Equities	
	Nominal	Real	Nominal	Real	Nominal	Real
U.S.	4.50	2.00	5.00	2.50	7.50	5.00
Euroland	3.75	2.00	4.25	2.50	6.75	5.00
Japan	3.00	2.00	3.50	2.50	6.00	5.00
U.K.	4.50	2.00	5.00	2.50	7.50	5.00

Source: Deutsche Asset Management, undated, 2.

Schedule 4.C2. Actual versus 'expected' equity risk premium in %[a]

Study	Country	Dates	Actual	Expected
Fama & French (2001)	U.S.	1872-2000	5.6	3.5
Fama & French (2001)	U.S.	1872-1950	4.4	4.2
Fama & French (2001)	U.S.	1951-2000	7.4	3.4
Dimson et al. (2000)	U.S.	1900-2000	5.6	4.0
Dimson et al. (2000)	15 countries[b]	1900-2000	5.1	3.5

[a]The actual premium is the compound, annualized rate of return less the compound, annualized return on short-term government debt. The expected premium uses dividend growth and earnings growth models to estimate equity returns.
[b]Australia, Belgium, Canada, Denmark (from 1915), France, Germany (ex. 1922/23), Ireland, Italy, Japan, Netherlands, Spain, Sweden, Switzerland (from 1911), U.K. and U.S.

Source: Deutsche Asset Management, undated.

APPENDIX 4.D

The Impact of Fundamental Changes Including Globalization on Expected Market Equity Risk Premia

1. The Basic Relationship”

In a CAPM economy, the risk premium on the market portfolio is related to its variance by the average degree of risk aversion.[26] This can be stated as:

$$\bar{r}_m - r_f = \bar{A}\sigma_m^2$$

where $\bar{r}_m - r_f$ is the market risk premium;

$\bar{A}$ is the average degree of risk aversion in the market; and

σ_m^2 is the risk of the market.

Thus, changes in the equity risk pemium can be modeled as depending on changes in the variance of the market.[27]

2. Canadian Market is Totally Segmented:

If the Canadian market was totally segmented from other international markets, then all of its risk, σ_m^2, would be non-diversifiable. Thus, investors would require compensation for all of σ_m^2.

3. Relationship Between Risk Premia and Risk Tolerance:

Let us now use Question 2 from “Concept Check” in Bodie et al. (2000) to illustrate what happens when the risk tolerance of investors increases, and so forth. This question is as follows:

[26] This relationship is found in a number of sources. Please see equation (7.2) in the following investment textbook: Zvi Bodie, Alex Kane, Alan J. Marcus, Stylianos Perrakis and Peter J. Ryan, *Investments* (McGraw-Hill Ryerson, 3rd Canadian edition, 2000), p. 244.

[27] As is done, for example, in: Lawrence Kryzanowski, Simon Lalancette and M.C. To, Performance attribution using a multivariate intertemporal asset pricing model with one state variable. *Canadian Journal of Administrative Sciences* 11:1 (March 1994).

> "Question 2 · Data from the period 1957-1998 for the TSE 300 index yield the following statistics: Average excess return, 3.60 percent; standard deviation, 16.08 percent.
>
> i. To the extent that these averages approximated investor expectations for the period, what must have been the average coefficient of risk aversion?
> ii. If the coefficient of risk aversion were actually 1.5, what risk premium would have been consistent with the market's historical standard deviation?"[28]

We begin with the answer to part *i* using the equation given above. We first calculate the variance of return on the market by multiplying 16.08% by 16.08% to get 2.59%. The average coefficient of risk aversion is then equal to: 3.60% divided by 2.59% to get 1.39.

We now provide the answer to part *ii* where market risk aversion is higher at 1.5 instead of 1.39. In this case, the market risk premium is equal to 1.5 times 2.59%, or 3.88%. In other words, everything else held constant, an increase in the risk aversion (decrease in risk tolerance) from 1.39 to 1.5, increases the equity market risk premium from 3.60% to 3.88%.

We now extend the question by introducing a utility with the same standard deviation of return of 16.08% as the market and a correlation with the market of 0.5. Thus, this utility's beta or relative risk is equal to its standard deviation of return of 16.08% times its correlation with the market of 0.5, all divided by the standard deviation of return for the market of 16.08%. This yields a beta of 0.5. Thus, this utility is one-half as risky as the market in terms of their non-diversifiable risks. In part *i*, the utility's own relative market equity risk premium would be 0.5 times 3.60%, or 1.80%. In part *ii*, the utility's own relative market equity risk premium would be 0.5 times 3.88%, or 1.94%. Thus, if the beta of the utility does not change as one would expect given that only risk aversion has changed, its relative market equity risk premium increases when market risk

[28] Zvi Bodie, Alex Kane, Alan J. Marcus, Stylianos Perrakis and Peter J. Ryan, *Investments* (McGraw-Hill Ryerson, 3rd Canadian edition, 2000), pp. 244-245.

aversion increases (risk tolerance decreases), and its relative market equity risk premium decreases when market risk aversion decreases (risk tolerance increases).

4. Relationship Between Risk Premia and Market Portfolio with Changing Risk:

We now extend the question by assuming that the composition of the market shifts to more risky industries, such as high-technology, bio-technology, and so forth. Thus, we assume that the coefficient of average risk aversion is still 1.5, and the standard deviation of the market increases from 16.08% to 20%. We have no reason to expect the standard deviation of the utility would change from its 16.08%, and we would expect that the correlation of returns between the utility and the market would decrease, assumed for the moment to be about 0.4. What are the new equity risk premia for the market and the utility?

We first calculate the new variance of return for the market by multiplying 20% by 20% to get 4%. We then get the new market equity risk premium by multiplying 1.5 times 4% to get 6%. We obtain the new beta for the utility by multiplying the utility's own unchanged standard deviation of return of 16.08% by the utility's own new correlation with the market of 0.4, and then divide this by the now higher standard deviation of return for the market of 20%. We get a new (and lower) beta for the utility of .32. The utility's relative equity risk premium is now equal to its beta of 0.32 times the new market equity risk premium of 6, or 1.92% (i.e., about the same as before except for rounding error). Thus, the utility's relative equity risk premium will increase if the correlation does not drop from 0.5 to 0.4, will remain unchanged if the correlation drops from 0.5 to 0.4, and will actually decrease if the correlation drops from 0.5 to below 0.4. The evidence that we presented earlier on the rolling betas and correlations lead to the conclusion that the correlation would drop below 0.4.

These results are not surprising, since while the total market equity risk premium has increased from 3.80% to 6%, the equity risk premium per unit of risk has remained constant at 1.5. Thus, unlike the case where the coefficient of risk aversion changes, increased market risk due to a changing market composition into risky assets that are less correlated with existing assets will lower the relative equity risk premium for the utility, and is likely to lower it enough that the utility's own relative equity risk premium will decrease.

5. Relationship Between Equity Risk Premia and Market Integration and Globalization:

Suppose now that the Canadian market is integrated with world markets. What is the proper equity risk premium for the Canadian market?

To answer this question, let us assume as above that the standard deviation of the Canadian market remains at 16.08%%, that the average risk aversion is 1.5 both within and outside of Canada, that the risk-free rate is the same in Canada as it is internationally, and that there are benefits from international diversification. The benefits from international diversification are such that the equity risk premium for an internationally diversified portfolio with the same standard deviation of return as the Canadian market is higher (say, 6%) than the previous value calculated for Canada-only investment of 3.88%.

Does this mean that the appropriate equity risk premium to be used for the TSE is now 6% instead of 3.88%? The answer is definitely no. While the internationally diversified portfolio and the Canadian market portfolio have the same standard deviation of return, they do not have the same level of non-diversifiable risk. While all of the total risk of the internationally diversified portfolio is non-diversifiable, much of the total risk of the Canadian market portfolio is now diversifiable, according to the theory and empirical evidence on international portfolio diversification. Thus, if 50% of the risk of the Canadian market portfolio is diversifiable when this portfolio is included in a well-diversified international portfolio, then the appropriate equity risk premium is not 6% or 3.88%, but it is one-half of 6% or 3%. This is why the theory and empirical evidence finds that globalization decreases the cost of capital for firms.

APPENDIX 4.E

Beta Adjustment to Reflect Sensitivity to Interest Rate Changes

One of the mainly flawed rationales for using a variant of the adjusted beta method for utilities is that raw utility betas need to be adjusted upward due to their sensitivity to interest rate changes, and that the appropriate adjustment is one that is intermediate between the raw and adjusted betas.

As is the case for the S&P/TSX Composite index, the returns of utilities are sensitive to changes in both market and bond returns. This suggests that utility returns may be better modeled using these two potential return determinants or factors. However, one should not confuse the sensitivity of utility returns with the premium required by investors to bear market and interest rate risk when investing in utility equities.

In the traditional one-factor CAPM, where the only factor is the market, one measures relative risk by estimating the utility's beta by running the following regression:

$$r_i = a_i + b_i R_m + e_i$$

where r_i and R_m are the return on utility *i* and the market *m*, respectively; and b_i is the beta coefficient of utility *i*.

The utility's required rate of return then is given by:

$$\bar{r}_i = r_f + b_i(\bar{R}_m - r_f)$$

where r_f is the risk-free rate, which is proxied here by the yield on a long-term Canada;

$(\bar{R}_m - r_f)$ is the so-called market equity risk premium; and

all the other terms are defined as before.

In a two-factor CAPM, one obtains the relative priced risks for utility *i* by estimating the utility's betas by running the following regression:[29]

$$r_i = a_i + b_{1i} R_m + b_{2i} R_b + e_i$$

where r_i, R_m and R_b are the return on utility *i*, the equity market *m*, and long Canada's, respectively; and

b_{1i} and b_{2i} are the beta coefficients of utility *i* (i.e., the sensitivities to market and interest rate risk, respectively).

The utility's required rate of return then is given by:

$$\bar{r}_i = r_f + b_i(\bar{R}_m - r_f) + b_i(\bar{R}_b - r_f)$$

where r_f is the risk-free rate, which is proxied here by the yield on a long-term Canada;

$(\bar{R}_m - r_f)$ is the so-called market equity risk premium;

$(\bar{R}_b - r_f)$ is the so-called interest rate risk (bond market) premium; and

all the other terms are defined as before.

While one would expect the estimates of R_m, R_b and $(\bar{R}_m - r_f)$ to be positive and significant, such is not the case for $(\bar{R}_b - r_f)$. Over the long run, we would expect the average return on long Canada's to be equal to the yield on long Canada's (the proxy for the risk-free rate in rate of return settings). This is because our expectation is that interest rates would fluctuate randomly so that bond returns would be above yields to maturity in some periods and below them in other periods. Thus, while it is true that utility equity returns are sensitive to interest rate changes, it is not true that interest rate risk will have a materially positive equity risk premium over the long run. Subsequently, we will show that this is the case based on an examination of the data.

[29] This two-step procedure for testing asset pricing models, such as the CAPM, originates with Eugene Fama and James MacBeth, Risk, return, and equilibrium: Empirical tests, *Journal of Political Economy* 71 (1973), pp. 607-636.

We now illustrate the above by first calculating the betas for the two-factor CAPM for our sample of seven utilities over the 1990-2002 period that have full data. In doing so, we use correct econometric procedures by using the orthogonalized long Canada bond returns. When this correct econometric procedure is used, **the market betas are the same as those obtained using the single-factor CAPM for each utility**, and the interest rate betas are the same as those obtained using the two-factor CAPM (without orthogonalization) for each utility. These results are reported in Schedule 4.E1. As expected, the beta estimates for each factor are positive (and generally) statistical significant at conventional levels.

Next, we calculate the bond market risk premia over various time periods that correspond to those used previously to calculate the market equity risk premia. These results are reported in Schedule 4.E2. As expected, over long periods, such as 1965-2002, the mean bond market risk premium is only 30 basis points, and it becomes negative over the three progressively longer time periods of 1957-2002, 1951-2002 and 1936-2002. While it is positive and quite material over the 1980-2002 period at 1.745%, this is offset by the relatively low market equity risk premium of 2.797%. Furthermore, according to our expectations, all of the mean bond risk premia are not significantly different from zero at conventional levels. In contrast, the mean equity risk premia are significantly different from zero for the two longest time periods of 1936-2002 (at 5% level) and 1951-2002 (at 12% level).

The two risk premia series (i.e., equities and bonds) are essentially uncorrelated at 0.02 over the full time period of 1936-2002. The highest correlation between these two risk premia series is 0.04 for the 1965-2002 time period.

Schedule 4.E1

This table provides the market and bond return betas for our sample of seven utilities based on the estimation of a two-factor CAPM over the period, 1990-2002. The three utilities that do not have data for the full time period are eliminated from the sample. They are Emera (Nova Scotia Power), Pacific Northern Gas and Enbridge. All betas are calculated using monthly total returns for the utility and the S&P/TSX Composite index.

Variable	BC Gas	Cdn Util.	Trans Alta Corp.	Trans Canada	Westcoast Energy	Atco Ltd.	Fortis Inc.	Mean, with Atco: In	Mean, with Atco: Out	Highest, with Atco in
Market beta	0.260	0.345	0.242	0.112	0.197	0.397	0.220	0.253	0.229	0.397
Orthogonalized bond return beta	0.364	0.443	0.568	0.756	0.409	0.494	0.415	0.493	0.493	0.756

Schedule 4.E2

This table provides the equity and bond market premia over yields on long Canada's for various time periods. Since the data are drawn from the Canadian Institute of Actuaries, the longest time series with Canada bond data is for the time period, 1936-2002

Time Period	Equity market risk premia	Bond market risk premia	Total risk premia[a]: Atco In	Total risk premia[a]: Atco Out	Total risk premia[a]: Atco In; Highest Individual Beta
1936-2002	4.659	-0.069	1.147	1.035	1.798
1951-2002	3.653	-0.240	0.807	0.719	1.269
1957-2002	2.273	-0.013	0.569	0.515	0.893
1965-2002	1.574	0.301	0.547	0.509	0.852
1977-2002	2.797	1.745	1.568	1.501	2.430

[a]This is calculated using the mean betas for the utility sample given in Schedule 4.E1. For example, 1.147 = (.253 *x* 4.659) + (0.493 *x* -0.069).

APPENDIX 6.A

IS THE RELATIONSHIP BETWEEN EX ANTE RISK PREMIA AND LONG GOVERNMENT YIELDS SPURIOUS?

We have reason to believe that the significant relationship found between ex ante risk premia and long government yields in the U.S. studies is spurious.[30] In the regressions estimated in these studies at the market level, the ex ante risk premia is given by the expected stock return from using the DCF model and analyst growth forecasts less the long government yield, which we will denote by Y and X, respectively. Consider the limiting case where Y and X are independent (i.e., the expected stock market return is independent of the long government yield or risk-free proxy) and both variables are normally distributed with mean zero and variance of one (i.e., standardized normal). If we now regress (Y – X) on X as is done in these studies, the estimated coefficient or beta on the X variable is Cov (Y-X, X)/Var(X), which will be equal to –1 in the population. When the estimation is done using a finite sample, the estimated coefficient will differ from –1. This is due to estimation error caused by the fact that the correlation between Y (the market return) and X (the long government yield) is unlikely to be exactly zero for any finite time period, especially when Y is proxied by the noisy and biased estimates emanating from the use of the DCF model with analyst expectations as inputs.

To provide some intuition on this argument, take the very simplifying case where X and Y can only take the values of 0 or 1. Then the four combinations between X and Y and the resulting values for Y – X are:

Y	0	0	1	1
X	1	0	0	1
Y - X	-1	0	1	0

[30] For example, see Robert S. Harris and Felicia C. Marston, 2001, The market risk premium: Expectational estimates using analyst's forecasts, *Journal of Applied Finance* 11:1 (2001), pp. 6-16.

By construction, the correlation between Y and X is 0, and the beta of a regression between Y and X is 0. However, the correlation between Y-X and X is –0.71, and the beta is –1.00.

The above proof also leads to a very counter-intuitive result for the zero-beta version of the traditional CAPM. If we calculate Y-X (the risk premium) as the market return (Y) minus the return on the zero-beta portfolio (X) and we regress Y-X against X, then the estimated slope coefficient should be –1.[31] This means that the market return will never change when the return on the zero beta portfolio (the risk-free proxy) changes. The reason is that the change in the intercept will always be offset by an equivalent change in the opposite direction in the ERP. In other words, we have a Security Market Line or SML where the intercept can change but the SML always goes through an unchanging market return. This is counter to the intuition behind the zero-beta version of the traditional CAPM, since this model makes no assumption that the market return is a fixed number.

[31] Please remember that the correlation between the returns on the market and the zero-beta portfolio are zero by definition.

APPENDIX 7.A

OUR CRITIQUE OF THE USE OF THE INTERNATIONAL COST OF CAPITAL METHOD CONTAINED IN PREVIOUS TESTIMONY[32]

Q. Please explain your criticism of the evidence of Dr. Evans based on the use of the International Cost of Capital Method.

A. We have five fundamental criticisms of the International Cost of Capital Method. We end with the most important of these criticisms.

First, according to Erb et al., while traditional factor models are reasonably successful in characterizing the expected return/risk trade-off in developed markets, they fail when applied to the new emerging equity markets.[33] They go on to state that, while the world beta model assumes that all capital markets are completely integrated, there are reasons to believe that some of the markets (in particular, the emerging markets) are not fully integrated into the world economy. Thus, their work provides an alternative approach for assessing the expected risk/return relationship for developing, and not developed markets such as Canada.

Second, Dr. Evans states that the "market return estimates in the international cost of capital study are derived from the country risk rating model developed by Erb, Harvey and Viskanta".[34] Based on our reading of the paper, Erb et al. do not actually test such a model. The closest they come to a test is in the latter part of their paper where they examine if credit risk rating is able to separate high-expected-return and low-expected-return investments. They do this by constructing four country credit rating quartile portfolios with equal initial

[32] Drs. Kryzanowski and Roberts, line 24, page 109 through line 8, page 115, Alberta Energy and Utilities Board, UtiliCorp Networks Canada (Alberta) Ltd. (UNCA). Refiled by Acquila as Ex 004-03-2003-07-09-Aquila-Intervenor Evidence of Drs. Roberts & Kryzanowski.
[33] Claude B. Erb, Campbell R. Harvey and Tadas F. Viskanta, Country risk and global equity selection, *Financial Analysts Journal*, Winter 1995, p. 74.
[34] Dr. Evans, Appendix C, p. C-12, of evidence.

investments and monthly rebalancing from the sample of 40 countries. Since these portfolios are built on lagged country credit risk ratings, their returns can be viewed as the out-of-sample performance of a portfolio selection strategy based on credit risk ratings. While the annual returns decrease for portfolios with a lower credit rating, Erb et al. suggest that the results do not reflect numerous costs incurred when investing abroad, such as much higher trade costs, especially for developing markets. Trade costs would be substantial for a monthly rebalancing strategy given the high bid/ask spreads in many of these markets. To illustrate the lack of liquidity in some of the markets, Erb et al. note that the total value of stocks traded in Nigeria in December 1993 was only $800,000.[35]

Third, Dr. Evans states: "…the international study is used to estimate the market risk premium for Canada using a globally-diversified portfolio of shares held by a Canadian investor and forward-looking country credit risk ratings for Canada and other countries". [36] The international cost of capital methodology notes that: "…the stocks in the IFCG [the proxies for the developing markets] indices are not necessarily available to outside investors".[37] Furthermore, while the indices for the developed markets use share float, those for the developing markets use market capitalization.

Fourth, the model is less forward-looking than equity risk premium model applications that use the forecasts of equity returns and bond yields of practitioners, and experts acting for intervenors. Furthermore, many of the available data series used to estimate the model are fairly short.

Fifth, the most important criticism is that the Erb et al. model does not work well for the Canadian market. Before a model can be used to forecast a variable (in this case, the required return or cost of equity), it has to be able to explain

[35] Claude B. Erb, Campbell R. Harvey and Tadas F. Viskanta, Country risk and global equity selection, *Financial Analysts Journal*, Winter 1995, p. 81.
[36] Dr. Evans, Appendix C, p. C-4, of evidence.
[37] *International Cost of Capital Perspectives Report 2001*, p. 3.

historical returns for that market reasonably well. In statistical jargon, before we test or use a model out-of-sample, it has to work in-sample.

Thus, we examine the in-sample fit of the Canadian average returns using the data given in Exhibit 1 of the Erb et al. paper. Doing this, we find that there is a significant relationship between annualized average returns and average Credit ratings, which confirm whatever regression statistics are reported in the Erb et al. paper. While we find that the estimated intercept is significant as expected, it has a value of only 28.4%. In other words, the predicted annualized average return for a country with the lowest country risk rating of 0% (i.e., almost certain default) is only 28.4% return on average! In addition, we find that the model does not work well for the Canadian market in-sample. **While the annualized average return for Canada over the estimation period was 8.2%, the predicted value using the estimated regression equation for Canada is 16.3%. This is approximately a 99% estimation error (overestimate) for the Canadian market. If the model has such a dismal performance in-sample for Canada, there seems to be little justification to use it out-of-sample for Canada.**

Q. Do you have any comments about whether or not the International Cost of Capital Method explicitly assumes that investors hold globally diversified portfolios?

A. Yes. In response to an information request, Dr. Evans makes the following statement:[38]

> "Strict adherence to the assumption of diversification would suggest that greatest weight be placed on the results of the International study, because that is the only study to explicitly assume that investors have maximized their diversification potential – i.e., by globally diversifying their portfolios."

[38] Dr. Evans, Response to FIRM.UNCA-RET-56. Also, Dr. Evans, page 27, of evidence.

This statement is incorrect because the International Cost of Capital Method does not explicitly or even implicitly assume that investors globally diversify their portfolios. The method is essentially a stacked regression of average realized equity returns for various country markets against those countries' credit risk ratings. There are three reasons why this does not assume that investors globally diversify their portfolios.

First, a country's credit risk rating represents a domestically diversified sovereign credit risk portfolio and not an internationally diversified credit risk portfolio. Just like market risk, a portion of a country's credit risk is diversifiable in an international context.

Second, any stacked regression implicitly places the same market weight on each country and each time period. Thus, micro markets such as those in Jordan and Zimbabwe have the same weight as macro markets such as those in the U.S. and Japan. To capture international diversification, world market indices are market-value-weighted and not equally weighted. This negates Dr. Evans statement that:[39]

> "I am now giving significant weight to an International Cost of Capital study that uses forward-looking country credit risk ratings and comparatively recent market returns for a number of countries to derive globally-efficient estimates of Canada's market risk premium."

Third, the International Cost of Capital Method is like using the standard deviations of total returns (a measure of total investment risk) for individual utilities when implementing the Equity Risk Premium Method instead of using the relative investment risks or betas (a measure of nondiversifiable investment risk) of individual utilities.

Q. Do you have any further comments on the use of the International Cost of Capital Method?

[39] Dr. Evans, page 26, of evidence.

A. Yes, we have four further comments.

First, the International Cost of Capital Method uses a measure of credit risk to measure the risk that is priced for equities. We would expect credit risk to be a very noisy proxy for market risk.

Second, Dr. Evans repeatedly notes that a major advantage of the International Cost of Capital Method is that it "does not use risk premium data for periods that stretch as far into the past". [40] The primary reason why this method does not use data prior to 1980 is that it was not available. For example, Ibbotson Associates Inc. uses the "entire history of ratings back to March 1980".[41]

Third, the International Cost of Capital Method, as implemented by Ibbotson Associates, Inc., estimates one credit risk beta using data from 1980. This is done by running a stacked regression between the equity returns for the country markets against the credit risk ratings for those countries, where the variables are measured using either a linear or logarithmic scale. In contrast, most applications of the Equity Risk Premium Method use five years of data to estimate investment risk or beta, and at most ten years of data. Thus, the International Cost of Capital Method gives realized returns and credit risk ratings from the early 1980s the same weight as those from the late 1990s in its beta estimation. Furthermore, to be compatible with the international CAPM, the International Cost of Capital Method should use an international credit risk rating and not a country-specific credit risk rating, and should estimate a different beta for each country. It is extremely implausible to assume that the relationship between equity market returns and credit risk rating is identical for each and every market. The International Cost of Capital Method estimates one beta so that the resulting regression equation can be used to "estimate the expected

[40] Dr. Evans, response to FIRM.UNCA-RET-60; and Dr. Evans, pages 27 and 29, of evidence.
[41] Ibbotson Associates, Inc., *International Cost of Capital Perspectives Report 2001*, p. 2. On the same page, we also find: "Country credit ratings are available for many countries dating back to 1979 on a semiannual basis. The entire history of available data is used for added statistical confidence." We use the 1980 date for expositional purposes from this point on although the correct date may be 1979.

return of any country given its country credit rating, whether or not the country has available return data".[42]

Fourth, Erb et al. devised the International Cost of Capital Method to deal with a number of problems, specifically, the fact that "most countries lack sufficient market data to incorporate into cost of equity models".[43] This is not the case for Canada, as the Canadian capital market is a developed and not a developing market.

[42] Ibbotson Associates, Inc., *International Cost of Capital Perspectives Report 2001*, p. 2.
[43] Ibbotson Associates, Inc., *International Cost of Capital Perspectives Report 2001*, p. 2.

APPENDIX 7.B

OUR CRITIQUE OF SOME OF THE PROBLEMS ASSOCIATED WITH THE USE OF THE COMPARABLE EARNINGS METHODOLOGY TO OBTAIN THE ROE OF AN APPLICANT UTILITY[44]

Q. Would you please illustrate the net effect of these problems using the samples used by Dr. Evans?

A. We illustrate the net effect of these problems by examining the market performance of the samples of firms used by Dr. Evans in his implementation of the Comparable Earnings Method. Dr. Evans argues that the risks of his 17/14 samples are comparable to those of an average utility. As noted earlier, rate of return experts representing the utilities and interveners, believe that utilities are less risky than the market (range of relative risks of 50% to 70% of that of the market). Finance logic then suggests that the return of the 17/14 samples should be between the yield or return on long Canada's and the return on the TSE300 index. The problems identified above suggest that the performance of the 17/14 samples will be biased upwards, and may be biased to such a large extent that the 17/14 samples outperform the market over at least the screening period used to select the samples.

If we take the two periods that match in the evidence presented by Dr. Evans[45] and in Table 2A available from the Canadian Institute of Actuaries[46] (namely, the 1951-2000 and 1991-2000 periods), we can compare the annual compound returns for the 17/14 samples with the TSE300 index. Over the longer time period the 17-company portfolio, the 14-company portfolio and the TSE300 earned annual compound rates of return of 13.65%, 13.42% and 10.94%, respectively. Over the shorter and more

[44] For the convenience of the Board, this is an extract from: Drs. Kryzanowski and Roberts, line 12, page 102 through line 12, page 109, Alberta Energy and Utilities Board, UtiliCorp Networks Canada (Alberta) Ltd. (UNCA). Refiled by Acquila as Ex 004-03-2003-07-09-Aquila-Intervenor Evidence of Drs. Roberts & Kryzanowski.
[45] Dr. Evans, Appendix C, p. C-16, of evidence. We assume that the 10, 20, 30 and 40-year periods ending in 2000 are 1991-2000, 1981-2000, 1971-2000 and 1961-2000, respectively.
[46] As supplied by Dr. Evans in BR.UNCA-28.pdf.

recent time period, the 17-company portfolio, the 14-company portfolio and the TSE300 earned annual compound rates of return of 13.94%, 12.92% and 13.14%, respectively. Thus, not unexpectedly given the biases introduced by using the Comparable Earnings Test, we find that the 17 sample outperformed the TSE300 index over both time periods and the 14 sample outperformed the TSE300 index over the longer time period and slightly underperformed the TSE300 index over the shorter time period, although both the 17 and 14 portfolios have a much lower investment risk than the TSE300 index. The reason that the 14 sample slightly underperformed the TSE300 index over the shorter time period is that it does not include high tech stocks while the TSE 300 index does over this period, and this ten-year period was characterized by a high-tech stock market bubble.

To further quantify the performance-enhancement bias in the selected samples, we examine the performance of the 17 stock sample used by Dr. Evans (hereafter referred to as the 17 sample or portfolio) using some standard portfolio performance measures. Specifically, we first form an equally-weighted portfolio of the 17 stocks, and calculate this portfolio's monthly return for the 120-month period, 1991-2000. This time period corresponds to the period over which the balance sheet returns for the sample are studied by Dr. Evans. We then calculate the excess return on this portfolio and the TSE300 index by subtracting off the risk-free T-bill rate from both of these return series. We then regress the excess returns on the 17 portfolio against the excess returns on the TSE300 index. The intercept of this regression is a measure of the excess returns or free lunch associated with holding this portfolio over this ten-year period. It is both adjusted for market movements and risk, and is commonly referred to as the portfolio's alpha. We then calculate the Sharpe ratio for the 17 portfolio and the market. This is calculated, for example, for the 17 portfolio by subtracting the average risk-free rate from the average monthly return of this portfolio, and then dividing this difference by the standard deviation of monthly returns for the 17 portfolio.

We find that the 17 portfolio has extraordinary investment performance over this 10-year period; namely:

- The 17 portfolio has a higher mean monthly return than the TSE 300 (1.6% compared to 1.1%).
- The 17 portfolio has a lower total risk as measured by the standard deviation of monthly returns than the TSE 300 (3.5% versus 4.4%).
- The 17 portfolio has a higher Sharpe ratio (i.e., higher average risk premium per unit of total risk) than the TSE300 (0.34 versus 0.15).
- The alpha or free lunch for the 17 portfolio is both positive and highly significant (p-value of 0.0015), and indicates that an **abnormal return of about 0.9% per month (or about 11% per annum) was earned by investors who were fortunate enough to hold this portfolio over this ten-year period**.
- Not only did the 17 portfolio yield a higher mean monthly return than the TSE300 but it had substantially less investment risk given its estimated beta of 0.39.

Q. Did you conduct any other analyses that have an impact on the validity of using the Comparable Earnings Test?

A. Yes, we examined the returns on equities (ROEs) for the 17 sample over the same time period as examined by Dr. Evans. We find that the mean and median ROEs for this sample for the ten-year period, 1991-2000, are 15.03% and 13.12%, respectively. When we examine the ROEs for each of the 17 companies, we find that the ROEs for Rothmans are unusually high, with a mean and median ROE of 39.2% and 39.15%, and the standard deviation of its ROE is unusually low at 2.98%. Furthermore, the minimum and maximum ROE for Rothmans over this ten-year period are 34.37% and 45.18%, respectively. Just removing Rothmans from the sample reduces the mean and median ROE to

13.52% and 12.83%, respectively. Furthermore, it would be difficult to argue that Rothmans cost of equity is about 39%!

Using the betas calculated by StockGuide, we find that two sample firms have a beta of zero, that is, they have no investment risk or they are like a risk-free asset in a CAPM world. The mean and median beta (measure of investment risk) for the 17 sample estimated by StockGuide is 0.28 and 0.25, respectively, or 0.30 and 0.27, respectively, without Rothmans. This is considerably lower than either our beta estimate of 0.5 for UNCA DISCO or Dr. Evans' estimate of 0.6.

We then adjust the ROE to reflect the much higher investment risk of UNCA DISCO compared to the 17 sample and the 2 subsamples thereof. Our adjustment process is as follows:

- The first step is to determine the implied risk premium in the unadjusted ROE by subtracting the ten-year average annual yield on long-term bonds from CFMRC of 7.4% from the raw ROE estimates
- The second step is to calculate the required risk premium for UNCA DISCO by adjusting the implied risk premium from step one by:
    - Calculating the ratio of the estimated beta for UNCA DISCO to the estimated beta for the 17 sample and the two subsamples;
    - Multiplying the ratio of the estimated beta by the implied risk premium from step one;
- The third step is to determine the required ROE for UNCA DISCO by adding the required risk premium for UNCA DISCO calculated in the second step to the average annual yield on long-term bonds of 7.4%.

After completing these steps, we obtain the following totally unrealistic adjusted ROE values for UNCA DISCO:

Raw ROE estimate	Beta estimate	Adjusted ROE Estimate		
		17 sample	16 sample (no Rothmans)	13 sample (no Rothmans or high-tech)
Mean	0.6[a]	23.53	19.96	39.49
Median	0.6[a]	21.12	19.68	30.98
Mean	0.5[b]	20.84	17.63	34.14
Median	0.5[b]	18.83	17.64	27.05
[a]Dr. Evans. [b]Drs. Kryzanowski and Roberts.				

Furthermore, counter to a *priori* expectations, removing high tech firms increases the cost of equity for the sample of remaining firms.

Q. Do you conduct any other tests of robustness?

A. Yes, we calculate the ROEs for all the firms included in StockGuide. For the 10-year time period, 1991-2000, we obtain grand mean and median ROE values of –5.67% and 5.68%, respectively. If we implement standard trimming procedures of trimming 0.5% from both tails of the distribution to correct for the possible impact of outliers, the mean ROE increases to –4.85%. If we use the mean and median for the time-series of median ROE for each of the ten years, we obtain values of 5.76% and 6.73%, respectively.

These results suggest that the ROE for a firm with the same investment risk as the typical firm in the Canadian market is less than 6%. Since this average ROE is less than the risk-free proxy over this ten-year period of 7.4%, this leads to the implausible conclusion that the implied risk premium is negative (with the upward bound of 6% - 7.4%, or –1.4%).

Q. Would you comment on the statements by Dr. Evans that:

> "the historical comparable earnings data are consistent with a 13.0-13.5% rate of return range for the highest quality, lowest risk

> unregulated companies. Because the investment risks of UNCA are similar to those of the average unregulated company in the groups of 17 and 14, the indicated comparable earnings fair rate of return for UNCA is also 13.0-13.5%."[47]

A. We begin by noting that the mean rates of return for the 17 sample are 15.0% and 15.2% for the 17 sample for 1991-2000 and for 1994-2000, respectively. These values are considerably higher than the 13.0%-13.5% range inferred from the data by Dr. Evans.[48]

There are two simple tests of whether or not these estimates are reasonable and logically consistent. The first test is to compare these return forecasts to what investment professionals expect for the market. The second test is to compare the implied risk premium from these values against those that Dr. Evans states elsewhere are unreasonable.

For the first test, we calculate the implied own risk premium for this so-called sample of "low" risk industrials as 13.0% minus 5.75% or 7.25%.[49] Using Dr. Evans' beta of 0.6 for UNCA, for illustrative purposes only, this means that the implied market return is 16.45%.[50] We can judge the reasonableness of a 16.45% expected market return estimate by comparing it against the mid-term median, upper quartile and highest forecasts of the return on the TSE300 of 10.0%, 10.5% and 18.0%, respectively, reported in the Wyatt survey, and the median and 95 percentile long-term forecasts of the return on the TSE300 of 9.0% and 13.0%, respectively, reported in the Mercer *2002 Fearless Forecast*. Both of these surveys have been discussed earlier in Sections II and IV of our evidence. Obviously, the Comparable Earnings Test implemented by Dr. Evans provides extremely optimistic forecasts for the market return, even if we use the low end of this range of 13.0%-13.5% for low risk industrials or UNCA DISCO.

---

47 Dr. Evans, page 73, of evidence.
48 Dr. Evans, page B-9, of evidence.
49 This is consistent with the method used by Dr. Evans in footnote 10, page C-14, of evidence.
50 If .6 (R_m – 5.75%) = 7.25%, then R_m = 7.25% + (0.6 x 5.75%), or 16.45%.

For the second test, we calculate the market's risk premium that results from Dr. Evans' Comparable Earnings Test. The risk premium estimate for the market is equal to the market return estimate minus the long Canada yield used by Dr. Evans. Doing this calculation yields a risk premium estimate for the market of 16.45% - 5.75%, or 10.7%. However, for the international cost of capital models, Dr. Evans considers a Canadian market risk premium of 8.8% to be unreasonably high. Specifically, we quote:[51]

> "Ibbotson also reports estimates of Canada's market risk premium using two alternative international cost of capital models. The International CAPM Model suggests that Canada's market risk premium is 10.4%; and the Relative Standard Deviation Model infers that Canada's market risk premium is 8.8%. Both of these values exceed Ibbotson's 8.5% estimate of the global risk premium. Ibbotson regards the Canadian results as unreasonably high, and I agree with that assessment. Therefore, no weight is given to the results of applying either of these alternative models."

Thus, to be consistent, Dr. Evans should give no weight to the results of applying the Comparable Earnings Method.

[51] Dr. Evans, footnote 10 on page C-14, of evidence.

APPENDIX 7.C

RECENT THINKING AND PRACTICE ON CAPITAL STRUCTURE

In formal academic research, the approach to determining capital structure taken in this evidence is called the trade-off theory. The name describes the central idea of this theory: firms determine a target optimal capital structure by balancing the tax-reduction benefits of debt against the expected costs of financial distress and loss of financial flexibility. This appendix reviews the standing of this theory in the academic literature and its following among financial executives.

The main conclusions are three-fold: first, among academic researchers, the trade-off theory enjoys reasonable support but faces serious challenges from a number of competing theories. Second, while it has moderate support among financial executives, a recent survey in the U.S. shows that executives look outside the implications of this theory when setting capital structures for their firms. Third, while the trade-off theory can offer useful qualitative guidance, it is a mistake to treat capital structure as if it were amenable to precise analysis by a formula.

To establish this conclusion, we draw importantly on recent survey papers by Barclay and Smith (2001) and by Graham and Harvey (2001).[52] Further, in addition to the papers they review, we add a discussion of selected research released after these papers were published. We follow their lead in organizing the discussion around theories or concepts argued to influence capital structure. Our review focuses on the findings for large, investment grade firms, as these are most relevant for the utilities industry.

1. Trade-off Theory:

As stated earlier, the trade-off theory holds that firms determine their capital structures through a trade-off of the principal benefit of debt, tax deductibility (Modigliani

[52] References cited are listed at the end of this appendix.

and Miller, 1963) against the costs: increased expected cost of financial distress (Scott, 1976, inter alia) and the tax disadvantage of interest income for investors as compared with dividends or capital gains (Miller, 1977). A number of researchers find support for the trade-off theory by testing its empirical implications. Bradley, Jarrell and Kim (1984), MacKie-Mason (1990) and Wald (1999), among others, find that riskier firms use less debt as suggested by the theory. Long and Malitz (1985) examine the most and least highly leveraged industries in the U.S. and find that industries with high leverage use fixed assets intensively and are mature and less risky. Barclay, Smith and Watts (1995) find that higher-growth, riskier firms use less debt.

On the other side of the ledger, two studies document firm behavior inconsistent with the theory. Graham (2000) finds that firms use considerably less debt than implied by this theory given observed expected financial distress costs. Opler and Titman (1998) report that when share prices increase, firms tend to issue more equity. In contrast, the theory implies that, with higher prices, smaller or less frequent equity issues are appropriate to maintain a target debt-equity ratio.

The survey by Graham and Harvey (2001) reports similarly mixed results. Four factors central to the trade-off hypothesis received only moderate emphasis as very important by financial executives: volatility of earnings and cash flows (rated as "important" or "very important" by 48.08% of executives), tax deductibility of interest (44.85%), industry average debt ratio (23.40%) and financial distress costs (21.35%). Balancing these responses, credit ratings, which attempt to incorporate all four factors, are the second most important debt factor and are rated as important or very important by 57.10% of executives. When asked whether they have "somewhat strict" target debt-equity ratios, 55% of large firms answer positively. This percentage increases to 64% for investment grade firms and 67% for regulated firms. This is more supportive of the trade-off theory but hardly conclusive.

Because the evidence backing the trade-off theory is less than overwhelming, academics have developed a number of competing theories and we review these next.

2. Competing Theories

2.1 Pecking Order Theory

According to the pecking order theory firms prefer internal financing and raise external funding as a last resort when internal funds are exhausted (Myers and Majluf, 1984; Myers, 1984). Managers have private information about the future prospects of their firms. Assuming that this private information is positive, the firm's securities are undervalued and equity is more undervalued than debt. As a result, firms first draw on internal funds, followed by debt and finally equity as the last choice. Since firms wish to avoid external financing according to this theory, they value financial flexibility. Shyam-Sunder and Myers (1999) find support for the pecking order model. Rajan and Zingales (1995) and Fama and French (2002) show that firms that have been more profitable in the past use less debt. This is consistent with the pecking order theory but not with the trade-off approach.

In their survey of executives, Graham and Harvey discover that financial flexibility and avoiding the sale of undervalued equity are important to financial executives. These factors are central to the pecking order theory. However, the pecking order theory holds that these factors are of greatest importance to firms most likely to have private information, small firms with significant growth opportunities, and this implication is not supported in the survey. Rather the survey reports that firms paying dividends (generally large, well established firms with less private information) are the ones that value the two factors most highly.

In addition, new studies reexamine the argument that when researchers find that more profitable firms use less debt this constitutes evidence against the trade-off theory. Sarkar and Zapatero (2003) point out that high earnings today can be coupled with expected low earnings in the future assuming that earnings follow mean reversion. In this case, we would expect profitable firms to use less debt and the trade-off theory could still hold. Their research supports the conclusions of Hovakimian, Opler and

Titman (2001) that pecking order considerations influence firms' short-term adjustments toward target capital structures as envisaged under the trade-off theory.

2.2 Market Timing or "Window of Opportunity"

Managers attempt to issue common shares when the market is high and repurchase their shares in poor markets according to Loughran and Ritter (1995). Valuation is measured relative to book values or to past levels of the firm's share price. Firms that succeed in timing the market issue equity at high prices and consequently have low leverage ratios. To the extent that it is based on rational factors, such success could arise from waiting until yesterday's private information is reflected in today's stock price (Lucas and McDonald, 1990). Unsuccessful market timers have higher leverage ratios. Baker and Wurgler (2002) measure the relationship between leverage and shifts in market-to-book ratios over time arguing that their results are most consistent with the market timing explanation. Further support for this view is in Graham and Harvey which identifies recent stock price performance as number three in the list of factors explaining when firms issue equity and particularly highly ranked for less established firms that do not pay dividends.

2.3 Signaling

In a variation on the theme of private information, signaling theory argues that firms with good prospects that are not widely recognized issue debt to create a credible signal to the market that they will enjoy strong cash flows sufficient to meet their increased debt servicing obligations (Ross, 1977 and Leland and Pyle, 1977). The survey by Graham and Harvey finds little support for this theory.

2.4 Free Cash Flow

Jensen's (1986) free cash flow theory of leverage is rooted in agency conflicts between managers and shareholders. Managers of a firm with plentiful free cash flow enjoy an opportunity to waste the cash in excessive consumption of managerial perquisites, through empire building or other unproductive investments. Under the free cash flow theory, managers take on additional debt using the free cash flow for debt service. In this way, they make a commitment to avoid wasteful uses of the firm's cash flow. This argument is widely advanced in support of leveraged buyouts. In the survey of financial executives, however, it received a low rating.

2.5 Product Market and Industry Factors

As stated earlier, the use of leverage varies systematically across industries. While this has been viewed as evidence for the trade-off theory as discussed earlier, researchers have developed alternative theories as well. For example, Titman (1984) argues that prospective product purchasers are concerned with the firm's ability to stay in business and make good on product guarantees. As a result, he holds that firms producing unique products should use less debt. Graham and Harvey report mixed results on this theory. Although high tech firms produce unique products, they do not control debt due to customer concerns. However, growth firms do report considering such concerns in their debt policies.

3. Synthesis

A number of capital structure theories are supported in academic research and while the trade-off theory enjoys the greatest popularity due to seniority and coverage in textbooks, there are a number of competing theories challenging its conclusions. This disparity is reflected in practice by financial executives. Further, perhaps due to the lack of consensus among researchers, "best practices" managers focus on practical factors only loosely related to theory, such as financial flexibility and credit ratings, when they set capital structures for their firms. Barclay and Smith (2001) provide a clear statement on this point:

> "Empirical methods in corporate finance have lagged behind those in capital markets for several reasons. First, our models of capital structure decisions are less precise that asset pricing models. The major theories focus on the ways that capital structure choices are likely to affect firm value. Rather that being reducible, like the option pricing model to a precise mathematical formula, the

existing theories of capital structure provide at best qualitative or directional predictions (p.198)."

References

Baker, Malcolm and Jeffrey Wurgler, 2002, Market timing and capital structure, *Journal of Finance* 57:1, February, pp. 1-32.

Barclay, Michael J. and Clifford W. Smith, 2001, The capital structure puzzle: another look at the evidence, in Donald H. Chew, Jr., ed, *The New Corporate Finance: Where Theory Meets Practice*, Third Edition (McGraw-Hill Irwin), pp.197-209.

Barclay, Michael J., Clifford W. Smith, and Ross L. Watts, 1995, The determinants of corporate leverage and dividend policies, *Journal of Applied Corporate Finance* 7:4, Winter.

Bradley, Michael, Greg Jarrell and Han Kim, 1984, The existence of an optimal capital structure: theory and evidence, *Journal of Finance* 39:3.

Fama, Eugene F. and Kenneth R. French, Taxes, financing decisions and firm value, *Journal of Finance* 53:3, pp. 819-844.

---, 2002, Testing trade-off and pecking order predictions about dividends and debt, *Review of Financial Studies* 15:1, Spring, pp. 1-33.

Graham, John R., 2000, How big are the tax benefits of debt? *Journal of Finance* 55:5, pp1901-1942.

Graham, John R. and Campbell R. Harvey, 2001, The theory and practice of corporate finance: evidence from the field, *Journal of Financial Economics* 60: 2-3, May/June, pp. 179-186.

Hovakimian, Armen, Tim Opler and Sheridan Titman, 2001, The Debt-Equity Choice, *Journal of Financial and Quantitative Analysis* 36:1, March, pp. 1-24.

Jensen, Michael, 1986, Agency costs of free cash flow, corporate finance and takeovers, *American Economic Review* 76, pp. 323-339.

Leland, Hayne E. and David H. Pyle, 1977, Information asymmetries, financial structure, and financial imtermediation, *Journal of Finance* 32, pp. 371-387.

Long, Michael and Ilene Malitz, 1985, The investment-financing nexus: some empirical evidence, *Midland Corporate Finance Journal* 3:3.

Lucas, D.J. and R.L. McDonald, 1990, Equity issues and stock price dynamics, *Journal of Finance* 45, pp.1019-1043.

MacKie-Mason, Jeffrey, 1990, Do taxes affect corporate financing decisions? *Journal of Finance* 45, pp.1471-1494.

Miller, Merton, 1977, Debt and taxes, *Journal of Finance* 32, pp. 261-275.

Myers, Stewart, 1984, The capital structure puzzle, *Journal of Finance* 39, pp. 575-592.

Myers, Stewart and Nicholas J. Majluf, 1984, Corporate financing and investment decisions when firms have information that investors do not have, *Journal of Financial Economics* 13, pp.187-224.

Modigliani, Franco and Merton Miller, 1963, Corporate income taxes and the cost of capital: a correction, *American Economic Review* 53, pp. 433-443.

Opler, Tim and Sheridan Titman, 1998, The debt-equity choice, unpublished working paper, Ohio State University.

Rajan, Raghuram and Luigi Zingales, 1995, What do we know about capital structure? Some evidence from international data, *Journal of Finance* 50.

Ross, Stephen, 1977, The determination of financial structure: the incentive signaling approach, *Bell Journal of Economics* 8, pp. 23-40.

Sarkar, Sudipto and Fernando Zapatero, 2003, The trade-off model with mean reverting earnings: theory and empirical tests, Working Paper, McMaster University.

Shyam-Sunder, Lakshmi and Stewart C. Myers, 1999, Testing static tradeoff against pecking order models of capital structure, *Journal of Financial Economics* 51:2, pp. 219-244.

Titman, Sheridan, 1984, The effect of capital structure on a firm's liquidation decision, *Journal of Financial Economics* 13, pp. 137-151.

Wald, John K., 1999, How firm characteristics affect capital structure: an international comparison, *Journal of Financial Research* 22:2, pp. 161-188.

Before the Public Utilities Board of the Northwest Territories

In the matter of:

Northwest Territories Power Corporation
Phase I General Rate Application

Evidence of
Hydro Communities (HC)
(Hay River, Yellowknife, Fort Smith)

On Capital Structure, Return on Common Equity, Sinking Fund and Capital Lease

Prepared Testimony of

Dr. Lawrence Kryzanowski and Dr. Gordon S. Roberts

Concordia University Research Chair in Finance, John Molson School of Business, Concordia University, Montreal; and CIBC Professor of Financial Services, Schulich School of Business, York University, Toronto.

March 2007

TABLE OF CONTENTS **Page**

I. INTRODUCTION AND SUMMARY

Q. Please state your names, employment and professions.

A. We are Dr. Lawrence Kryzanowski of Concordia University and Dr. Gordon S. Roberts of York University. Dr. Kryzanowski is currently a Full Professor of Finance and Concordia University Research Chair in Finance (previously Ned Goodman Chair in Investment Finance) at Concordia University. He earned his Ph.D. in Finance at the University of British Columbia. Dr. Gordon S. Roberts is currently CIBC Professor of Financial Services at York University's Schulich School of Business. He earned his Ph.D. in Economics at Boston College.

Q. Please describe your experience relative to your current role of submitting evidence before the Board.

A. Dr. Kryzanowski has experience in preparing evidence as an expert witness in utility rate of return applications, stock market insider trading court proceedings, and confidential final offer arbitration hearings for setting of fair rates for the movement of various products by rail. Together with Dr. Roberts in 1997, he prepared a report for the Calgary law firm, MacLeod Dixon, on rate of return considerations in the pipeline application by Maritimes and Northeast. For a group of organizations collectively and most recently referred to as the Consumers Group (formerly UNCA Intervenor Group and FIRM Customers), Drs. Kryzanowski and Roberts provided evidence on the fair return on equity and the recommended capital structure for ATCO Electric Limited in its 2001/2002 Distribution Tariff Application and for Aquila Networks Canada (Alberta) Ltd. ("ANCA") in its 2001/2002 Distribution Tariff Application and its 2002 Distribution Tariff Application (DTA) No. 1250392 before the Alberta Energy and

Utilities Board. On behalf of the Province of Nova Scotia, they provided evidence and testified before the Nova Scotia Utility and Review Board in the matter of Nova Scotia Power Inc. in 2002. They filed evidence and testified before the Regie de l'Energie du Quebec for the Fédération canadienne de l'entreprise indépendante ("FCEI") / Union des municipalities du Québec ("UMQ") & Option consommateurs ("OC") in the 2003 application of Hydro Quebec Distribution. Together with Dr. Roberts, and on behalf of Consumers Group, he prepared testimony and testified in Generic Hearing No. 1271597 before the Alberta Energy and Utilities Board in 2003-2004.

Dr. Roberts is also experienced in preparing evidence for utility rate of return hearings. From 1995–1997 he submitted prefiled testimony as a Board witness in rate hearings for Consumers Gas. In 1996, he served as an expert advisor to the Ontario Energy Board in its Diversification Workshop. As noted above, together with Dr. Kryzanowski, he has also prepared evidence on rate of return and capital structure considerations and appeared before regulatory boards in Nova Scotia, Quebec and Alberta.

More broadly, Drs. Kryzanowski and Roberts often provide technical expertise and advice on financial policy. Among their consulting clients in recent years are the Superintendent of Financial Institutions, the federal Department of Finance, Canada Investment and Savings, Canada Mortgage and Housing Corporation, and Canada Deposit Insurance Corporation. Our brief *curricula vitae* are attached as Appendix 1.A

Q. What is the purpose of the evidence that you are presenting here?

A. The City of Yellowknife and the Towns of Hay River and Fort Smith (collectively referred to as the Hydro Communities or HC) have retained us to provide evidence on the fair return on equity, recommended capital structure, and costs of debt and leasing for Northwest Territories Power Corporation (NTPC) in the present hearing.

Q. Please describe the general approach that you have used in preparing your evidence.

In preparing our evidence we considered and used various techniques for determining an appropriate capital structure and for measuring the fair return on equity for a regulated utility. Although NTPC is a crown corporation owned by the Government of the Northwest Territories, we follow the stand-alone principle under which capital structure and the fair return on equity are determined as if each company were "standing alone" as a shareholder-owned entity.

For determining an appropriate capital structure for NTPC, we conducted an analysis of the bond ratings, capital structures, interest coverage ratios, returns on equity and equity ratios (both actual and those allowed by regulators) for a comparable sample of utilities. We then determined an appropriate equity ratio for an average-risk utility. To arrive at a recommendation for NTPC, we adjusted our overall capital structure to reflect the above-average business risk of NTPC.

For the determination of the recommended rate of return on equity, we considered and eliminated various approaches as being unreliable, and formulated our recommended rate of return primarily based on the Equity Risk Premium Test. We supplement our rate of return evidence by conducting a Discounted Cash Flow (DCF) analysis, and benchmarking against the return expectations for stocks and bonds of various samples of buy- and sell-side investment professionals.

We also addressed the appropriateness of NTPC's method of calculating its cost of debt adjusting for sinking fund earnings. In this section of our evidence, we examine best practices regarding the use and design of sinking funds as well as a past decision by the Alberta Energy and Utilities Board. Here we also reexamine the calculation of the cost of NTPC's lease financing in light of best practices and the results of our return on equity analysis.

Q. Please provide a summary of your evidence indicating the major conclusions of each section.

A. In Section II we examine current economic and financial market conditions in the U.S. and Canada and forecast those economic variables that we use as inputs in the fair rate of return and capital structure tests.

A long-term trend provides an important context to our analysis of the fair rate of return on equity in Section IV of our evidence. This trend derives from the belief widely held by knowledgeable market participants that equity risk premiums will be significantly lower in the future than suggested by extrapolation from realized equity returns in the boom years of the second half of the 1990s.

Turning from trends to our economic forecast, a key factor in predicting Canadian economic fortunes over the next two years is what will happen in the U.S. where the economy is currently in a slowdown. The slower pace of economic growth south of the border is being driven by falling housing prices and their impact on consumer spending in the U.S. This lower spending, in turn, is leading to weaker Canadian export growth. Later this year and in 2008, the U.S. economy will likely recover supported by lower energy prices and rising equity markets and its strengthening will boost Canadian manufacturing and commodity exports. Despite the slowdown, Canada's real GDP growth is still expected to be positive in both 2007 and 2008.

We also discuss the prospects for the economy of the NWT and conclude that growth at a higher rate than the overall rate for Canada is likely.

Turning to interest rates, for rate-making purposes we require a forecast of the rate on 30-year Canada's. We examine forecasts from four sources: Consensus Economics, Bank of Montreal, Bank of Nova Scotia and Toronto Dominion Bank. Using 2006/07 and 2007/08 as our "test years", we employ forecasts for September 30 to represent an "average" for each year. We employ both direct forecasts of the 30-year Canada rate as well as forecasts for 10 year Canada's adjusted upward by an average spread. We forecast the 30-year Canada rate at 4.20% for the first test year and 4.65% for the second.

Section III contains our views on the appropriate capital structure for NTPC. We begin by examining relevant financial data for a sample of eight Canadian utilities. We analyze their bond ratings, capital structures, interest coverage ratios and returns on equity. Also, we briefly review the practical implications of finance theory on capital structure for utilities. We then examine the business risk of NTPC along with the equity ratios of comparable companies – both the actual ratios and the ratios allowed by regulators. Based on these examinations and tests, we arrive at a recommendation for the appropriate equity ratio of 42%.

In Section IV, we estimate the fair rate of return for NTPC using primarily the Equity Risk Premium Test. We assess the expected market risk premium for the average Canadian stock at 4.90%. We check and reaffirm this conclusion using a Discounted Cash Flow (DCF) test employing historical and future estimates of dividend growth rates for the market proxy, and with comparisons of the long-term return expectations of buy- and sell-side investment professionals for equities and bonds. Next, we determine that an average risk utility is 50% as risky as the S&P/TSX Composite. We add an adjustment of 10 basis points for flotation costs. Given our point forecast of a long-term Government of Canada bond rate of 4.20% for the first test year and 4.65% for the second, we are recommending a return on equity of 6.75% for 2006-2007 and 7.20% for 2007-2008. Our return on equity recommendation allows an average risk utility a risk premium (with inclusion of the flotation cost adjustment) of 255 basis points over our forecast for long Canada yields. We apply this recommended rate of return to NTPC leaving it to the capital structure to adjust for higher business risk.

In Section V, we deal with the cost of NTPC's debentures that have sinking funds. We show that the method used by NTPC to calculate the embedded cost of debt for these debentures is inequitable by construction and explodes as the debentures approach maturity. We show that the use of sinking fund debentures, as well as the features of NTPC's three non-redeemable debentures with sinking funds, does not conform to "best practice". This is followed by evidence demonstrating that NTPC's sinking fund investment policies did not conform to what is considered to be "prudent" in terms of portfolio management. With regard to rulings at other regulatory bodies, we refer to a decision by the Alberta Energy and Utilities Board against the use of the method employed by NTPC for determining the embedded cost for debt with sinking fund provisions. We end the first part of this section by recommending that the Board adopt the Alberta ruling in terms of stipulating how the embedded cost of debt should be calculated for debt issues with sinking funds.

Section V continues with our analysis of the cost of NTPC's lease. Our discussion in this section leads to the conclusion that the cost of the lease as presented by NTPC is overstated for four reasons. First, NTPC's calculation uses weights of 6.74% equity and 93.26% debt while the standard approach is to employ a debt weight of 100%. Second, if the cost of the lease is to include an equity component, the cost of equity should be lowered by more than 25 basis points to capture the lower risk of the capital lease. Third, the costs of debt used by NTPC are overstated due to the incorrect use of a sinking fund adjustment. Fourth, and finally, the costs of equity (drawn from Ms. McShane's evidence) are unreasonably high as we show in Section IV of this evidence.

We recalculate the lease cost for each test year employing adjustments based only on the third and fourth points above. The calculations produce a lease cost of 8.19% for 2006/07 and 8.24% for 2007/08. In the interests of conservatism, we make no further downward adjustments although such adjustments are warranted based on our first two points above.

Section VI of our evidence contains our critique of key aspects of the evidence dealing with the recommended ROEs and capital structure, and economic/financial market assessments of Ms. McShane, expert witness for NTPC.

We focus on three key areas in our critique: the forecast for the 30-year Canada rate, recommended capital structure, and return on equity. Turning to the first area, we find that Ms. McShane arrives at forecasts quite similar to our own. We note a few technical differences. For return on equity, the second area, we document in detail a number of adjustments that Ms. McShane either makes or fails to make to standard methodologies. We demonstrate that her stance on these adjustments or non-adjustments consistently leads her toward a higher recommended return on equity when compared with our recommendation.

We complete our discussion of the third area with a detailed comparison of recommendations for the returns on equity by Ms. McShane, ourselves, and the results of selected adjustment formulas currently in use by Canadian regulators. We regard the regulatory formulas as generous because they do not reflect the trend toward a lower equity market risk premium or MERP discussed in Sections II and IV of our evidence and incorporated into our recommendations. With this in mind, we conclude that, should the Board wish to move deliberately in the direction of implementing a lower MERP, it would be appropriate to set the fair rate of return for an average risk utility somewhere between our recommendations based on a risk premium over long Canada's of 255 basis points and the average of regulatory formulas bearing an average risk premium of 421 basis points. The analysis also demonstrates once more the upward biases of Ms. McShane.

Q. Please summarize your recommendations for the rate of return portion of your evidence using a format that is suitable for comparing your recommendations with those of Ms. McShane.

A. The following table contains the summary.

	Component		Flotation Allowance	Total	Weight
	1	2			
Discounted Cash Flow Test	N/A	Risk Premium of 4.90% for S&P/TSX Composite is conservatively high	N/A	N/A	0%; for bench-marking purposes only
Survey Expectations of Investment Professionals*	N/A	Risk Premium of 4.90% for S&P/TSX Composite is conservatively high	N/A	N/A	0%; for bench-marking purposes only
Equity Risk Premium Test	Risk-free Rate of	Risk Premium (50% of) of 4.90% = 2.45%	0.10%		100%
2006-2007	4.20%			6.75%	
2007-2008	4.65%			7.20%	
Recommendation		**2. 45%**	**0.10%**		**100%**
2006-2007	**4.20%**			**6.75%**	
2007-2008	**4.65%**			**7.20%**	
*Includes surveys conducted by W.M. Mercer Limited and Watson Wyatt.					

II. ECONOMIC AND FINANCIAL MARKET CONDITIONS

Q. How is this portion of your evidence organized?

A. We begin by discussing a significant long-term trend in capital markets that forms an important backdrop to our forecast here and to our analysis of the fair rate of return on equity in Section IV – a downward shift in expected market risk premiums. Next, we present our view of the economic outlook for Canada and the Northwest Territories. We conclude with our forecasts of the long Canada rate to be used in our rate of return analysis.

Q. Is there any long-term trend that influences your forecasts?

A. Yes, there is a significant trend toward lower expected market risk premiums. After the recession of the early 1990s, the rest of the decade was an ideal period in capital markets due to a long economic expansion and falling interest rates. As evidence of the economic expansion, note that between January 1990 and December 1999 real GDP in Canada grew by 37.33%.[1] Average real GDP growth in Canada was 2% annually between 1990 and 1998, and was 5.1% in 1999 and 4.4% in 2000. Annual average real GDP growth in the U.S. was 2.9% between 1990 and 1998, and averaged 4.1% in 1999 and 2000. As evidence of falling interest rates, 91-day Canadian T-Bills decreased from 12.13% in January 1990 to 4.82% in December 1999, while U.S. T-Bills decreased from 7.75% to 5.37%. In brief, most of the 1990s was an ideal period for capital markets characterized by strong and sustained growth for much of the period and falling interest rates.

[1] See CANSIM II SERIES V498943, V122484 and V121817.

Because the boom years of the 1990s were such a unique period, knowledgeable market participants do not expect that the excess of equity returns over long Canadian bond yields will be as high in the future. Evidence of falling equity premia comes consistently from surveys of knowledgeable market participants. For example the Watson Wyatt *21st Annual Canadian Survey of Economic Expectations 2002*, a survey of Canadian economists and portfolio managers reported a long run median forecasted total return on the S&P/TSX Composite index of 8% between 2007-2016, and a median forecasted yield on Canadian ten-year bonds of 5.8% between 2007-2016. This suggests a market risk premium over 10-year Canada bonds of 2.2%. Although the Watson Wyatt survey did not report forecasts for 30-year bonds, we deduce that, given a positively sloping yield curve, the risk premium over 30-year bonds would be even smaller.

A current survey of Canadian investment managers, Mercer Investment Consulting's 2007 Canadian Fearless Forecast reaches similar conclusions. For 2007 the median forecast of the return on the S&P/TSX is 7.5% as compared to an expected return on the Scotia Capital long bond index of 4.8%. This suggests an expected market risk premium of 2.7%.

In Section IV of our evidence and in Appendix 4.B, we return to the equity risk premium and summarize a large body of research predicting that, in the future, it will be well below its historical average.

Q. What is your forecast for the Canadian economy through 2008?

A. A key factor in predicting Canadian economic fortunes over the next two years is what will happen in the U.S. where the economy is currently in a slowdown.[2] The slower pace of economic growth south of the border is being driven by falling housing prices and their impact on consumer spending in the U.S. This lower spending, in turn, is leading to weaker Canadian export growth.

Later this year and in 2008, the U.S. economy will likely recover supported by lower energy prices and rising equity markets and its strengthening will boost Canadian manufacturing exports. At the same time, export growth is expected to receive assistance from the Canadian dollar which is not predicted to strengthen more than a minor amount in 2008. Further, even though energy prices have come down, they are still high by historic standards generating strong revenues for western Canada.

Despite the slowdown, Canada's real GDP growth is still expected to be positive and 2.3% for 2007 and 2.9% for 2008 according to Consensus Economics, January 8, 2007.

Q. What are your views on the economy of the Northwest Territories (NWT)?

A. The NWT has enjoyed rapid economic growth since 1999 fuelled largely by growth in mining, oil and gas which expanded from one-third to one-half of the territorial economy over the period 1999-2005.[3] During this period, economic growth in the NWT far outpaced that of the rest of Canada. Diamond exploration grew as diamonds replaced gold as the most important mining activity.

[2] Our forecast is drawn from TD Economics, *TD Quarterly Economic Forecast*, December 19, 2006, www.td.com/economics; BMO Financial Group, *North American Outlook*, November 14, 2006, www.bmo.com/economic; and Scotiabank Group, *Global Economic Research, Forecast Update*, January 9, 2007, www.scotiabank.com.

[3] Our NWT economic forecast is based on *Charting the Next Course, Background on the Northwest Territories Economy*, Northwest Territories Finance, November 2006.

Forecasting economic growth based solely on projects already in existence in 2006, such as the Ekati and Diavik diamond mines and the Snap Lake diamond mine construction, suggests that real GDP will grow only at an annual rate of 1.5% over the period 2005 to 2020. A more realistic forecast incorporates projects known to be in the planning stage and includes the Mackenzie gas project, other oil and gas exploration, development and production along with other development activity. This more realistic forecast leads to a prediction of real territorial GDP growth of just under 4% annually, which exceeds the real GDP forecasts for Canada.

Statements by NTPC officials are consistent with the second, more realistic forecast. For example, in the Company's 2005/06 *Annual Report*, page 16, Judith Groucher, Director, Finance & CFO states: "The NWT continues to benefit from high levels of economic activity". In the same report on page 2, Richard Nerysoo, Chairman, writes: "Our opportunities are enormous. In a time that is marked by increased resource development, expanding energy demands and the need for environmental friendly energy sources, NTPC, NTEC (03) and Sahdai Energy Ltd. are positioned to be key players in delivering on these opportunities."

In summary, the NWT economy has a bright future. Even if we conservatively take the average of our two forecasts, we predict real, long-run, annual economic growth between 2 and 3%.

Q. What rate do you recommend as the long Canada rate for use in market risk premium analysis?

A. For rate-making purposes we need to forecast the rate on 30-year Canada's for each test year.

As seen in Schedule 2.1, in developing our forecast, we draw on forecasts from Consensus Economics from October 2006 and on more recent predictions provided by the economics departments of three Canadian chartered banks.[4] Using April 1, 2007 through March 31, 2008 as our 2007/8 "test year" to match NTPC's fiscal year, we employ forecasts for September 30, 2007 as representing an "average" for the year.

In addition to working directly with forecasts for 30-year Canada's, we also follow the National Energy Board's practice of forecasting this rate by adding an average spread to the consensus forecast on 10-year Canada's.

Beginning with the 10-year forecasts, Consensus Economics reported on October 6, 2006 that the median forecast for 10-year Canada's 12 months forward was 4.50%. Bank of Montreal's forecast is 4.10%. Scotiabank Group forecasts that the 10-year Canada rate will be 3.70% in the third quarter of 2007. From TD Economics comes a forecast of 4.40%. We average these three bank forecasts to obtain 4.07% as our forecast for the 10-year Canada rate on September 30, 2007 as shown in Schedule 2.1.

To transform our 10-year forecast into a prediction for the rate on 30-year Canada's we add the average spread between these two instruments as observed over the last four quarters through Q4 2006. Using data from TD Economics, we calculate this average spread as 6 basis points. Rounding to 10 basis points and adding to 4.07% gives us 4.17% as our 30-year Canada's forecast.

As a check on this result, we repeat the same steps, using the Consensus Economics forecast for the 10-year Canada rate, 4.50%, in place of the

[4] Consensus Economics provides forecasts looking forward 6 and 12 months and as a result the only forecasts available for September 2007 are from October 2006.

average of the bank forecasts. Adding the average spread (rounded) of 10 basis points produces an estimate of 4.60% for 30-year Canada's. We do not use this forecast as it reflects dated information and the banks have since lowered their forecasts.

As a further check, we recalculate the 30-year forecast as the simple average of forecasts from the three banks: 4.20% from Bank of Montreal, 3.80% from Bank of Nova Scotia and 4.55% from TD. This gives us an average of 4.18%, virtually identical to what we obtained from our bank forecasts earlier.

Recognizing that these forecasts vary somewhat and erring on the side of caution, we adopt a long-term rate of 4.20% for the test year 2006/07 for purposes of our analysis of the fair rate of return on equity for the applicant utilities. The use of this, our higher estimate, builds an element of conservatism into our forecast.

Turning to the 2007/08 test year we repeat the same steps to obtain estimates of 4.55% for 10-year Canada's and 4.63% for 30-year Canada's based on averages of the bank forecasts as shown in Schedule 2.1. In estimating the long-Canada rate for the 2006/07 test year, we employed the Consensus Economics forecast as a check but this is not feasible as there is no such forecast for the second test year. The check that we apply rather follows our other prior check beginning with the banks' average forecast for 10-year Canada's of 4.55% and adding the average rounded spread of 10 basis points to obtain 4.65% just slightly higher than our estimate in Schedule 2.1. As before, we take the higher estimate of 4.65% as our long-Canada rate for the second test year.

Q. Please provide your forecast for the 30-year U.S. Treasury bond yield.

A. Our forecast for the 30-year U.S. Treasury bond yield follows the same methodology that we employ for the long-term Canada rate and is summarized in Schedule 2.2. For the test year 2006/07, we obtain forecasts from the same three banks for September 30, 2007. BMO Economics forecasts a rate of 4.60%, Bank of Nova Scotia forecasts 4.35%, and the forecast from TD Economics is 4.95%. The average of these three forecasts is 4.63%.

Following our practice for Canadian rates discussed earlier, we create a second forecast based on the 10-year rate adjusted for a spread. To do this we find the average of the banks' forecasts for the U.S. 10-year rate and add the average spread. The forecasts are: 4.50% (BMO), 4.25% (BNS) and 4.80% (TD) for an average of 4.52%. To convert this average to a 30-year forecast we follow our earlier practice of adding the average spread observed over the most recent four quarters. For U.S. Treasuries this was 8 basis points based on data from TD Economics. This gives us a second forecast for 30-year U.S. Treasuries of 4.60%. As above, we do not use the dated Consensus Economics forecast here.

We now have two forecasts, 4.63% and 4.60%. Following our approach from our Canadian forecast, we take the higher of these two rates and round up to the nearest 10 basis points. This gives us our forecast for U.S. 30-year Treasury bonds of 4.70%.

To obtain our forecast for the second test year, 2007/08, we repeat the same steps. To begin, we obtain forecasts from the same three banks for September 30, 2008.[5] BMO Economics forecasts a rate of 5.30%, Bank of Nova Scotia forecasts 4.80%, and the forecast from TD Economics is 5.35%. The average of these three forecasts is 5.15%.

[5] The Bank of Nova Scotia forecast is for June 30, 2008, the longest available.

Next, we create a second forecast based on the 10-year rate adjusted for a spread. To do this we find the average of the banks' forecasts for the U.S. 10-year rate and add the average spread. The forecasts are: 5.20% (BMO), 4.65% (BNS) and 5.25% (TD) for an average of 5.03%. To convert this average to a 30-year forecast, we follow our earlier practice of adding the average spread observed over the most recent four quarters estimated earlier as 8 basis points. This gives us a second forecast for 30-year U.S. Treasuries of 5.11%.

We now have two forecasts, 5.15% and 5.11%. Following our approach from our Canadian forecast, we take the higher of these two rates and round up to the nearest 10 basis points. This gives us our forecast for U.S. 30-year Treasury bonds of 5.20%.

III. CAPITAL STRUCTURE

Q. Please explain how you have organized this section of your evidence on capital structure.

A. We begin by examining relevant financial data for a sample of eight Canadian utilities drawn from *Stock Guide*. This sample consists of gas and electric utilities and pipelines that are covered in *Stock Guide* and have publicly traded common shares. We require the included companies to be publicly traded to ensure consistency between our samples here and in later sections where we present our evidence on the fair rate of return. We analyze bond ratings, capital structures, interest coverage ratios and returns on equity for our sample companies. Next, we briefly review the practical implications of finance theory on capital structure for electric utilities. We review the business risks faced by NTPC and relate them to these implications. We then turn to examining the equity ratios of comparable companies – both the actual ratios and those allowed by regulators in Canada. We conclude this section of our evidence with our recommendation on the appropriate equity ratio for NTPC.

Q. What evidence can you present on bond ratings and capital structures for Canadian utilities?

A. Schedule 3.1 displays Dominion Bond Rating Service (DBRS) and Standard & Poor's (S&P) bond ratings at the beginning of February 2007 for our eight Canadian utilities spanning different parts of the industry: gas, electric and pipelines. As stated above, these companies represent a current sample of utilities with publicly traded shares for which data are available in *Stock Guide*.[6] In forming this sample we seek to measure ratings and financial ratios for the traded entity associated with the

[6] We supplement the *Stock Guide* data with ratios from *Financial Post Advisor*.

regulated utility. In focusing on traded companies, our goal is to maintain sample consistency throughout our evidence. We recognize, however, that many of the traded companies include nonregulated businesses in addition to the regulated utility. We control for any bias by commenting on the differences as well as comparing our conclusions to those drawn strictly for regulated entities.

The bond ratings are from the websites of DBRS and S&P as well as from Bloomberg. Starting with the DBRS ratings, Schedule 3.1 shows that these range from A for Canadian Utilities, Enbridge and TransCanada Corporation down to BBB (low) for Pacific Northern Gas. S&P does not rate Pacific Northern Gas. The Schedule shows that the typical Canadian energy utility is rated between A (low) and BBB (high) by DBRS.

We next turn to the S&P ratings and make a similar comparison. The S&P ratings for the utilities in our sample range from A for Atco and Canadian Utilities down to BBB for Emera and TransAlta. The Schedule shows that the typical Canadian energy utility is rated A- by S&P.

The next step is to examine the actual, long-term capital structures of the companies in our sample for 2003 through 2005, the latest years for which data are available in *Stock Guide* and *Financial Post Advisor.* Focusing on the 2005 common equity ratios, Schedule 3.2 reveals that there is considerable variation across companies from a high of 55.10% for TransAlta to a low of 29.19% for Atco. The average percentage of common equity was 41.11% in 2005 up from 37.71% in 2003.

In addition, Schedule 3.2 shows the percentages of long-term debt and preferred shares in the capital structures of these companies. Again, there was considerable variation in the proportionate use of financing across companies. On average, the companies employed 53.72% long-term debt and 5.18% preferred shares in 2005. These ratios show common equity, long-term debt and preferred shares as percentages of long-term capital excluding short-term debt.

The presentation of ratios for the same group of companies continues in Schedule 3.3. The first three columns show the coverage ratio, EBIT/ Interest expense.[7] The average coverage ratio was 2.65 in 2005. The next three columns display cash flow to debt which averaged 16.33% in 2005.

Q. What conclusions about an appropriate capital structure for an integrated electric utility can you draw from Schedules 3.1 – 3.3?

A. The schedules show that, from the vantage point of DBRS, Canadian Utilities, Enbridge and TransCanada Corporation are the only companies which enjoy an A credit rating. The other companies are all rated A (low) (or lower). For S&P, only two companies in our sample (Atco and Canadian Utilities) are rated A. As stated earlier, the typical company is rated on the borderline between A(low) and BBB (high) by DBRS and given a marginally higher A- rating by S&P. Of the eight companies in our sample, four received a rating below A- (A (low)) from at least one of the rating agencies. Further, three companies garnered a rating of BBB or below from at least one of the agencies. Yet, despite their lower ratings, these companies have experienced no difficulties in accessing capital markets to raise long-term financing. This conclusion was not contradicted by Ms. McShane in her responses to Information Requests.[8]

[7] EBIT are earnings before interest and taxes.
[8] NTPC response to Information Request, HC.NTPC-25, and Information Request, HC.NTPC-27 dated February 16, 2007.

We conclude that the experience of the companies in Schedules 3.1 - 3.3 suggests that a bond rating of BBB or higher is sufficient to maintain good access to capital markets.

Q. Schedule 3.3 also contains data on ROEs for the companies in your sample. Do these data support your argument that a bond rating of BBB or above is sufficient for a regulated electric utility?

A. Yes, they do. The ROE figures for 2003 through 2005 show that all of the companies earned positive ROEs in all three years. Further, a 2001 study on the Canadian electric utility industry by DBRS concludes that actual earned ROEs typically exceed ROE targets set by regulators.[9]

In Schedule 3.4 we update this comparison for 2005 and broaden it beyond electric utilities to encompass our sample. The update shows that utilities continue to enjoy typical earned ROEs in excess of the target ROEs allowed by regulators.

Turning to the details, we conduct our update for 7 of our eight sample companies for which we have data on allowed returns. For two companies, Atco and Fortis, we have allowed returns by divisions giving us a sample of 11 comparisons. The average 2005 allowed return for this sample was 9.56% while the average actual ROE for the consolidated company was 11.46%. The difference, 190 basis points represents the outperfomance of allowed returns. Further, only 3 of our 11 regulated companies failed to achieve actual ROEs higher than their allowed rates. This strongly suggests that having a bond rating of BBB did not impede these companies from profitably conducting their businesses.

[9] G. Lavalee, M. Kolodzie and W. Schroeder, *The Canadian Electric Utility Industry*, Dominion Bond Rating Service, November 2001, p. 49.

Q. Your discussion shows that the typical Canadian utility in your sample has a bond rating between A (low) and BBB (high) from DBRS or A- from S&P. Further, a number of companies have BBB ratings. What is the relevance of this sample for NTPC which enjoys a higher bond rating of Aa3 from Moody's?

A. The bond rating of NTPC is based on the Government of the Northwest Territories. Under the stand-alone principle of regulation, we must set aside the impact of government ownership of NTPC and assess a fair capital structure from the standpoint of an investor-owned utility of comparable risk. This standard is provided by our sample in Schedule 3.1. Our analysis establishes that the sample represents a group of companies which, with appropriate adjustments discussed below, can proxy for the risk that would be faced by NTPC if it were investor owned. Applying the stand-alone principle, we use this sample to establish an appropriate capital structure for NTPC.

Q. Turning from examining data to the realm of finance theory, what can we learn from finance theory about the appropriate level of the equity ratio for a regulated electric utility?

A. The first thing we can learn is to be suspicious of attempts to determine an appropriate equity ratio using a formula. Unlike other areas in finance, research on capital structure can offer only qualitative policy advice. To quote a leading, current corporate finance textbook:

> "No exact formula is available for evaluating the optimal debt-equity ratio."[10]

---

[10] S.A. Ross, R.W. Westerfield, J. F. Jaffe and G.S. Roberts, *Corporate Finance*, Fourth Canadian Edition, Toronto, McGraw-Hill Ryerson, 2005, p. 492.

While we expect an introductory textbook to contain an element of simplification in order to present material to beginning students, this statement has yet to be superseded by advanced research. We review selected research on capital structure in Appendix 3.A.

Q. In the absence of a formula, can you explain the key considerations in determining capital structure?

A. In the same textbook we find the following:

> "How should companies establish target debt-equity ratios? While there is no mathematical formula for establishing a target ratio, we present three important factors affecting this ratio:[11]
>
> - Taxes. As pointed out earlier, firms can only deduct interest for tax purposes to the extent of their profits before interest. Thus, highly profitable firms are more likely to have larger target ratios than less profitable firms.
> - Types of assets. Financial distress is costly, with or without formal bankruptcy proceedings. The costs of financial distress depend on the types of assets that the firm has. For example, if a firm has a large investment in land, buildings, and other tangible assets, it will have smaller costs of financial distress than a firm with a large investment in research and development. Research and development typically has less resale value than land; thus, most of its value disappears in financial distress. Therefore, firms, with large investments in tangible assets are likely to have higher

[11] S.A. Ross, R.W. Westerfield, J. F. Jaffe and G.S. Roberts, *Corporate Finance*, Fourth Canadian Edition, Toronto, McGraw-Hill Ryerson, 2005, pp. 493-4.

target debt-equity ratios than firms with large investments in research and development.

- Uncertainty of operating income. Firms with uncertain operating income have a high probability of experiencing financial distress, even without debt. Thus, these firms must finance mostly with equity. For example, pharmaceutical firms have uncertain operating income because no one can predict whether today's research will generate new drugs. Consequently, these firms issue little debt. By contrast, the operating income of utilities generally has little uncertainty. Relative to other industries, utilities use a great deal of debt [emphasis added].

Q. What does consideration of these three factors tell us about the appropriate amount of debt for an integrated utility?

A. For any company, if we set aside the second and third factors for a moment, the first factor tells us that a company should use a large proportion of debt financing to reduce its cost of capital. Simply stated, factors 2 and 3 restrain the company's use of debt in order to reduce the cost of financial distress and the probability that it will occur due to low operating income. Turning from speaking in general about any company to focusing on a regulated electric utility, we believe that factors 2 and 3 are largely mitigated by the special features of this industry.

For an electric utility, the costs of financial distress (factor 2) are reduced because its assets make excellent collateral. Further, the regulation process allows the company to go to its regulator to apply for relief in the unlikely event that it does not earn its fair rate of return in a given year, and especially if its ability to service its debt were in jeopardy. We term this unlikely based on the DBRS study cited above and our update in

Schedule 3.4 which states that Canadian electric utilities typically earn more than their allowed ROEs. Additionally, in the extreme event that an electric utility became insolvent, it is highly likely that the regulator (and other governmental bodies) would work with the company to find new investors or a merger partner so that service (and thus, asset usage) would not be interrupted. This is what occurred with the bankruptcy of Pacific Gas and Electric Company in California.[12] As a result, the cost of financial distress is far lower than for a nonregulated firm.

The third factor is the probability of financial distress. As stated in the quotation, this probability is low for utilities because operating income has low variability, which is further diminished if the utilities make extensive use of deferral accounts. In conclusion, we come back to the beginning of our answer to this question. If we set aside factors 2 and 3 (the costs of financial distress and the probability of financial distress), the theory suggests that a company should use a high proportion of debt. Our comments on factors 2 and 3 explain why it makes sense to downplay them in practice for this industry. With the focus then on the first factor, taxes, we would expect regulated electric utilities to be among the most highly leveraged industries.

Q. Your answer to the previous question addressed integrated electric utilities as a whole. How do you assess the business risk of NTPC?

A. Our answer focuses on uncertainty of operating income introduced earlier in our overview of important factors in the determination of capital structure. Factors that increase costs to a utility such as higher energy prices do not necessarily increase business risk. Management can prevent these factors from increasing the uncertainty of operating income

[12] K. Gaudette, Bankrupt Pacific Gas and Electric hopes to avoid state laws, Associated Press, *The Nando Times*, January 25, 2002, www.nando.net/business/story/228567p-2199342c.html.

in several ways. First, it can forecast their impacts and build them into proposed pricing. In a fair regulatory environment, such costs will be allowed and passed on to customers. Second, management can engage in risk mitigation to control the impact of such factors on operating income. Third, factor risk can be mitigated by use of deferral accounts. Business risk is only increased if these two approaches to controlling risk fail. We now apply this framework for assessing business risk to NTPC.

NTPC is an integrated electric utility serving the NWT.[13] The company's rate base of around $200 million makes it small relative to the comparison utilities in our Schedules. The customer base is principally wholesale consisting of two distribution utilities serving the larger population areas (Yellowknife and Hay River) followed by general service and residential customers. NTPC's relatively small number of customers is spread out over a large territory and as a result most areas are served by isolated systems independent of a power grid. Although the company faces the challenge of operating in severe weather conditions, it has been able to achieve a good reliability record. According to the *Annual Report*, page 12: "From the customer's perspective the lights were on 99.97% of the time and when the lights did go out, the average time to restore power was 18 minutes."

In Section II of this evidence, we examined the prospects for economic growth in the NWT. Drawing on forecasts from Northwest Territories Finance and NTPC's 2005/2006 *Annual Report*, we showed that solid real economic growth is in the offing.

NTPC enjoys a near-monopoly position on the supply side as it produces power for distribution utilities in the two largest communities and produces and distributes directly in 25 others. This leaves only 5 small communities

[13] Our discussion here draws on NTPC's 2005/2006 *Annual Report*, pp. 11-16.

with populations of fewer than 1000 each where the company has no presence.

Q. Your discussion establishes that, in comparison with other Canadian electricity distributors, NTPC enjoys lower risks with respect to supply, retail and wholesale competition. What is your view of the risk of competition from alternative fuels such as natural gas?

A. The risk of such competition is minimal. In the most recent complete fiscal year, the company produced 75% of its power generation from hydro and 16% with diesel. Less than 9% of electricity generation was with natural gas suggesting that gas is not well positioned to compete with electricity either in generation or as an alternative power source for consumers.

Q. Are there any other risks faced by NTPC?

A. Risk of higher costs due to bad weather requiring higher capital expenditures, is mitigated by regulation. A number of risks are mitigated by deferral accounts. Page 3-22 of the General Rate Application indicates that the Board has approved deferred treatment of rate stabilization funds and fuel riders that offset the risks of higher energy prices for the diesel fuels used in generation. Additional deferral accounts approved by the Board address overhauls, regulatory hearing costs, financing costs, injuries and damages, Snare Cascades deferral account, employee future benefits, deferred revenues related to property acquisitions and capital studies. Further, the company has applied for Board approval for two additional deferral accounts relating to water licensing and job evaluation costs.

Environmental concerns are not a major potential risk to NTPC because 75 percent of its power capacity is hydro. Site remediation costs are going to be effectively subject to deferral account treatment. If greenhouse gas emission standards are raised to comply with the Kyoto Accord, it is unlikely that NTPC will face any significant costs of upgrading its plants or potentially see some of its assets stranded.

Q. Please state your views on the risk posed by the regulatory environment faced by NTPC.

A. NTPC is regulated by the Board. Ms. McShane indicates that regulatory risk can arise when allowed returns do not fit market expectations or rate design (including allowed capital structures) varies from what is fair and reasonable in view of business risks. According to her evidence, page 8, lines 217-225:

> “Since utilities are generally regulated on the basis of annual revenue requirements, there is a tendency to downplay longer-term risks, essentially on the grounds that the regulatory framework provides the regulator an opportunity to compensate the shareholder for the longer-term risk when they are experienced. This premise may not hold. First, customer resistance may forestall higher return awards when the risk materializes. Second, no regulator can bind his successors and thus guarantee that investors will be compensated for longer-term risks in the event they are incurred in the future.”

While we agree with Ms. McShane that regulatory risk is a legitimate part of business risk, we disagree with her implication that this risk is a significant one for three reasons. First, nowhere in Ms. McShane’s evidence do we find any specific examples of such risk actually occurring and Ms. McShane produced no such specific examples in response to an Information Request. On the contrary, she stated: “Ms. McShane’s evidence does not indicate that the Board may not appropriately compensate NTPC for its higher business risk".[14] Second, it is our understanding that the Board regulates in a fair manner. Third, our earlier review of earned ROEs for Canadian utilities and comparison with allowed rates of returns showed that regulators are typically generous to utilities.

Q. Please summarize the conclusions of your analysis of NTPC's business risk.

A. Our analysis shows that NTPC is in an acceptable position with regard to the major factors causing business risk for a regulated electric utility in Canada. We base this assessment on our view that the regulatory process and prudent management practices will combine to mitigate the potential risks we discuss. Two further favorable factors are the lack of competition and reliance on hydro generation which shields the company from the risk of rising energy prices. On the other side of the ledger, NTPC is smaller that our sample companies and faces challenges due to the geography of its service area. On balance, our view is that the business risk faced by NTPC is somewhat higher than that faced by the average integrated electric company or the average utility in Canada.

Q. Given your assessment of the business risk of NTPC as somewhat above average for an integrated electric utility what capital structure do you recommend?

A. In response to an earlier question, we briefly explained why we believe the determination of capital structure represents a qualitative judgment. Following that approach and dovetailing with the qualitative approach taken by Canadian regulatory bodies in past decisions, we arrive at our

[14] NTPC response to Information Request, HC.NTPC-26 dated February 16, 2007.

recommendation by developing a number of benchmarks for NTPC's common equity ratio.

First, we turn to Schedule 3.2 where we observe that the average actual equity ratio for utilities in our sample was 41.11% for 2005, the most recent year for which we have data. This represents one useful benchmark for the equity ratio for an integrated utility. Other benchmarks are helpful for two reasons. First, like any sample average, our average equity ratio depends on the sample drawn and can vary somewhat for this reason. Second, as we indicated earlier, the average is based on equity ratios for traded companies which include nonregulated activities as well as regulated utilities.

As a check on our calculations we examine the equity ratios allowed by various Canadian regulatory bodies for the companies in our sample for which we obtained data from past decisions. The sample includes Atco Electric Transmission and Distribution, Atco Gas and Pipelines, Enbridge Gas Distribution, Emera (Nova Scotia Power), Fortis Alberta, Fortis British Columbia, Pacific Northern Gas, TransAlta, and TransCanada Pipelines and is displayed in Schedule 3.5. There, we calculate the average allowed equity ratio for these 11 companies as 38.22%. The analysis in Schedule 3.5 reinforces our conclusion that the average "generous" equity ratio for an integrated electric or gas utility is around 38%.

Q. Why do you call this average equity ratio "generous"?

A. We term it "generous" because it represents the result of a regulatory process in which decisions by regulatory bodies take as input the views of opposing parties each representing its own interest. We already showed how the regulatory process may be regarded as generous as it almost always results in the regulated companies earning an ROE in excess of the allowed return.

Focusing the discussion of generosity on the common equity ratio leads to a similar conclusion. Regulated utilities have little incentive to optimize the use of debt in their capital structures. Having a capital structure with insufficient debt increases the weighted cost of capital because equity is the most expensive form of financing. In the case of regulated utilities, this “extra” cost associated with insufficient debt may be recovered through the process of regulation. If the company can persuade its regulator to approve this unwarranted extra equity, there is no cost to the company from a higher cost of capital. If this occurs, then the regulated company has unused debt capacity which can be a benefit to the parent holding company. The assets of the regulated utility can then serve as collateral to increase the borrowing power of the unregulated part of the holding company adding value for the shareholders. If this occurs, the shareholders gain unfairly at the expense of the customers of the regulated utility who have to pay higher rates to “compensate” the regulated utility for the cost of carrying unwarranted extra equity.

Q. Can you develop another benchmark common equity ratio from your recommendation for the capital structure of ATCO Pipelines and what was subsequently allowed by the AEUB in its Generic Decision 2004-052, pages 46-47?

A. Yes, we can. We select ATCO Pipelines because it represents an example of a utility with greater business risk than a relevant set of comparison companies drawn from different segments of the utility industry in Alberta – the eleven utilities included in the AEUB’s Generic Decision 2004-052. In that hearing, we recommended a common equity ratio for ATCO Pipelines of 40%, Ms. McShane recommended 50% and the Board awarded 43%. These numbers are drawn from Table 8 on page 35 of the Decision; Ms. McShane confirmed her number in her reply to an

Information Request.[15] In that same hearing, we also identified AltaGas Distribution as a company with business risk well above the average and recommended an equity ratio of 40%. The Board awarded 41%.

Based on these numbers and recalling our earlier discussion of "generosity" in past decisions, we regard 40-43% as an appropriate range for a higher risk utility.

Q. Do you have any other benchmarks?

A. Yes, another useful benchmark comes from past decisions by the Board for NTPC's allowed capital structure. In Schedule 3.6, we summarize Board decisions available to us going back to Decision 1-1991 for test year 1989-90 and running through Decision 1-2002 for test years 2001-2 and 2002-3. Some of these past decisions were based on hearings while, in others, the Board approved the results of negotiated settlements.

Our summary reveals that over the last 10 years going back to test year 1996-7, Board-approved allowed equity ratios have fluctuated over a narrow range from 40% to just over 43%. Further, over the longer run, the Board has approved declining equity ratios down from a high of 49.16% in 1989-90 the earliest year for which we have data.

Q. Please provide your views on the significance of NTPC's non-taxable status as a Crown corporation for the determination of its allowed capital structure.

[15] NTPC response to Information Request, HC.NTPC-24 dated February 16, 2007.

A. We believe that the argument that non-taxable status merits a capital-structure adjustment is flawed and recommend that no such adjustment is necessary. The argument for an adjustment is stated in Ms. McShane's evidence , page 17, line 456 to page 18, line 464:

> "…the income tax allowance provides a cushion that enhances interest coverage ratios.
>
> In addition, effectively, a taxable utility can share downside business risk with the Canada Revenue Agency (CRA). A non-taxable utility cannot. The shareholder in a non-taxable utility will experience a larger decline in the achieved return, given a similar percentage decline in operating income, than a shareholder in a taxable utility. A higher common equity ratio is required for the non-taxable utility to offset the impact of downside business risk on the shareholder."

We believe this argument is flawed for three reasons. First, it is based on an overly simplistic view of financial markets and the ratio guidelines employed by bond rating agencies. Although bond rating agencies certainly pay attention to ratios, there is no formula which translates ratios into bond rating: considerable judgment comes into play. Simply having a key ratio below a certain level is not by itself grounds for a downgrade in practice. To demonstrate our point we refer to Schedule 3.3 which gives interest coverage ratios for our sample of companies for three years. Focusing on 2005 because it is the most recent year, we see that five companies had interest coverage ratios lying in the narrow range of 2.24 to 2.46: Emera, Enbridge, Fortis, Pacific Northern Gas and TransAlta. Yet despite having very similar interest coverage ratios, these companies did not share a common bond rating. Rather they display a range of ratings: DBRS rates Enbridge as A, Emera and Fortis as BBB (high) , TransAlta as BBB and Pacific Northern Gas as BBB (low). Similarly, Standard & Poor's rates Enbridge as A-, Fortis as BBB+ and Emera and TransAlta as BBB. Pacific Northern Gas is not rated by Standard & Poor's.

Further evidence that bond rating agencies exercise considerable judgment in forming ratings comes from observing that half of the companies in Schedule 3.1 have split ratings with the rating agencies disagreeing. Further, even when downgrades occur, utilities can carry on their businesses profitably as long as they remain investment grade. It follows that lower coverage ratios resulting from non-taxable status should not increase risk for utilities. With no increased risk, the argument for a higher equity component collapses.

Second, the argument that lower coverage ratios for non-taxable utilities justify a higher equity ratio can be dismissed on logical grounds as contradictory to the stand-alone principle. As explained earlier, such lower coverage results from the non-taxable status that goes with government ownership. Under the stand-alone principle, the impact of such ownership must be set aside.

Third, the likelihood that a utility, such as NTPC, would breach a 1.0 coverage ratio within a one-year period is very, very small.

Q. Please summarize the four benchmarks that are relevant in determining an appropriate common equity ratio for NTPC.

A. Schedule 3.7 contains a summary and shows that the four benchmarks range from 38% to 43% when rounded.

Q. Please state your recommendation for the common equity ratio for NTPC.

A. We form four estimates of the appropriate equity ratio for NTPC. As Schedule 3.7 shows, the first is based on the average of actual equity ratios for eight traded utility companies. The second estimate is the average equity ratio allowed 11 regulated entities within these companies by their regulatory boards. The third estimate is the range allowed by the AEUB for two high-risk utilities. The fourth and final benchmark is the range of past Board decisions for the allowed equity ratio of NTPC from 1997 to the present. These benchmark equity ratios all fall in a range of 38% - 43%.

Our analysis of the business risk faced by NTPC assesses this risk as somewhat higher than that of the average shareholder-owned electric utility in Canada. This suggests that a fair common equity ratio for NTPC should be at 42%, just below the top of this range.

To explore the reasonableness of this conclusion, we reconsider our four benchmarks from Schedule 3.7 in turn. We begin with our first benchmark, the average of actual equity ratios for 8 traded utilities. However, because this measure also includes capital for unregulated activities which tend to be riskier than regulated business, we believe that 42% exceeds the appropriate level of equity for an average risk utility. We confirm this view when we look next at our second benchmark of 38.22% and regard it as a generous measure of an appropriate capital structure for an average risk utility. Given our view that NTPC's level of business risk is somewhat above average for an integrated utility in Canada, our second benchmark indicates that a level of equity above 38% is required.

We reinforce this view with our third benchmark of 40-43% equity allowed by the AEUB for high-risk, Alberta utilities. Given, NTPC's above-average risk, we believe that its target equity ratio should fall into this range. Our fourth benchmark bolsters this view as it indicates that this range has corresponded to Board decisions for NTPC since 1997.

Our recommendation is to set the common equity ratio at 42% just below the top of the range of 38 – 43%.

Q. Does this conclude your evidence on NTPC's capital structure?

A. Yes, it does.

IV. RATE OF RETURN ON COMMON EQUITY FOR 2006/07 AND 2007/08 TEST YEARS

INTRODUCTION

How is this section of your evidence organized?

A. We begin with a discussion of the general regulatory principles that are appropriate in conducting our fair rate of return analysis. As discussed in Section I of our evidence, our general approach is to determine the appropriate return on equity for a utility of average investment risk (henceforth referred to as the “average-risk utility”), after adjusting the capital structure of the applicant utility (NTPC) to account for any difference in its business risk from an average-risk utility.

After discussing general regulatory principles, we present our implementation of the Equity Risk Premium Test. For this estimation method, the recommended rate of return on equity is equal to the estimate of the risk-free rate plus the premium (or additional return) that investors would require to bear the risk equivalent to an equity investment in an applicant utility of average risk. The premium (or additional return) that equity investors require to bear the investment risk of this average-risk utility is commonly referred to as the own market equity risk premium or own ERP for an average-risk utility.

For the estimate of the risk-free rate, we use the estimate for the yield on long Canada’s for 2007 and for 2008 determined earlier in Section II. Since the own ERP for our average-risk utility is obtained by multiplying the MERP (i.e., the premium for investing in a market proxy such as the S&P/TSX Composite index) by the relative investment riskiness of our average-risk utility, we provide estimates of each of these two components in turn.

We first estimate the required MERP for Canadian equities based on historical and forward-looking estimates for Canada and the U.S., and recent evidence that suggests that previously estimated MERPs using realized returns as a proxy for expected returns have produced an upwardly biased estimate of the required MERP. The expected MERP estimates of various academic and practitioner scholars, and of surveys of Canadian investment professionals suggest that the MERP in the future will be much lower than was obtained historically for periods longer than 50 years. We argue using finance theory that most of the fundamental changes in the Canadian market imply that the MERP has decreased and will remain below that achieved over periods that exceed 50 years. We explain why some have argued that the MERP can be low, nil or negative given that the risk (standard deviation of returns) of equities is higher than the risk of bonds and cash over short holding periods of one year but becomes lower than the risk of bonds or cash over longer holding periods of ten to twenty years depending on the evidence examined. We also provide evidence that bond returns exhibit mean aversion over time, while stock returns and risk premiums exhibit mean reversion over time. We estimate a MERP of 4.90% with a range of 4.7% to 5.1%.

We use a DCF test, using historical and future estimates of dividend growth rates, to obtain an alternate estimate of the MERP, and find that our estimate based on historical MERP is reasonable. We also benchmark our estimate of the MERP of 4.90% against the expectations of samples of investment professionals that include those on both the sell and buy sides of the market. We conclude that our estimate is conservatively high.

We then estimate the relative investment riskiness of our average-risk utility as being its beta of 0.5, and show that the betas of utilities (and their return correlations with the market proxy) have increased somewhat during the past three years after decreasing over the 1990-98 period and then remaining stable at lower values. We then demonstrate that the two primary rationales that have been given for using the adjusted beta method when calculating the required rate of return on equity are not valid. We then multiply the estimate of the MERP by the estimate of the relative investment riskiness or beta of our average-risk utility to obtain our estimate of the own ERP for our average-risk utility of 2.45% (with a range of 2.35% to 2.55%). We further examine the robustness of this estimate by comparing the relative total riskiness of utilities with other industries, and find that the relative total riskiness of utilities is less than 50% of the mean total riskiness of various benchmarks consisting of 39 to 47 industries. Thus, even if investors require additional compensation for bearing nondiversifiable risk, we find no contradictory evidence to the estimate of 2.45% for an average-risk utility. This represents our "bare bones" cost of equity estimate.

Based on the "stand-alone" principle, we add 10 basis points to the "bare bones" cost to compensate the applicant utility (NTPC) for potential equity flotation or issuance costs even if it will never incur such costs.

Putting all the parts together, we end this section with our return on equity recommendation for an average-risk utility of 6.75% and 7.20% for the 2006/07 and 2007/08 test years. Our return on equity recommendation allows an average-risk utility to earn a risk premium (including the flotation cost adjustment) of 255 basis points over our forecast for long Canada yields of 4.20% and 4.65% for the 2006/07 and 2007/08 test years.

DISCUSSION OF GENERAL PRINCIPLES

Q. What regulatory principles have you found appropriate in conducting your analysis of the fair rate of return on equity capital for an average-risk utility?

A. We believe that the regulatory process should ensure that an average-risk utility earns a return on common equity that would adequately compensate equity investors for its risk level. Further, this rate of return on equity would enable an average-risk utility to maintain its financial integrity and to meet its financial obligations. The shareholders' interests must be balanced with the interests of the customers of an average-risk utility who are entitled to safe and reliable service at reasonable rates.

Q. What rate of return test have you used to determine the fair rate of return on common equity for an average-risk utility?

A. In designing our testimony, we identified various techniques that are commonly used for measuring the fair rate of return on equity both before the Board and in other jurisdictions. We have based our conclusions regarding the fair rate of return on common equity primarily on the Equity Risk Premium Test. We do not employ the Comparable Earnings Approach because we believe that it is without merit and unsuitable for use in determining a fair rate of return on equity for a utility. Section VI of our evidence includes a detailed discussion of this point. Although we consider the DCF Test to be inferior to the Equity Risk Premium Test, we use the DCF Test to provide additional estimates of MERP using both historical and forward-looking estimates of share price or dividend growth. We use these estimates as further inputs for judging the reasonableness of our estimates of the implied MERP using the Equity Risk Premium Test. Section VI includes a detailed discussion of why the DCF Test as commonly employed in the regulatory setting is deemed to be inferior to the ERP Test, and why the DCF Test is best applied at the market and not individual firm level.

THE EQUITY RISK PREMIUM OR ERP TEST

Q. What is the Equity Risk Premium Test?

A. The Equity Risk Premium (ERP) Test estimates the cost of equity capital for utility companies with respect to other publicly traded investment opportunities that are available to investors. It is an attempt to find the risk-adjusted "opportunity cost" for investing in the shares of utility companies. This cost is based on the <u>gross</u> rate of return required by equity investors; i.e., the rate of return required by equity investors before trade costs and taxes.

Q. What approach have you used to implement the Equity Risk Premium Test?

A. There are several ways to implement the ERP Test. The Test which we conducted uses the following inputs:

1. the yield forecasted for 2007 and 2008 for long Canada's (input #1);
2. a forward-looking risk premium for the S&P/TSX Composite (our market diversified market proxy) based on its realized values over various periods between 1900 and 2006 for Canada, and 1802 and 2006 for its counterpart in the United States (input #2);
3. the investment riskiness of an average-risk utility relative to the market portfolio as proxied by the S&P/TSX Composite or relative to other Canadian industries (input #3); and
4. an adjustment to cover fees involved with potential equity offerings or issues by an average-risk utility (input #4).

As noted earlier, the reasonableness of the estimate of input #2 is judged based on comparisons against future estimates of market returns, and estimates of the risk premium obtained from the DCF Test for the market proxies in both Canada and the U.S. The four input estimates for the Equity Risk Premium Test are combined as follows:

(Input #1) + [(Input #2) *x* (Input #3)] + (Input #4) = recommended rate of return on equity for an average-risk utility.

We now need to detail how we obtained the final estimates of each of the four inputs, and to present the recommended rate of return on equity for an average-risk utility that results from a combination of the final estimates of the four inputs.

Long Canada Yield Estimate (input #1)

Q. What is your estimate of the long-term risk-free rate that will prevail for the 2006/07 and 2007/08 test years?

A. As discussed in Section II, we have forecasted the midpoint of the range of the long-term Government of Canada bond rates to be 4.20% and 4.65% for the 2006/07 and 2007/08 test years.

Market Equity Risk Premium (MERP) Estimate (Input #2)

1. MERP Estimate: Some Measurement Considerations:

Q. What considerations go into the measurement of the MERP?

A. The MERP reflects equity investors' assessment of the expected (or required) return differential from investing in a portfolio that reflects available investment opportunities as compared to investing in the risk-free benchmark security. It indicates the total incremental return that equity investors require for bearing the risk of equities relative to investing in a risk-free benchmark security. In Canada, the S&P/TSX Composite Index is usually chosen as being representative of the equity opportunities that are publicly available for investment. This portfolio is well diversified in a relative sense only when viewed from a domestic-only investment perspective. The equity risk premium occurs because risk-averse investors require a positive reward for bearing each unit of risk, and equities exhibit varying degrees of risk. The reward required for bearing each unit of risk increases, as investors become less risk tolerant, and decreases, as investors become more risk tolerant. The MERP is the total compensation that investors require to bear the total risk of this market proxy.

If the market only rewards investors for bearing non-diversifiable risk, the relative non-diversifiable risk or beta of the average-risk utility relative to the market proxy needs to be estimated because investments in the securities of individual firms (such as stocks in specific utilities) are not by themselves well-diversified portfolios. Under this assumption, the MERP is adjusted upwards or downwards to reflect the relative **non-**diversifiable risk of the average-risk utility relative to the more diversified market portfolio. The lower non-diversifiable risk of our average-risk utility relative to that for the diversified market portfolio necessitates a downward adjustment in the risk premium added to the forecasted long-term risk-free rate to calculate the cost of equity for our average-risk utility.

If investors do not hold well-diversified portfolios and thus require an additional premium for bearing diversifiable risk, then the total risk of the average-risk utility needs to be compared to the total risk of average-risk firms in other industries. Under this view of the world, the relative ratio of the total risk of the average-risk utility to that of the mean of average-risk firms across industries can be used as an index to adjust the MERP upwards or downwards to get the appropriate own ERP for an average-risk utility.

Because the forward-looking or *ex ante* risk premium is difficult to observe and depends on future estimates that are subject to considerable error and bias depending upon the source, cost of equity studies typically place a heavy weight on measurement of historical or *ex post* risk premiums. This approach involves measurement issues because historical measures may themselves be biased or noisy proxies for forward-looking variables.

One important difference between expected and realized risk premiums relates to the occurrence of a negative risk premium. The expected MERP measures the expected return differential of a well-diversified but risky portfolio of equities over risk-free government securities. Since investors are risk averse, they would not invest in equities unless they expected the MERP to be non-negative. However, since realizations can differ from rational expectations, the historical or realized MERP can be negative for any given period of time.

To illustrate, the total return (i.e., dividend yield plus investment value change) for the S&P/TSX Composite for 1990 was minus 14.80%. This results in a negative MERP for 1990 when the risk premium is calculated using the Long Canada return of 3.34%. This negative MERP was not a good proxy of the MERP expectation of equity investors at the beginning of 1990. As of January 2, 1990, those investors holding equities must have expected that equities would outperform Long Canada's over the year. Similarly, investors holding equities must not have expected the negative total returns achieved by the S&P/TSX Composite in 1992, 1994, 1998, 2001 and 2002.

To address this potential difficulty with historical data, return on equity studies generally employ periods of at least ten years so that the realized MERP is positive. Also, the difference between the average realized and the average expected MERP should diminish, as the measurement period gets longer if the underlying return distribution is normal and remains unchanged over this longer measurement period. This is commonly referred to as returns being IID normal, or independently and identically and normally distributed, in that they have the same normal distribution at each point in time and returns are independent over time. This assumption suffers from various important drawbacks. First, even if single-period returns are assumed to be normal, then multiperiod returns cannot also be normal since they are products (**not** sums) of the single-period returns. Second, several studies using longer-horizon or multi-year returns conclude that there is substantial mean-reversion in stock market prices at longer horizons. For example, Campbell and Viceira (2005, p. 39) find that:[16]

> "At very long horizons, holding long-term nominal bonds is even riskier than holding stocks. At horizons of up to 30 years, stocks are still riskier than bills and bonds but the relative magnitude of these risks changes with the investment horizon."

This means that due to fundamental shifts in economies and/or markets (technically, referred to as regime shifts), the use of too distant time periods may result in the inclusion of time periods that are no longer representative of currently possible market returns and/or market risk premiums. Fundamental changes have occurred over time in the level of market integration across international markets, the level of market frictions (particularly, trade costs), and so forth. For example, much of the impact of the globalization of economies and financial markets, and of financial innovations has occurred over the past 30 to 40 years.

A second difficulty arises if returns are not IID (i.e., independently and identically distributed) since both the market risk and its equity risk premium then are time-varying. *Ceteris paribus* (everything else held equal), the MERP will change over time, and can change drastically, with changes in the risk-free rate, risk tolerance of the representative investor, and the set of available investment opportunities. For example, the set of available investment opportunities has expanded

[16] John Y. Campbell and Luis M. Viceira, 2005. The term structure of the risk-return trade-off, *Financial Analysts Journal* 61:1 (January-February), 34-44.

significantly since the 1960's due to the astonishing variety of new risk management securities introduced in the 1980's and 1990's.[17]

A third difficulty arises because a period with a declining required MERP is likely to coincide with a temporarily increased realized MERP. Peter A. Diamond, Institute Professor at M.I.T., states this as follows for the U.S. market:[18]

> "It is important to recognize that a period with a declining required equity premium is likely to have a temporary increase in the realized equity premium. This divergence occurs because a greater willingness to hold stocks, relative to bonds, tends to increase the price of stocks. Such a price rise may yield a higher return than the required return. For example, the high realized equity premium since World War II may be in part a result of the decline in the required equity premium. Therefore, it would be a mistake during the transition period to extrapolate what may be a temporarily high realized return."

A fourth difficulty arises because the reliability and comparability of the chosen proxy of the market varies considerably over time. To illustrate, most experts use the Canadian stock and Long Canada return series available from the Canadian Institute of Actuaries for the period from 1924 onwards. Thus, while the S&P/TSX Composite Total Return Index is used from December 1956, other proxies that are more likely to be contaminated by survivorship and selection biases are used from 1924 to 1957. Similarly, S&P's U.S. dividend yields reported in Ibbotson and Sinquefield (1977) are used for Canada for the period January 1926-December 1933, after adjusting for the 0.17% difference between the S&P and TSE dividend yield index over the period January 1956-December 1965. While the long-term bond series is for bonds with a term-to-maturity of over ten years, the

[17] For example, see Merton Miller, Financial innovation: Achievements and prospects, 385-392, In: Donald H. Chew, Jr. (Ed.), *The new corporate finance* (New York: McGraw-Hill Irwin, third edition, 2001).
[18] Peter A. Diamond, What stock market returns to expect for the future?, *An Issue in Brief*, Centre for Retirement Research at Boston College, No. 2, September 1999, p. 2.

actual average maturity is less than 30 years, and varies over time. Given a positive realized term premium, this results in realized risk premiums that are somewhat too high.

Q. To reiterate, what criteria need to be satisfied when deciding on what time period yields relevant data for calculating historical MERP in Canada?

A. For purely statistical reasons, the error in the MERP estimate will decrease (that is, become more precise) with longer evaluation periods if returns are IID. However, the statistical niceties of using the longest time period must be balanced against two other criteria:

First, the chosen time period should include regime shifts that can be expected to be possible in the future. Second, the chosen time period should have data that are reasonably reliable and are for a comparable proxy of available market investment opportunities over its duration.

Q. What period of time best satisfies these two additional criteria for the Canadian market?

A. In Canada, the time period since 1956 best satisfies these two additional criteria. First, reliable data for a comparable market proxy (the S&P/TSX Composite Index) are available only from 1956. The available Canadian equity market data prior to 1956 is usually obtained by splicing together series for equity portfolios with inconsistent formation characteristics. Because of the existence of interest rate controls and the absence of a Canadian money market to price fixed income securities, the data on fixed income securities are also of poor quality prior to 1956. Furthermore, the period of time since 1956 incorporates much of the impact of globalization, financial market innovation and trade cost competition on the expected returns for equities and bonds. The period of time prior to 1956, however, does include regimes that are not very likely but are possible in the future. For these reasons, we begin with an examination of the post-1956 data for our ERP tests, and then examine returns prior to and after 1956.

Q. How should the historical MERP be calculated?

A. The historical MERP generally is calculated using holding period returns for a market proxy and for a risk-free proxy. In academic research on Canadian markets, the S&P/TSX Composite index and the T-bill rate generally are used as the proxies for the market and the risk-free rate, respectively. In contrast, in the rate setting process, the risk-free rate is proxied by the more risky Long Canada. Furthermore, in the rate setting process, the estimated MERP, after being properly adjusted for risk differences between the applicant utility (herein the average-risk utility) and the market, is added to the expected yield (not expected holding period return) on Long Canada's to get the cost of equity estimate for the applicant utility. How we deal with these inconsistencies is addressed as we describe the steps that we follow in our MERP tests.

2. MERP Estimate: Based on nominal or real returns:

Q. Should the MERP be calculated using nominal or real returns?

A. It is preferable to use real returns to estimate the MERP when using historical data, although most experts have used nominal returns.[19] The use of real returns

[19] Booth (1999) identifies the existence of a risk-free rate bias, inflation rate bias and term premium bias in estimating MERPs. He suggests that the MERP forecast should be based on the real equity return combined with the current inflation expectation to minimize such biases. Laurence Booth, 1999,

is more appropriate for low inflation regimes, such as the present one, because MERP estimates that include high inflation periods include an additional risk premium that grows with the rate of inflation to compensate investors for a loss in the purchasing power of the risk premium.

3. MERP estimate: The appropriate average of historical annual data:

Q. When is it preferable to use the arithmetic and the geometric average historical MERP?

A. This issue is discussed more fully in Appendix 4.A. We begin with the observation that the use of the geometric average or some weighted-average of the arithmetic and geometric averages is becoming conventional wisdom.

The arithmetic average is preferred when making investment decisions for a one-period investment horizon where the investment horizon is identical to the interval of time over which the historical returns are measured. Thus, if historical returns are measured on an annual basis, then the investment horizon is restricted to one year. A one-year horizon definitely is not the long-term horizon that is assumed in determining the ROE for rate-making purposes. The arithmetic average also is preferred for forward-looking decisions when historical returns are normal IID or independently and identically distributed over the estimation period. As noted earlier, the normal IID assumption is not appropriate for asset returns for investors that have longer term horizons (so-called buy-and-hold investors).

Estimating the equity risk premium and equity costs: New ways of looking at old data, *Journal of Applied Corporate Finance* 12: 1, 100-112.

The geometric mean or some weighted-average of the geometric and arithmetic mean are preferred when the length of the investment horizon exceeds the return measurement interval, and the weight given to the geometric mean in any such weighted average increases as the investment horizon becomes longer. Similarly, the geometric mean or some weighted-average of the geometric and arithmetic mean is preferred when returns are not normal IID due to, for example, long-run mean reversion in the returns for some asset classes, as has been found for stocks, and long-run mean aversion in the returns for other asset classes, as has been found for bonds. Dr. Siegel notes that his work on the risk premium using data for the period 1802-2001 provides support for mean reversion for a 30-year horizon (i.e., the horizon used for Long Canada's in rate of return regulation).[20]

Dr. Buckley summarizes the debate on this issue as follows:[21]

> "Particularly important in estimating the equity risk premium is whether excess returns are measured using a geometric or an arithmetic mean return. To a significant extent, this question revolves around mean reversion in stock returns. Evidence of mean reversion is substantial, although it cannot be proved unequivocally. Given the weight of evidence of mean reversion, there may be a strong case for the use of a geometric mean with an equity premium of between 3% and 5% - or even less."

Dr. John Campbell at a 2001 *Equity Risk Forum* has aptly stated the argument for a weighted average of the two types of means as follows:[22]

> "Which is the right concept, arithmetic or geometric? Well, if you believe that the world is identically and independently distributed and that returns are

[20] Jeremy J. Siegel, Historical results: Discussion, *Equity Risk Premium Forum*, November 8, 2001, p. 46.
[21] A. Buckley, *The European Journal of Finance* 5: 3 (September 1999), 165-180.
[22] John Campbell, Historical results: Discussion, *Equity Risk Premium Forum*, November 8, 2001, p. 45.

> drawn from the same distribution every period, the theoretically correct answer is that you should use the arithmetic average. Even if you're interested in a long-term forecast, take the arithmetic average and compound it over the appropriate horizon. However, if you think the world isn't i.i.d., the arithmetic average may not be the right answer.
>
> I think that the world has some mean reversion. It isn't as extreme as in the highway example, but whenever any mean reversion is observed, using the arithmetic average makes you too optimistic. Thus, a measure somewhere between the geometric and the arithmetic averages would be the appropriate measure."

Drs. Mehra and Prescott, who are the authors who first identified the equity premium puzzle, note that they reported arithmetic averages, since the best available evidence at that point in time indicated that stock returns were uncorrelated over time.[23] They now acknowledge that the arithmetic average can lead to misleading estimates when returns are serially correlated, and that the geometric average may be the more appropriate statistic to use. Drs. Mehra and Prescott (p. 57) note that stock returns have been found to be mean reverting.

Q. What do corporations use when they make forward-looking investment decisions?

A. Corporate practice among the leading U.S. corporate entities is to use the geometric mean if a long-term risk-free rate is used (such as long Treasuries) and to use the arithmetic mean if a short-term risk-free rate is used (such as T-

[23] Rajnish Mehra and Edward C. Prescott, The Equity Premium in Retrospect, forthcoming: G.M. Constantinides, M. Harris and R. Stulz, *Handbook of the Economics of Finance* (Amsterdam: North Holland). Draft of their paper, February 2003.

bills). Specifically, the teaching note to the case study, Grand Metropolitan PLC, states:[24]

> "In practice, two combinations of risk-free rates and equity-risk premiums are seen: (1) long-term risk-free rates plus geometric means or (2) short-term risk-free rates plus arithmetic means. Nothing in the theory of the CAPM dictates the use of these parameters; they are artifacts of practice. A recent survey of leading American corporations and financial institutions suggests greater use of the geometric-mean/long-term risk-free rate approach."

Q. Do you have any evidence that the returns on stocks and bonds and equity risk premiums exhibit mean reversion or mean aversion in Canada or the U.S.?

A. Yes, we do. We find that stock returns exhibit mean reversion in both Canada and the U.S., bond returns exhibit mean aversion in both Canada and the U.S., and equity risk premiums exhibit mean reversion in both Canada and the U.S. We also find that the extent of mean reversion in equity risk premiums is more pronounced in the United States than in Canada.

Q. Would you please review the tests that you conducted to determine if stock and bond returns exhibit mean reversion or aversion, and if equity risk premium exhibit mean reversion or aversion.

A. A formal test for mean reversion/aversion is the variance-ratio test. The test is based on the fact that if returns follow a random walk (are independent), then the variance should be proportional to the return horizon. The Variance-Ratio or VR measure is:

[24] The referenced study is: R. F. Bruner, K.M. Eades, R.S. Harris and R. Higgins, 1998, Best practices in estimating the cost of capital: Survey and synthesis, *Financial Practice and Education* (Spring/Summer).

$$VR(T) = Var[r_t(T)] \div N\ Var[r_t] = 1$$

where T is the multi-year period being examined, $Var[r_t(T)]$ is the variance of a T-period continuously compounded return, and $Var[r_t]$ is the variance of a one-period or benchmark return r_t. A variance ratio of one indicates no aversion or reversion of the mean of the series. A variance ratio greater than one indicates mean aversion, and mean aversion increases as the VR moves towards larger values above one. Thus, a VR of 3 indicates greater mean aversion in the series of returns or risk premiums than a VR of 2. Similarly, a variance ratio less than one indicates mean reversion, and mean reversion increases as the VR moves away from one towards zero.

We calculate the variance ratios for holding periods of 5, 10 and 15 years relative to a benchmark holding period of 1 year for stocks, long bonds and risk premiums for Canada and the United States. The Canada data are annual from the Canadian Institute of Actuaries for the period 1924-2002. The U.S. data are annual from Ibbotson & Associates for the period 1927-2002. The results are reported in Schedule 4.1 and depicted in Schedule 4.2.

From Schedule 4.2, it is apparent that:

- The equity risk premiums for both Canada and the U.S. exhibit mean reversion as the investment horizon increases from 1 to 5 to 10 to 15 years;
- The extent of mean reversion in equity risk premiums is more pronounced for American versus Canadian equities; and
- The extent of mean reversion in equity risk premiums is more pronounced for the most recent 50 years than for the full time horizon ending with 2002 for both the Canadian and U.S. samples.

Q. What do you conclude from your tests of mean reversion about whether the geometric or arithmetic mean MERP should be used in the Equity Risk Premium Test?

A. We conclude that the use of the arithmetic mean MERP results in an overstatement of the prospective MERP, and that the use of the geometric mean MERP results in an understatement of the prospective MERP. This is likely to be the reason why different groups of professionals use one or the other type of mean in their forward-looking analyses. Actuaries typically use the geometric MERP for the determination of pension plan funding requirements. Many financial economists, especially those associated with buy-side investment entities, have historically used the arithmetic mean MERP. Well-run corporations typically use the arithmetic mean MERP with the T-bill rate as the risk-free proxy, and the geometric mean MERP with a long Treasury as the risk-free proxy.

We recommend that a weighted average of the arithmetic and geometric mean MERP is preferable. The use of a weighted average should not unduly favour equity investors over the customers of applicant utilities in a rate-setting environment. The use of any weighted-average of the geometric and arithmetic mean MERPs also removes any perceived need to make additional adjustments to ensure the financial integrity of an applicant utility. This occurs because the difference between such a weighted-average and the geometric mean MERP grows with the level of market risk.

Based on the variance-ratio test results discussed above and other test results reported in the literature, we recommend a blended mean MERP with weights of 75% and 25% for the arithmetic and geometric mean MERPs for Canada and the United States. However, this makes no adjustment for the greater mean reversion in the U.S. MERPs discussed above.

4. MERP estimate: Impact of market frictions:

Q. Are there any market frictions that should be kept in mind when examining historical MERP?

A. Historical MERP studies are based on gross and not net returns, although investors make decisions between investments of different risk based on net and not gross returns. There are at least two frictions that cause a divergence between gross and net returns from investment.

The first major market friction is taxes. As tax rates increase, investors require higher gross returns from investment to get the same net (after-tax) return, and vice versa when tax rates decrease. Similarly, if the tax rate reduction differs by type of asset, then their gross returns will change by different amounts to maintain their same net returns. To illustrate, if the effective tax rate on the return of a non-dividend-paying growth stock declines by more than that on the return of a long-term government bond, then the drop in the gross return of the stock to maintain its after-tax return will exceed the drop in the gross return of the bond. In turn, this will decrease the required MERP, all else held equal.

The second major market friction is trade costs, which include liquidity costs (as measured, for example, by the effective bid-ask spread), broker commissions, and so forth. In general, the gap between gross and net returns increases as trade costs increase, and decreases as trade costs decrease.

5. MERP estimate (input #2): Initial Canadian estimate based on historical data:

Q. What is your interpretation of the relevant data on historical MERPs in Canada?

A. We begin with an examination of the 50-year time period of 1957-2006 because, although it does not satisfy the longevity criterion, it appears to best satisfy the other two criteria of being based on a consistent market proxy with reliable data, and being based on a time period that is likely to represent the type of regime and regime shifts likely to persist in the future. We then examine two shorter periods, 1965-2006 and 1977-2006, and four longer time periods, 1951-2006, 1936-2006, 1924-2006 and 1900-2006. The examination of the longer periods are required to capture some of the regimes that are not expected to occur in the future but are possible. Based on the results reported in Schedule 4.3, the arithmetic and weighted-average annual MERPs for the 50-year period of 1957-2006 are 3.06% and 2.64%, respectively, based on nominal returns, and 2.92% and 2.54%, respectively, based on real returns.[25] The arithmetic average annual MERP based on nominal returns is lower at 2.29% and 2.51% for the two shorter time periods, 1965-2006 and 1977-2006, respectively, and is higher at 4.47%, 5.14%, 5.36 and 5.78% for the four progressively longer time periods, 1951-2006, 1936-2006, 1924-2006 and 1900-2006, respectively. The corresponding arithmetic average annual MERP are lower using real returns. To illustrate, the arithmetic average annual MERP for the longest time period drops from 5.78% to 5.15% when we move from nominal to real returns. Similarly, the weighted-average annual MERP are lower for the two shorter time periods, become progressively higher for the four progressively longer time periods, and are consistently higher using nominal instead of real returns.

This strongly suggests that the MERP (however measured) has been declining in Canada over time. The arithmetic mean MERP is below 5% even using nominal returns if this mean is adjusted somewhat for: (i) the decrease of trade costs of about 1%; (ii) the material, upward re-valuation of equities over the three longest

[25] The weighted average consists of a 75% and a 25% weight on the arithmetic and geometric means, respectively.

time periods (i.e., for the sizeable increase in the price-to-dividend ratio over these periods); and (iii) the observation that investors appeared to earn a return on bonds that was probably at least 20 basis points below their expectations. As noted by Dr. Jones, trade costs drive a wedge between gross equity returns and net equity returns. His analysis shows that the average cost to buy or sell stocks has dropped from over 1% of value as late as 1975 (i.e., before the deregulation of brokerage fees) to under 0.18% today. He concludes that, while trade costs account for a small part of the observed equity premium, the gross equity premium is perhaps 1% lower today than it was earlier in the 1900's.[26]

In the interest of being conservatively high, we estimate that the MERP going forward is 4.9%.

6. MERP estimate: Possible rationales for further adjusting the initial Canadian estimate:

Q. Do you have any reason to expect that there have been some other fundamental changes since 1957 that have had an impact on the MERP?

A. Yes, there are other fundamental changes that have had an impact on the MERP. One such change is the increased integration of financial markets, the rapid growth of financial innovation, mutual funds, index products, derivative products and exchange-traded funds over the past 30 to 40 years. Since this allows small investors to acquire and manage diversified portfolios at lower cost, the required risk premium will be lowered since greater diversification means that these investors attain the same expected returns by bearing less risk. Also, since the reduction in cost has been higher for equity versus fixed income investment

---

[26] Charles M. Jones, 2001, A century of stock market liquidity and trading costs, working paper presented at an asset pricing workshop, Summer Institute, National Bureau of Economic Research, July 19-20.

vehicles, the MERP relative to historical levels can be expected to decline.[27] Other fundamental changes include the introduction of a capital gains tax in Canada in 1972 (increases the MERP), more recent successive reductions in the capital gains inclusion rate (decreases the MERP), and increased willingness or tolerance of Canadian investors to bear risk (decreases the MERP).

Q. What do these fundamental changes imply about your initial estimate of the MERP?

A. On balance, the fundamental changes suggest that our initial estimate of the MERP is conservatively high. Nevertheless, we do not alter our initial estimate of the Canadian MERP to reflect this observation.

7. MERP estimate: Canadian forward-looking estimates:

Q. Are there any expectations data on Canadian stock and bond returns and the MERP that you considered in assessing the robustness of your estimate of the MERP?

A. Yes, we considered the forecasts by leading economists and portfolio managers from 42 organizations (e.g., chartered banks and investment management firms) contained in *Economic Expectations 2007* authored by Watson Wyatt.[28] Based on consensus expectations, the expected MERP based on the S&P/TSX Composite and 30-year Canada's is 2.1% short-term (2007), 3.2% mid-term (2008-11) and 2.9% long-term (2012-2021). Another way of demonstrating the conservatism in our MERP estimate of 4.9% is to compare our estimate against the MERP derived using the most optimistic scenario drawn from this survey. This is to obtain the various MERPs by subtracting the 90th percentile estimates

[27] Similar points are made about mutual funds by Diamond (1999), p. 2.
[28] Watson Wyatt International, *Economic Expectations 2007; 26th Annual Canadian Survey*, 2007.

of the S&P/TSX Composite return (i.e., the return that has a 90% chance of being lower) from the 10th percentile estimates of the 30-year Canada's (i.e., the yield that has a 90% chance of being higher). Doing such, we obtain MERP estimates of 6.0% short-term, 5.5% mid-term and 5.7% long-term.

The consensus median nominal return expectations for the S&P/TSX Composite Index in Mercer's *2007 Fearless Forecast* are higher for the year ending December 2007 (7.5% versus 6.4% in the Wyatt study) and are the same for periods ending in December 2011 (8% in both although the Mercer and Wyatt expectations are for the 5- and 4-year periods ending in December 2011).[29] The survey results collected by Mercer represent the views of 51 Canadian and Global investment managers.

Q. Are there any regulatory jurisdictions that place weight on such surveys for their estimates of MERP?

A. Yes, there is. According to a report prepared by NERA,[30] UK regulatory estimates of the MERP have generally relied heavily on survey evidence of investor expectations with some consideration usually given to evidence on historic average returns. However, UK regulators have generally judged that the historic MERP provides an overstatement of the current risk premium.

8. MERP estimate: Historical and forward-looking estimates for non-Canadian markets:

---

[29] Mercer Investment Consulting, *2007 Fearless Forecast*, February 7, 2007. Available at: http://www.mercerhr.ca/knowledgecenter/reportsummary.jhtml/dynamic/idContent/1258150;jsessionid=JPTILBPUKS3ZSCTGOUFCIIQKMZ0QUJLW.

[30] NERA, UK water cost of capital, *A Final Report for Water UK*, Prepared by NERA, London, July 2003, p. 76.

Q. Is there any value in examining the U.S. or international experience?

A. Yes, there is. First, as markets become more integrated, foreign-exchange and risk-adjusted returns become approximately equal across various world markets. This is referred to as the “law of one price”. Second, examining other markets provides a test of how reasonable the Canadian estimates of the MERP are. However, one must be careful not to introduce an *ex post* selection bias when selecting which other market(s) to examine. Choosing the market that has grown to be the largest market or has had an above-average *ex post* performance introduces an *ex post* selection bias. This happens to some extent when the U.S. equity market is chosen for this purpose.

Dr. Jeremy Siegel has conducted extensive studies of the MERP for the U.S. over the past 200 years. Based on his results, which are summarized in Schedule 4.4, the so-called Ibbotson time period, 1926-2001, has generated the highest arithmetic and weighted-average mean MERPs of 6.2% and 5.5%, respectively. Dr. Siegel notes that this high MERP is due to real stocks maintaining their long-term historical average real return of almost 7%, while real bond and bill returns were below their long-term historical average real returns. In fact, for the 55 years up to 1982, the real return on bills averaged nearly zero. Siegel goes on to conclude that *the reason why the MERP is too high for this period is that historical real stock returns are biased upward to some extent and government bond returns are biased downwards over this period*.[31]

Mr. Richard Arnott and Mr. Peter Bernstein reach a similar conclusion that the realized MERP exceeded the expected MERP over this time period.[32] Specifically, equity investors earned 70 basis points annually more than what they expected and bond investors earned an annual 20 basis points less than

[31] Jeremy J. Siegel, Historical results I, *Equity Risk Premium Forum*, November 8, 2001, pp. 31-32.
[32] Robert D. Arnott and Peter L. Bernstein. What risk premium is “normal”?, *Financial Analysts Journal* 58:2 (March/April 2002), pp. 64-85.

what they expected. According to Arnott and Bernstein, one cause of this risk premium windfall was the unanticipated inflation of the late 1960s and 1970s that adversely affected realized bond returns. Another cause was the rise in price-to-dividend multiples from 18 to 70 times over the 1926-2001 period, with almost all of this increase occurring in the last 17 years of this period, that favorably affected stock returns. Mr. Arnott and Mr. Bernstein estimate that this rise in the price-to-dividend multiple added about 180 basis points or 1.8% to annual stock returns.[33]

When we examine the three sets of arithmetic and weighted-average mean MERP reported in Schedule 4.4 for periods that begin prior to World War II and run through 2001, we find that those that are included in the Ibbotson time period exceed our forward-looking estimate for Canada of 4.9%, and those that predate the Ibbotson time period fall short of our forward-looking estimate for Canada of 4.9%. However, if we adjust, for example, the 1926-2001 realized MERP downwards by 90 basis points to reflect the normal expectations of investors, as per Mr. Arnott and Mr. Bernstein, the arithmetic equity market risk premium of 5.3% is now closer to our estimate of 4.9%. This still makes no adjustment for the risk of the U.S. market, which is expected to be higher over this period, and the material reduction in trade costs of about 1% over this period. Thus, an examination of the U.S. MERP experience suggests that our estimate of 4.9% for Canada is conservatively high.

Q. Please discuss the source of any MERP estimates commonly used for the United States, and any limitations of these estimates.

[33] This is higher than the 1% estimate of Dimson et al. (2003). Elroy Dimson, Paul Marsh and Mike Staunton, Global evidence on the equity risk premium, *Journal of Applied Corporate Finance* 15:4 (Summer 2003), 27-38.

A. MERP estimates for the U.S. are commonly based on data from Ibbotson & Associates for the period 1926-2006. Dr. Schwert points out that any MERP estimates that incorporate stock returns during the Great Depression period are suspect since stock market volatility was abnormally high during this period. Dr. Schwert argues that the Ibbotson data series do not satisfy many of the criteria for choosing the best index in a given period. These criteria include coverage, weighting method, point-sampled data, and the availability of dividends.[34]

Drs. Wilson and Jones make further corrections to those made by Dr. Schwert for the biases caused by the use of time-averaged data.[35] Wilson and Jones highlight the importance of the breadth of index coverage by demonstrating that the narrower S&P 90 used by Ibbotson & Associates outperformed more broad-based market measures over the 1926-1956 period. Their finding implies that the commonly used Ibbotson series overstates the return to stock, and hence the MERP over this period because market performance is based on this narrow market sample. Dimson et al. use the data series developed by Drs. Wilson and Jones in the data series that they assembled for the 1900-2002 period. The Dimson et al. data series are available from Ibbotson & Associates, and is referred to as the DMS-Ibbotson data set.

Q. Please discuss the MERP estimates based on the use of the data sets available from Ibbotson.

A. The estimates using the two Ibbotson data sets are summarized in Schedule 4.5. The arithmetic mean MERP for the longest time periods for each data set are 6.6% (nominal returns) and 6.2% (real returns) for the longer DMS-Ibbotson data set time period of 1900-2006 and 6.6% (nominal returns) and 6.3% (real returns)

[34] G.W. Schwert, 1990. Indexes of United States stock prices from 1802 to 1987, *Journal of Business*, 63: 3 (July): 399–426. The market volatility results are reported in G.W. Schwert, 1989. Why does stock market volatility change over time?" *Journal of Finance*, 44: 5 (December): 1115–54.
[35] J.W. Wilson and C. P. Jones, 2002. An analysis of the S&P 500 index and Cowles extensions: Price indexes and stock returns, 1870-1999, *Journal of Business*, 75: 3 (July): 505-533.

for the shorter Ibbotson data set time period of 1926-2006. However, for the three time periods equal to 50 years or less, the MERPs based on either nominal or real returns are lower than our going forward estimate of 4.9%. These results suggest that our estimate may be too low in an international context only if one believes that time periods longer than 50 years generate more accurate forward-looking MERPs.

However, Drs. Dimson et al. argue that comparisons across markets require an adjustment for risk differences, and that the effects of equity revaluations need to be removed to obtain expected MERP from realized MERP. The effect of risk-adjusting the arithmetic mean U.S. MERPs for the higher risk of the U.S. market compared to the Canadian market over the longest time periods for both data sets are summarized in Schedule 4.6. Doing this, lowers the arithmetic mean MERP for the U.S. from 6.6% to 5.9% using nominal returns and from 6.2% to 5.5% using real returns for the DMS-Ibbotson data set (1900-2006 period). Similarly, risk-adjusting lowers the arithmetic mean MERP for the U.S. from 6.6% to 6.3% using nominal returns and from 6.3% to 6.0% using real returns for the Ibbotson data set (1926-2006 period).

Further reductions in these long period MERPs for the U.S. are required to reflect the upward bias caused by unsustainable upward equity revaluations over these time periods,[36] the 1% reduction estimated by Dr. Jones from the reduction of trade costs over this 100-plus-year period, and about a 20 basis point increase due to bond investors obtaining less than they expected. Thus, the historical MERP estimates for the U.S. provide no rationale for altering our going forward MERP estimate for Canada of 4.9%.

[36] To illustrate, the removal of equity revaluations over the 103-year period (1900-2002) studied by Drs. Dimson et al reduces the arithmetic mean MERPs for the U.S. and Canadian markets from 6.4% and 5.5%, respectively, to 5.5% and 4.9%, respectively.

Furthermore, why only consider the United States? The arithmetic mean MERP for the world index of Drs. Dimson et al. over the 103-year period 1900-2002 is 4.9%. When the revaluation of equities is removed, the arithmetic mean MERP for the world index is reduced to 4.1%. When an adjustment is made for the lower total risk level of the world index as compared to the Canadian index, the arithmetic mean MERP for the world index becomes 5.0%. However, over most of this 103-year period, the achievement of the rewards associated with international diversification would have been quite high. Thus, the 1% reduction in the MERP for the U.S. due to trade cost reductions would be even higher for the world index.

Thus, these findings for the U.S. and the world for over a century of historical risk premiums further support our view that our 4.9% MERP estimate is conservatively high.

Q. What other estimates of the equity market risk premium have been reported in the more recent literature for the U.S. and other developed countries?

A review of this literature is presented in Appendix 4.B. Two studies estimate realized and expected MERP for 15 countries over more than a century. They find that the expected MERP, when measured **against short-term** government bonds over the 101-year period, is 4.0% and 3.5% for the U.S. and a sample of 15 developed countries including the U.S., respectively. All of the studies reviewed in Appendix 4.B conclude that the U.S. MERP has narrowed substantially, and is expected to be lower in the future. Most of the U.S. forward-looking equity risk premium estimates vary from zero or slightly negative to about 4%. Interestingly, at an equity risk premium forum in November 2001, Dr. Ibbotson made a long-term 4 percent (400 bps) equity risk premium forecast (i.e., geometric return in excess of the long-term government bond yield), under the assumption that the market was fairly valued.[37]

9. MERP estimate: Use of non-Canadian estimates:

Q. Do you use any explicit or implicit weighting scheme when you consider the MERP in Canada and in foreign countries, such as the United States?

A. We use no explicit or implicit weighting scheme. Our approach is to use this additional information on foreign MERPs to subjectively adjust the initial point estimate of the Canadian MERP in its range (or distribution) of possible MERP values.

10. MERP estimate: Biases and their impact:

Q. Are there any biases in the various estimates of the MERP that you refer to above?

A. Yes, there are a number of biases. All of them suggest that the various estimates are likely to be upwardly biased. We discuss four such biases.

The first bias is survivorship bias. Some examples follow. First, when a new index is introduced, the index sponsor generally provides historic data on that index. For example, when the S&P/TSX Composite index was introduced in January 1977, historic ("back-fill") data was provided dating back to January 1956. The historic data was for firms in existence as of the date of the index

[37] Roger Ibbotson, Summary comments, *Equity Risk Premium Forum*, November 8, 2001, p. 108.

introduction. Second, as proposed by Brown, Goetzmann and Ross (1995),[38] financial economists concentrate on the performance of surviving markets and so-called “winner” markets like the U.S. stock market. Financial economists ignore other markets that have done poorly or even disappeared. Examples given by Brown et al. include the Argentine market that is considered a comparatively less important emerging market because of long history of poor performance, and the Russian market where investors at one point had all their wealth expropriated during the last 100 years.

The second bias is caused by selection bias. Various studies argue that the historic returns for index additions or deletions (and indexes) are not representative of returns in general since S&P500 and S&P/TSX Composite replacement selection decisions use historical price information to select stocks for replacement. For example, Chung and Kryzanowski (1998)[39] find that deletions are drawn from stocks (so-called losers) that have performed abnormally poor relative to the market prior to their removal from the index, and additions are drawn from stocks (so-called winners) that have performed abnormally well relative to the market prior to their addition to the index. This is not surprising because the major criterion for index deletion and addition for the former S&P/TSX Composite was relative capitalization (i.e., market price per share times the number of shares of float). Thus, relative losers are replaced with relative winners in terms of market price.

The third bias is caused by differences in index construction. For example, while the S&P/TSX Composite and S&P500 indexes are currently both value-weighted indexes, they differed until more recently in how the weights are calculated. The S&P500 index now also uses the public float when calculating a firm’s weight for

[38] S. Brown, W. Goetzmann and S. Ross, Survival, *Journal of Finance* 50 (1995), pp. 853-873. The following examples are drawn from Brown et al. (1995).
[39] R. Chung and L. Kryzanowski, Are the market effects associated with revisions to the TSE300 Index robust, *Multinational Finance Journal* 2 (March 1998), pp. 1-36.

index construction purposes. For much of the past, differences in index construction made the S&P/TSX Composite more representative than the S&P500 of the actual investment opportunities that were available to public investors.

The fourth bias is caused by data recording problems. The price of the last trade is used to value firms in financial difficulty that have their trading suspended. If these firms later fail and are delisted, they are removed from the index using the last traded price and not their current price.

Q. Have you made any adjustments for these biases?

A. No, we have not made any adjustments for these biases. However, by not accounting for these biases, the MERP estimates reported earlier are conservatively high.

11. MERP estimate: Based on the DCF Test:

Q. Please provide a brief discussion of why you generate DCF estimates of the MERP?

A. As is discussed in more detail in Section VI of our evidence, Discounted Cash Flow (DCF) Tests have a number of disadvantages that make them unreliable for estimating the required rate of return or risk premium on equity, particularly for individual companies. Nevertheless, because the DCF approach represents an alternative method of estimating the MERP, it is useful as a check on the reasonableness of our MERP tests. With this in mind, we conduct DCF Tests using the constant growth and the two-stage growth versions of the Dividend Discount Model or DDM for the U.S. market as proxied by the S&P500 Index, and for the Canadian Market as proxied by the S&P/TSX Composite Index. We use both historical estimates of dividend growth and forecasts of future growth as proxied by GNP and pre-tax corporate profits. The output of these DCF tests consists of various estimates of the MERP.

Q. Would you please describe the constant growth and two-stage versions of the DDM?

A. The required rate of return in the constant growth DDM or Gordon model is given by:

$$k = \frac{D_1}{P_0} + g$$

where D_1 is the expected dividend in the next period, or D_0 (1 + g);

P_0 is the current price or level of the stock or index; and

g is the growth rate in dividends, which is assumed to be constant until the end of time.

In this version of the model, the growth rates in dividends, earnings, book value and share price are all assumed to be equal.

In the two-stage DDM, dividends are assumed to grow at a fixed rate g_1 or variable rate g_t for an initial period (herein deemed to be up to the first five years), and then to grow at a different fixed rate g_2 thereafter. In this version of the DDM, the implied required rate of return is found by solving for k in:

$$P_0 = \sum_{t=1}^{5} \frac{D_0(1+g_1)^t}{(1+k)^t} + \left(\frac{D_6}{k-g_6}\right)\left(\frac{1}{(1+k)^5}\right);$$

Or: $P_0 = \dfrac{D_0(1+g_1)^1}{(1+k)^1} + ... + \dfrac{D_4(1+g_5)^1}{(1+k)^5} + \left(\dfrac{D_6}{k-g_6}\right)\left(\dfrac{1}{(1+k)^5}\right)$

where $D_6 = D_0(1+g_1)^5(1+g_6)$ or $D_6 = D_0(1+g_1)(1+g_2)(1+g_3)(1+g_4)(1+g_5)(1+g_6)$.

The implied MERP is then obtained by subtracting the current or going forward yield on long-term government bonds from the estimate of k derived from the above models.

Q. Would you please first discuss the DCF Test results that use historical estimates of future expected growth rates?

A. The DCF Test results for the S&P/TSX Composite Index and the S&P500 Index are reported in Schedules 4.7 and 4.8, respectively, for each of the years over the period, 1971-2002. All of these tests use growth rates based on the last ten years of data ending in the year indicated that are smoothed by equally weighting each data point. The tests use the historical 10-year annual growth rate in either dividends (adjusted or unadjusted for other cash flow distributions to shareholders) or nominal GNP. Since the highest implied MERPs are obtained using GNP growth, we confine our discussion to those results.

For the S&P/TSX Index, the mean MERP from the single-stage DDM with a generous upward dividend adjustment for nondividend cash distributions of 50% declines from 5.18% for the full 32-year period, 1971-2002, to 2.94% and 1.39% for the more recent 20 and 10 year periods, respectively. Similarly, the mean MERP from the two-stage DDM declines from 2.88% for the full 32-year period, 1971-2002, to 1.18% and 0.12% for the more recent 20 and 10 year periods, respectively. These results suggest that our forward-looking estimate of the MERP for the S&P/TSX of 4.9% is conservatively high.

For the S&P500 Index, the mean MERP from the single-stage DDM with a generous upward dividend adjustment for nondividend cash distributions of 50% declines from 5.58% for the full 32-year period, 1971-2002, to 4.18% and 2.80% for the more recent 20 and 10 year periods, respectively. Similarly, the mean MERP from the two-stage DDM declines from 3.35% for the full 32-year period, 1971-2002, to 2.55% and 1.76% for the more recent 20 and 10 year periods, respectively. These results also, once again, suggest that our forward-looking estimate of the MERP for the S&P/TSX of 4.9% is conservatively high.

Q. Is there any support for the notion that the long-term growth in earning's (dividends) cannot exceed long-term growth in GNP?

A. Yes, this is a commonly held position. In fact, in the summary comments at a recent equity risk premium forum, Dr. Leibowitz summarized his viewpoint as follows:[40]

> "I'm very impressed by the level of consensus on the view that earnings can grow only at a somewhat slower rate than GDP per capita and that no one seems to feel it can grow much more – except Roger Ibbotson…"

There are at least five reasons why the long-term growth in the economy is considered to be an upper bound for the long-term growth in the earnings of the market. First, since a disproportionate share of the growth in the economy comes from unlisted firms (i.e., private entrepeneurs), these investment opportunities are typically not available to the general public and are not captured by the indexes used to calculate MERPs.[41] Second, a good portion of the growth in the business sector of the economy cannot be financed by retained earnings and, thus, requires the continual issuance of new shares (referred to as seasoned issues). Third, many firms dilute their share base by issuing stock options, which are generally not offset by share repurchases. Fourth, Siegel (p. 15) argues "the returns to technological innovation have gone to workers in the form of higher real wages, while the return per unit of capital has remained essentially

[40] Marin Leibowitz, Summary comments, *Equity Risk Premium Forum*, November 8, 2001, p. 109.
[41] Jagannathan et al. use the S&P, CRSP and Board of Governors (BOG) portfolios to examine the MERP. The BOG portfolio, which includes stocks that are not publicly traded and all stocks held by U.S. residents, has about two times the value of the CRSP stocks. While they obtain nearly identical MERP estimates using the S&P and CRSP portfolios over the entire sample period and various sub-periods, their estimates using the BOG data are higher on average by roughly two percent. Ravi Jagannathan, Ellen R. McGrattan and Anna Scherbina, 2000, The declining U.S. equity premium, *Quarterly Review of Federal Reserve Bank of Minneapolis*, Fall, pp. 3-19.

unchanged."[42] Fifth, the growth in the economy is usually measured as growth in GDP or in GNP on a per-capita basis.

Q. What adjustment do you make for the conjecture that dividend yields are an incomplete and poor proxy for the cash distributions received by equity distribution?

A. In both Schedules 4.7 and 4.8, we overadjust for the possibility that cash distributions other than dividends (e.g., share repurchases) are sizeable and are not offset by stock option issuance. We do this by increasing the dividend yield by 50% for the one-stage DDM model. However, many observers have shown that completed repurchases are much less than announced repurchases and that stock buybacks are offset by share issuances.[43]

Q. Would you please now discuss the DCF Test results that use going forward estimates of future expected growth rates?

A. These results are summarized in Schedule 4.9. In this schedule, we use consensus estimates of nominal GDP and before-tax corporate profits obtained from Consensus Economics. All of the MERPs using the consensus forecasts for both the U.S. and Canadian equity markets are below 3%. To determine how much actual GDP growth needs to exceed expected GDP growth for both markets to achieve a MERP estimate close to our 4.9% estimate, we add 200 basis points in GDP growth to the consensus estimates from Consensus Economics for each year going forward. This is reported as case 4 in Schedule 4.9. Doing this yields a range of MERP estimates from 4.88% to 5.03%. Thus, to

---

[42] J. Siegel, 1999, The shrinking equity premium, *Journal of Portfolio Management* 26:1 (Fall), pp. 10–17; and W. Reichenstein, 2002, What do past stock market returns tell us about the future?, *Journal of Financial Planning* forthcoming.

[43] For examples, see J.C. Bogle, 1995, The 1990s at the halfway mark, *Journal of Portfolio Management* 18:1 (Summer), pp. 21–31; and K. Cole, J. Helwege and D. Laster, 1996, Stock market valuation indicators: Is this time different?, *Financial Analysts Journal* 52:3 (May/June), pp. 56–64.

obtain our MERP estimate of 4.9%, the consensus has to have consistently underestimated the GDP growth rate by 2% for each year going forward.

Q. What inference do you draw from your estimates of the implied MERP using these forecasts of economic and market professionals for U.S. and Canadian equity markets?

A. The conclusion that we draw is that our forward-looking estimate of the MERP for the S&P/TSX composite of 4.9% is conservatively high.

12. The final Canadian MERP estimate (final input #2):

Q. What MERP are you forecasting to be used to calculate the risk premium for an average-risk utility for 2006/07 and 2007/08?

A. We determine that our estimate of the Canadian MERP of 4.9% discussed above needs no further upward adjustment since it is already conservatively high. This latter observation reflects the recent evidence that the use of the realized market MERP results in an over-estimate of the risk premiums required historically, and the consensus conclusion in recent studies that the required risk premium going forward will be low. On balance, weighing all of these factors leads to our Canadian MERP forecast of 4.9%. Our point estimate is substantially higher than: (i) the forecasted range of no more than 3.5% based on a survey of professionals by Watson Wyatt; (ii) a maximum of about 3% based on a DCF test at the market level using the going forward forecasts for GDP and pre-tax corporate profits of market and economic professionals; and (iii) the “consensus” forecasts of academic and professional scholars of a low, nil or negative equity risk premium for the U.S. going forward.

Relative investment risk of an average-risk utility (input #3)

Q. How does the overall riskiness of an average-risk utility compare with the typical firm contained in the S&P/TSX Composite?

A. The overall (investment) riskiness of an average-risk utility is typically determined by measuring its contribution to the risk of the market proxy. In a risk premium framework, this contribution is typically measured by the market beta of an average-risk utility.

Since market betas vary over time, investment professionals prefer to use only the most recent data in order to capture the firm's current risk even for firms with long trading histories. However, to ensure reasonable statistical precision, beta estimations typically are based on approximately 5 years of monthly observations. The betas used herein are based on 60 months of data, and are only calculated if almost all months have returns based on actual market transactions.

It is not possible to estimate a reliable beta for the average-risk utility directly. This utility does not trade publicly. However, it is possible to make an approximation. We use the same sample of eight utilities that we used in our capital structure discussion in Section III. We presented the rationale for the sample selection there. Here we add Westcoast Energy as this company traded throughout 2001, and as exchange units of Duke in 2002. As shown in Schedule 4.10, the average beta for a group of ten utilities is 0.307 for 1992-2006, a sizeable decrease from 0.583 for 1990-1994. The mean of the mean cross-sectional betas for the 14 rolling five-year periods is 0.307. The means of the mean cross-sectional betas for the first eight and the last five rolling five-year periods are 0.424 and 0.118, respectively. We estimate the beta for an average-risk utility at 0.50, above the grand average of the average rolling-betas for the 13 rolling periods.[44] We believe that this estimate is conservatively high, and provides sufficient coverage for any estimation errors.

Q. What other risk-related factors did you consider that could affect the cost of equity capital for an average-risk utility?

A. We also examined whether an average utility was becoming a more desirable investment because of an increase in its potential to diversify investor portfolios. In modern portfolio theory, an asset becomes more desirable for portfolio diversification purposes if its correlations with all the other assets decrease towards zero or even become negative, everything else held constant. This important contribution led to the awarding of a Nobel Prize in Economics to Dr. Harry Markowitz.

Thus, we calculate moving average correlations for our sample of utilities with the S&P/TSX Composite index. These results are summarized in Schedule 4.11. We find that the average correlation between a utility in our sample and the S&P/TSX Composite is substantially lower for the most recent five-year period relative to the more distant eight-year period (0.068 versus 0.387), and is quite low at 0.264 across all 13 rolling five-year periods. This suggests that an average utility is now more desirable as an investment because of its enhanced potential for portfolio risk reduction. A greater potential for risk reduction leads to a reduction in an asset's own equity risk premium.

This reduction in the correlations between the returns of the utilities and the market also contributes to the reduction in the betas of the sample of utilities.[45]

[44] Betas of 0 and 1 correspond to no market risk and a market risk equal to a well diversified portfolio such as the S&P/TSX Composite index, respectively. Thus, a beta of 0.50 for an average-risk utility indicates that this utility has 50% of the investment risk of the S&P/TSX Composite.

Q. Modern portfolio theory from which we draw the concept of beta assumes that all investors diversify their portfolios and that, as a consequence, only nondiversifiable risk is priced. However, if investors do not hold well diversified portfolios, it has been argued that they would demand a risk premium for bearing such risk. Would you please comment on this position?

A. There is conflicting evidence in the literature on whether or not the own risk of a firm is rewarded in the market. As pointed out earlier, if investors do not hold well-diversified portfolios and thus require an additional premium for bearing diversifiable risk, then the total risk of the average-risk utility needs to be compared to the total risk of average-risk firms in other industries. Under this view, the relative ratio of the total risk of the average-risk utility to that of the mean of the average-risk firms in various industries can be used as an index to adjust the MERP upwards or downwards to get the appropriate ERP for an average-risk utility.

Q. Why is not appropriate to use a relative risk index that compares the variance of an average-risk utility to the variance of the market proxy?

A. There are three reasons why such an approach is not appropriate. First, a relative risk index should have the property that when one finds the weighted average of the firms or industries that comprise the market index the result is the risk of the market proxy. This does not happen if you use a relative risk index that is obtained by dividing the variance of an industry index by the variance of the market proxy. Second, if investors receive a return premium for bearing

[45] The beta coefficient is given by $\beta_i = (\sigma_i \rho_{im}) / \sigma_m$, where σ_i and σ_m are the standard deviation of returns for utility *i* and the market *m*, respectively; and ρ_{im} is the correlation between the returns for utility *i* and the market *m*, respectively. Thus, if the relative risks of the utility and market remain constant, the beta decreases towards zero as the correlation between their returns moves from 1 to 0.

nondiversifiable risk, then the capitalization-weighted average return premium will be already reflected in the return of the market proxy. This happens because the return on the market proxy is merely a weighted average of the returns on the firms or industries that compose that market proxy. Thus, the market proxy already incorporates the nondiversifiable risk premium for a firm (or industry) of "average" nondiversifiable risk. Third, how the nondiversifiable risk of an average-risk firm in a particular industry compares to such firms in other industries is best studied using our approach.

Q What do you find when you conduct such an analysis for the various industries in Canada?

A. We use the indirect decomposition method of Campbell et al. to estimate the industry-level monthly variances for 47 industry groups. The specific procedure is detailed in Appendix 4.C. The results for the complete period of 1975-2003 and the most recent 10-year period of 1994-2003 are summarized in Schedule 4.12. We examine various benchmarks that include: (i) the elimination of the three industries with the highest variances, (ii) the elimination of industries with less than 10 firms, and (iii) the elimination of industries with less than 10 firms and the industry with the highest variance after eliminating industries with less than 10 firms. In all cases, we find that the average variance of the utilities is less than 40% of the mean variance of the industry benchmark. Thus, even if we assume that investors need to be compensated for bearing nondiversifiable risk, the relative risk of utilities compared to all industries is less than 50%

Q. What conclusion do you derive from these analyses?

A. We conclude that a relative risk index is 0.50 whether or not investors receive a return premium for bearing nondiversifiable risk when appropriate benchmarks are chosen.

1. Relative investment risk of an average-risk utility: The use of the adjusted beta method:

Q. What is your opinion on the practice by some expert witnesses, such as Ms. McShane, in rate of return hearings of adjusting the betas used in calculating the required rate of return on equity?[46]

A. There are two primary rationales that have been given for using the adjusted beta method when calculating the required rate of return on equity. Both rationales are flawed.

Q. Would you please explain what the first rationale for using the adjusted beta method for utilities is and why it is flawed?

A. The first rationale is based on the empirical finding by Blume (1975) that the betas of individual U.S. equities, for a large sample that is representative of the overall market, tend to regress over the long run towards the mean beta for the sample.[47] In the case of a large representative sample, the mean beta will be one.

Blume regresses the beta estimates obtained over the period 1955-1961 against the beta estimates obtained over the period 1948-1954 for common shares traded on the NYSE. Blume finds that the betas of firms with values less than one

[46] E.g., lines 1029-1045, page 38, Testimony of Ms. McShane.
[47] M.E. Blume, Betas and their regression tendencies, *Journal of Finance* 30 (June 1975), pp. 785-796.

subsequently tend to increase towards the sample beta of one, and firms with betas of more than one tend to subsequently decrease towards the market beta of one. The relationship estimated by Blume suggests that the quality of beta forecasts can be improved, and that a higher quality predictor of an individual firm's beta may be a weighted average of the sample beta and the firm's current beta where the weights are approximately one-third and two-thirds, respectively.[48]

There are at least five substantive reasons for not adjusting betas for utilities based on this rationale.

First, Harrington (1983)[49] shows that the betas that are supplied by commercial vendors that use this adjustment have little predictive accuracy. Her conclusion is based on a comparison of the actual beta forecasts supplied by a number of commercial investment vendors (such as Value Line) with their corresponding benchmark estimates for four forecast horizons.

Second, there appears to be no evidence that the relationship estimated by Blume that is over 40 years old applies to other markets, such as the Canadian market, or to more recent time periods. In other words, there appears to be no empirical evidence that the betas of Canadian stocks revert to the sample mean.

Third, if the sample average is consistently lower than the market beta, as is the case for the samples of utilities studied herein, the use of the market beta of one will result in an over-prediction of the mean beta in the next period for the sample. This is easily shown by taking a portfolio that is invested 40% in risk-

[48] Also, see O.A. Vasicek, A note on using cross-sectional information vs. Bayesian estimation of security betas, *Journal of Finance* 28 (September 1973), pp. 1233-1239.
[49] D.R. Harrington, Whose beta is best?, *Financial Analysts Journal* (July-August 1983), pp. 67-73.

free assets and 60% in the market, and thus, has a constant beta of 0.60 by construction. Its adjusted beta would consistently be 0.73 (i.e., two-thirds of 0.6 + one-third of 1), although its actual or true beta is substantially lower at 0.6.

Fourth, the previous point has already been documented in the published literature. Kryzanowski and Jalilvand (1986)[50] test the relative accuracy of six beta predictors for a sample of fifty U.S. utilities from 1969-1979. They find that the best predictors differ only in that they use different weighted combinations of the average beta of their sample of utilities, and that, not unexpectedly, the worst predictor is to use a beta of one or the so-called "long-term tendency of betas towards 1.00".

Fifth, adjusting the beta towards one assumes that the "true" beta for the utility is one. In other words, this adjustment method is based on the implicit assumption that the "true" beta for the utility is the same as that of the market index.

Q. Would you please explain what the second rationale for using the adjusted beta method is and why it is flawed?

The second rationale for using a variant of the adjusted beta method for utilities is that raw utility betas need to be adjusted upward due to their sensitivity to interest rate changes, and that the appropriate adjustment is one that is intermediate between the raw and adjusted betas. We provide a detailed criticism of this rationale in Appendix 4.D. This detailed criticism will now be summarized.

As is the case for the S&P/TSX Composite index, the returns of utilities are sensitive to changes in both market and bond returns. This suggests that utility

---

[50] L. Kryzanowski and A. Jalilvand, Statistical tests of the accuracy of alternative forecasts: Some results for U.S. utility betas, *The Financial Review* (1986), pp. 319-335.

returns may be better modeled using these two potential return determinants or factors. However, one should not confuse the sensitivity of utility returns to the returns of each of these factors with the premium required by investors to bear market and interest rate risk when investing in utility equities.

When there is only one determinant of utility returns (namely, the market), the theoretically justified approach is to use the traditional one-factor CAPM to implement the Market Risk Premium Method. The method is implemented by first estimating the utility's beta by running a regression of the returns on the utility against the returns on the market proxy (S&P/TSX Composite index). The utility's required equity risk premium is obtained by multiplying the equity risk premium estimate for the market by the utility's beta estimate. The cost of equity for the utility is obtained by adding the equity risk premium estimate for the utility to the estimate of the risk-free rate (as proxied by the yield on long Canada's).

When there are two possible determinants of utility returns (in this case, equity market risk and interest rate risk), the theoretically justified approach is to use a two-factor APM (Asset Pricing Model) to implement the Market Risk Premium Method. The Equity Risk Premium Method now is implemented by first estimating the utility's two betas by running a regression of the returns on the utility against the returns on the equity market proxy (S&P/TSX Composite index) and on the bond market proxy (long Canada's). The first component of the utility's required equity risk premium is obtained by multiplying the equity risk premium estimate for the market by the utility's market beta estimate, and the second component of the utility's required equity risk premium is obtained by multiplying the bond risk premium estimate by the utility's bond beta estimate. The utility's required equity risk premium is the sum of these two components. The cost of equity for the utility then is obtained by adding the equity risk premium estimate appropriate for the level of relative risk for the utility to the estimate of the risk-free rate (as proxied by the yield on long Canada's).

While one would expect the estimates of the return on the S&P/TSX Composite index, of the return on long Canada's, and of the return on the S&P/TSX Composite index over the yield on long Canada's to be positive and significant, such is not the case for the return on long Canada's over the yield on long Canada's. Over the long run, we would expect the average return on long Canada's to be equal to the yield on long Canada's (the proxy for the risk-free rate in rate of return settings). This is because our expectation is that rates would fluctuate randomly so that returns would be above yields to maturity in some periods and below them in others. Thus, while it is true that utility returns are sensitive to interest rates, it is not true that interest rate risk will have a positive risk premium over the long run.

To examine the nature of bond market risk premiums, we calculate the bond market risk premiums over various time periods that correspond to some of those used previously to calculate the MERP. These results are reported in Schedule 4.D2 in Appendix 4D. As expected, over long periods, such as 1965-2002, the mean bond market risk premium is only 30 basis points, and it becomes negative over the three progressively longer time periods of 1957-2002, 1951-2002 and 1936-2002. While it is positive and quite material over the 1980-2002 period at 1.745%, this is offset by the relatively low MERP of 2.797%. Furthermore, according to our expectations, all of the mean bond risk premiums are not significantly different from zero at conventional levels. In contrast, the mean equity risk premiums are significantly different from zero for the two longest time periods of 1936-2002 (at 5% level) and 1951-2002 (at 12% level).

Looking forward we expect MERPs to be low, and we do not expect the bond market risk premium to be material (on the positive side) since interest rates are now at or near historic lows.

THE INITIAL COST OF EQUITY CAPITAL RECOMMENDATION

Q. What cost of equity capital are you recommending for the average-risk utility based on the Equity Risk Premium Tests?

A. Based on a MERP estimate of 4.90% and at a relative risk factor of 50% of the S&P/TSX Composite index, the ERP required for our average-risk utility (i.e., our final estimate of input #2 multiplied by our final estimate of input #3) is calculated to be 2.45%. Given our point forecast of a long-term Government of Canada bond rate of 4.20 and 4.65% for the 2006/07 and 2007/08 test years (our final estimates of input #1), our cost of equity capital point estimate is 6.65% and 7.10% for the 2006/07 and 2007/08 test years.

ADJUSTMENT TO THE “BARE BONES” COST OF EQUITY CAPITAL RECOMMENDATION FOR AN AVERAGE-RISK UTILITY

Q. What adjustment is required to this “bare bones” figure to make it suitable for a cost of equity estimate for purposes of regulation?

A. Past practice in varous regulatory jurisdictions considers the need to adjust from a market-value based rate of return to an accounting-based rate of return in order to preserve the financial integrity and financing flexibility of a utility such as our average-risk utility. The idea is that our average-risk utility should be allowed to maintain its market-to-book value ratio sufficiently above unity (the value of one) in order to attract investment and to recoup flotation costs associated with issuing new equity financing instruments.[51] The notion that each company should

[51] For example, see G.R. Schink and R.S. Bower, Application of the Fama-French model to utility stocks, in *Financial Markets, Institutions and Instruments; Estimating the Cost of Capital: Methods and Practice*

maintain a market value above book value is somewhat contradictory as it suggests that each company should plan to earn a return on new investments above the allowed rate of return.

Also, as was discussed earlier, the use of the arithmetic mean instead of a weighted average of the arithmetic and geometric means in determining the MERP already provides some protection to ensure the financial integrity and financing flexibility of an applicant utility.

For these reasons, we only consider flotation costs as a justification for making an adjustment to the “bares bones” cost. However, given the high dividend payout ratios paid by utility firms, no compelling justification even exists for making an adjustment for equity flotation costs. Since all ongoing equity needs should be able to be totally funded internally, no flotation costs should be incurred for public equity offerings. Furthermore, NTPC neither has nor is expected to undertake public equity offerings. Nevertheless, we make an adjustment to the “bare bones” cost to compensate the NTPC for potential equity flotation costs.

Q. What adjustment to the “bare bones” cost do you make to compensate NTPC for potential equity flotation costs?

A. When firms issue or sell new equity to the market, they incur underwriting fees paid for marketing the issue, and other underwriting and issue expenses for legal and accounting services, printing of issuing documents, and applicable registration fees. Research on flotation or issuance costs for new equity issues for utilities in Canada over the five year period ending with 2001 finds that the

3:3 (1994), pp. 74-95. In testimony before this Board, Ms. McShane has acknowledged that “… a number of regulatory boards in the United States give no weight to the comparable earnings test” (The Public Utilities Board of the Northwest Territories, Board Decision 1-91, page 42.

median fee is 4% of gross proceeds for equity offerings (see Schedule 4.13). When the equity offering fees are amortized over a 50-year period, the annual adjustment needed to compensate the average-risk utility for potential equity flotation costs is about 8 basis points annually, which we round up to 10 basis points to cover other issue costs.

THE FINAL RECOMMENDED COST OF EQUITY CAPITAL FOR THE AVERAGE-RISK UTILITY

Q. What cost of equity capital are you recommending for the average-risk utility based on your Equity Risk Premium Tests?

A. As noted earlier, our Equity Risk Premium Tests used the following inputs:

1. the yield forecasted for 2006/07 and 2007/08 for long Canada's (input #1);
2. the forecast of the implied MERP for the S&P/TSX Composite (input #2);
3. the investment riskiness of the average-risk utility relative to the market as proxied by the S&P/TSX Composite Index or the average variance of Canadian industries (input #3); and
4. an adjustment to cover fees involved with potential equity offerings or issues (input #4).

We also stated that the recommended rate of return on equity for the average-risk utility is obtained by combining our final estimates of these four inputs as follows:

(Input #1) + [(Input #2) *x* (Input #3)] + (Input #4)

Based on a market risk premium estimate of 4.90% and a relative risk factor of 50% of the S&P/TSX Composite index, the equity risk premium required for the average-risk utility (i.e., our final estimate of input #2 multiplied by our final estimate of input #3) is calculated to be 2.45%. Given our point forecast of a long-term Government of Canada bond rate of 4.20% and 4.65% for the 2006/07 and 2007/08 test years (our final estimate of input #1) and adding 0.10% for equity flotation costs (our final estimate of input #4), our point estimate of the cost of equity capital for an average-risk utility is 6.75% and 7.20% for the 2006/07 and 2007/08 test years, respectively.

Thus, we are recommending a return on equity of 6.75% and 7.20% for the 2006/07 and 2007/08 test years, respectively. Our return on equity recommendations allows an average-risk utility a risk premium (with the inclusion of the equity flotation adjustment) of 255 basis points over our forecast for long Canada yields.

V. COST OF DEBT WITH SINKING FUNDS AND CAPITAL LEASE

INTRODUCTION

Q. What are your qualifications and experience in debt cost and its management, and in the review of financing programs?

A. Our experience on debt cost and its management and program review include: published academic articles on managing interest rate and foreign exchange risks employing duration analysis; research track record in the area of debt structure, costing, syndication, credit spreads, ratings and term structure of relative yield spreads between taxable and nontaxable bonds; research record in portfolio performance measurement; expert testimony on capital structure and cost of debt before Boards in Alberta, Quebec and Nova Scotia; and the conduct either solely or jointly of numerous proprietary reviews for government and governmental agencies and private-sector entities that include: the Federal Office of the Superintendent of Financial Institutions (OSFI), Federal Department of Finance (floating versus fixed debt maturity; reserves management framework – asset liability matching to immunize market risk exposure and to deal with rollover risk, prudent credit risk management, cost-of-carry minimization, and best portfolio risk management practices; management of funding of Canadian Foreign Exchange Fund Account; and of Canada Bills program), CMHC, CDIC, External Affairs Canada, Canada Investment and Savings (wholesale versus retail debt, embedded options, hedging costs and redemption probabilities), New Zealand Debt Management Office (debt maturity and foreign exchange exposure), National Bank (credit risk management) and Hydro Quebec (assessment of methodology for performance measurement of derivative trading portfolio and risk control), among others.

Q. How is this section of your evidence organized?

A. The first part of the evidence in this section deals with the cost of NTPC's debentures that have sinking funds. We show that the method used by NTPC to calculate the embedded cost of debt for its debentures with sinking funds is inequitable by construction and explodes as the debentures approach maturity. We show that the three non-redeemable debentures with sinking funds do not conform to "best practice" in that they do not contain any of the three embedded options contained in a typical sinking fund issue, and the redemption features in the other two debentures with sinking funds are of dubious value. This is followed by evidence that shows that NTPC's sinking fund investment policies did not conform to what is considered to be "prudent" in terms of portfolio management, and that by the time the Government of the NWT (or GNWT) changed the regulations governing the sinking fund investment policies of NTPC that it was very unlikely that the sinking fund(s) could earn a rate of return that was equal or better than the promised yields being paid by NTPC on the debentures with sinking funds. With regard to rulings at other regulatory bodies, we refer to a decision by the Public Utilities Board of Alberta against the use of the method employed by NTPC for determining the embedded cost for debt with sinking fund provisions. We end the first part of this section by recommending that this Board adopt the Alberta ruling in terms of stipulating how the embedded cost of debt should be calculated for debt issues with sinking funds.

In the second part of this section of our evidence, we deal with the cost of NTPC's capital lease. We note that the cost of the capital lease is calculated as a blended cost of equity and debt although standard cost treatment is to use 100% debt. We argue that the equity implicit in the calculation of the cost of the capital lease is not reflected in NTPC's computation of its equity component. We then provide three arguments of why the cost of the lease as calculated by NTPC is too high. We argue that NTPC as a non-taxed regulated utility gains, unlike a stand-alone taxable utility, from being able to include the full amount of the annual amortization expense in its operating cost structure for rate purposes. We conclude this section of our evidence by recommending a lease cost of 8.19% for 2006/07 and 8.24% for 2007/08 after making only a partial adjustment for the factors that have resulted in NTPC providing a too high cost of the lease.

COST OF DEBENTURES WITH SINKING FUNDS

Q. Which debt issues of NTPC have sinking funds?

A. According to the most recent Annual statement for the 2005-06 fiscal year, the consolidated statements of NTPC indicate that it has five outstanding debt issues with sinking funds. These five issues are listed in Schedule 5.1. They are the same five issues that are listed in Table NTPC.TWU-15 that was supplied by NTPC and are captured in Schedule 3.6 of NTPC's application.[52]

Q. How are the debt issues with sinking funds divided between NTPC's regulated and nonregulated entities?

A. They are all allocated to NTPC's regulated activities. The sinking fund investment values of $37.804 million and 28.850 million for fiscal year ends 2006 and 2005 as reported on a consolidated basis in NTPC's 2005/2006 *Annual Report* on page 33 are identical to the closing mid-year closing balances reported for 2005/06 and 2004/05 in Schedule 3.6 of NTPC's application.

Q. How does NTPC calculate the embedded cost of debt on its debentures that have sinking funds?

A. NTPC uses a method where the numerator of the calculation (i.e., interest expense) is reduced by the earnings attributable to the sinking fund (or a very

[52] Undertaking Response – Technical Workshop, NTPC GRA 2006/07 and 2007/08, January 12, 2007, in file: NTPC2016Undertaking1-16no11.

conservative estimate of such when looking forward) and the denominator is reduced by the full amount of the sinking fund outstanding.

Q. Why is the calculation method important?

A. It is important because this method of calculating the embedded cost for debt with sinking fund provisions levers up or increases the cost of debt when the returns earned on the sinking fund investments are below the rates paid by NTPC on the debt, and can lever down or decrease the cost of debt for some scenarios when the returns earned on the sinking fund investments are above the rates paid by NTPC on the debt. The reason that it does not decrease the cost of debt in all scenarios when the returns earned on the sinking fund investments are above the rates paid by NTPC on the debt is that an end-of-year sinking fund contribution decreases the denominator of the calculation for the year but does not decrease the numerator for that year because the annual sinking fund payment is not invested during that year. Earning future returns on the sinking fund investments that exceed the rates paid by NTPC on the debt was a very unlikely scenario at the time the sinking fund debt was issued given the historic investment policy that NTPC followed for its sinking fund investments. We will return to this issue below.

Thus, as the shortfall between the rate paid by NTPC on the sinking fund debt and the investment returns earned on its sinking funds has been sizeable, this has resulted in a material upward adjustment to the cost of the debt of NTPC.

The effect of the calculation method is easily illustrated by first presenting an illustrative example and then referring to NTPC's implementation of their method of calculating the cost of debentures with sinking fund provisions. Suppose that a regulated utility issues $20 million of 10% debentures with a ten-year maturity and a sinking fund that has no embedded options, and that the bond indenture specifies annual end-of-year payments of $2 million into the sinking fund less earnings for the year. We now assume that the sinking fund earns a constant annual rate of return (ROR) of 6%, 8%, 10% or 12% over its life. The respective embedded costs of this debt over its life are calculated and presented in Schedule 5.2.

In this example, the embedded cost of debt increases above the debenture's promised yield (PY) when the sinking fund's ROR equals the debenture's PY and even when the sinking fund's ROR equals the debenture's PY or is less than the debenture's PY for some of the early years of the debenture's life. Furthermore, a symmetrical difference in the sinking fund's ROR above and below the PY (in this case a difference of ± 2%) has an asymmetric impact on the debenture's embedded cost of debt. To illustrate, if the sinking fund's ROR is 2% above the PY at 12%, the embedded cost of debt is estimated to be 10.22% at the debenture's half-life in terms of mid-year maturity (i.e., years 5-6 in the schedule). In contrast, if the sinking fund's ROR is 2% below the PY at 8%, the embedded cost of debt is estimated to be 14.22% at the debenture's half-life in terms of mid-year maturity. Thus, earning a ROR on the sinking fund that is x% less than the debenture's PY has a much larger impact on the embedded cost of debt than earning a ROR on the sinking fund that is x% larger than the debenture's PY. Thus, the adjustment method is inequitable by construction since it increases the embedded cost of debt disproportionately more when the rate of return on the sinking fund is below the interest rate paid by the firm on its debentures than it decreases the embedded cost of debt when the rate of return on the sinking fund is above the interest rate paid by the firm on its sinking fund debentures, and this divergence gets larger as the ratio of sinking fund value to the outstanding principal amount of debentures gets larger.

The explosive nature of using this calculation formula is evidenced by comparing the debt costs calculated by NTPC for its 11% sinking fund debentures issued on

9 March 1989.[53] Specifically, the effective cost of this debt for various years is as follows: 14.466% for 2001/02 (Table 4), 15.212% for 2002/03 (Table 5), 16.407% for 2003/04 (Table 6), 20.646% for 2004/05 (Table 7), 20.474% for 2005/06 (Table 8) and 215.57% based on forecasts for 2006/07 (Table 9), although NTPC has put "n/a" for 2006/07.

Q. How has the typical sinking fund been structured?

A. Many corporate bond indentures, especially in the 1970s, 1980s and early 1990s, had sinking fund provisions. Based on a sample of bonds drawn from the 1990 edition of *Moody's Industrial Manual*, Drs. Kalotay and Tuckman find that about 51% of the bonds had sinking funds if their original maturities were 11 to 20 years and almost 77% of the bonds had sinking funds if their original maturities were more than 20 years.[54] This study also finds that bonds of lower credit quality are more likely to contain sinking fund provisions. Thus, sinking funds have been used as a mechanism for debt retirement as the economic life of the underlying asset diminishes. In turn, this allegedly strengthens the credit rating of the issuer. Sinking funds are also supposedly a mechanism for reducing shareholder wealth losses arising from informational asymmetries between the borrower and lender. However, Drs. Kurtenbach and Vijayakumar find that investors associate the sinking fund provision, at least in the case of municipal revenue bonds, with riskier projects or riskier issuers. As a result, the inclusion of a sinking fund provision increases borrowing costs to issuers.[55]

Drs. Thompson and Norgaard find that the inverse relationship between the inclusion of sinking-fund provisions and credit quality is the most pronounced for

[53] NTPC response to Information Request, HC.NTPC-23, NTPC GRA 2006/07 and 2007/08, pages 10-15 of 16, dated February 17, 2007.
[54] Andrew Kalotay and Bruce Tuckman, 1992, Sinking fund repurchases and the designation option, *Financial Management* 21: 4 (Winter), 110-118.
[55] James M. Kurtenbach and Jayaraman Vijayakumar, 1999, Information asymmetry and municipal revenue bonds, *Journal of Public Accounting and Financial Management* 11: 2 (Summer), 177-202.

utility issues.[56] They find that only 30% of the Aa-rated utilities issued debt with sinking fund provisions in 1963 compared to 100% of the Baa-rates new issues.

Q. What does this typical sinking fund structure tell us about past practice by NTPC?

A. It tells us that the inclusion of a sinking fund is likely unnecessary for an issuer like NTPC which enjoys a bond rating of Aa3 from Moody's due to the GNWT guarantee.

Q. How has the typical sinking fund been structured to minimize the risk to the issuer?

A. The provisions of a typical sinking fund require the issuer to retire fixed principal amounts before maturity but include various embedded (European and American) options that minimize the risk exposure to the issuer. To facilitate these redemptions, the issuers manage risk by having the option of either purchasing the required number of bonds in the market (a delivery option) or calling them at par (a "conventional call provision"). Thus, the issuer can minimize borrowing costs by calling the bonds when the bonds sell at a premium because the current effective bond yield is lower than that promised at issue, all else held equal. Similarly, the issuer can minimize borrowing costs by open market purchases when the current effective bond yield is higher than that promised at issue, all else held equal.

In addition, the typical bond indenture with a sinking fund provision includes a sinking fund acceleration feature. This is an American call option that allows the issuer to call all or part of the issue according to some price schedule where the call exercise price declines linearly to par as the size of the purchase increases.

[56] F.C. Thompson and R.L. Norgaard, 1967. *Sinking Funds: Their use and value*. New York: Financial Executive Research Foundation.

Kalotay and Tuckman (1992, page 112) report that only 3 of their sample of 257 bonds did not contain this American call feature.

Many bond indentures include “acceleration” features, which allow the issuer to call more than the required sinking fund payments at par on each payment date. For example, “double-up” and “triple-up” options allow an issuer to call two and three times the mandatory sinking fund requirement, respectively, on each payment date. Kalotay and Tuckman (1992, page 112) find that “only about seven percent of the issues contain no optional sinking fund payments”.

The typical bond indenture with a sinking fund provision also has a designation option, which allows the issuer to designate any or all prepurchased bonds to be placed in the sinking fund as its sinking fund contribution at any future sinking fund contribution date. The designation option protects the issuer against buying the bonds on the open market at inflated prices from accumulators when rates are relatively high and bond prices are correspondingly low.

Thus, a typical bond indenture with a sinking fund provision embeds at least three types of options that minimize the risk to the issuer. These are the conventional call provision, the acceleration call option and the designation delivery option. As we show below, the “Canada plus call” provision in NTPC’s bonds, greatly restricts the effectiveness of the first option.

Q. How are the sinking fund provisions in the five outstanding debenture issues of NTPC structured?

A. First, NTPC appears to have used the less common “general sinking fund” for the three earliest issued debentures with sinking fund provisions listed in Schedule 5.1, and a variant thereof (hereafter, referred to as the “hybrid general sinking fund”), which is obtained by the attachment of the redeemable option, for the two more recent issued debentures with sinking fund provisions listed in Schedule

5.1. Thus, NTPC has not used the more common “specific sinking fund” for its five outstanding debenture issues with sinking fund provisions.[57] With the general sinking fund, the firm invests the sinking-fund payments in, for example, securities that have the same term-to-maturity as the bond issue. With the specific sinking fund, the firm uses the payments to retire portions of the issue prior to the maturity of the issue in a cost-minimization fashion by using either a call feature or open market purchases of outstanding amounts of the issue. Second, only two of the five debenture issues with sinking fund provisions appear to have any of the above three embedded options that are almost always used to control the risks associated with sinking funds. They are the two most recently issued issues with redeemable options that are listed in Schedule 5.1; namely, the 8.41% redeemable sinking fund debentures due February 27, 2026 and issued February 1996, and the 6.33% redeemable sinking fund debentures due October 27, 2018 and issued in October 1998.[58] The three older issues carry much higher yields. They include the 11% sinking fund debentures due March 9, 2009 and issued in March 1989, the 11 ⅛% sinking fund debentures due June 6, 2011 and issued in June 1991, and the 10 ¾ % sinking fund debentures due May 28, 2012 and issued in May 1992.

The two redeemable debentures have a “Canada plus call” feature that is not very valuable to NTPC since its call pricing formula severely diminishes the value of the call feature. To illustrate, NTPC states in its response to the HC information request HC.NTPC-23 that:[59]

> “For diligence purposes, on August 16th 2006 the Corporation requested Scotia Capital, the Corporation’s fiscal agent to determine how much it would cost to redeem the 8.41% debenture. Based on the yield curve at that time,

[57] According to Kryzanowski et al. (1982), the general sinking fund was the more common choice by corporations (Lawrence Kryzanowski, Devinder K. Gandhi and Lawrence J. Gitman, 1982, *Principles of Managerial Finance* (Harper Row Publishers Inc., 1982, p. 676).
[58] NTPC response to Information Request, HC.NTPC-23, NTPC GRA 2006/07 and 2007/08, page 2 of 16 dated February 17, 2007.
[59] NTPC response to Information Request, HC.NTPC-23, NTPC GRA 2006/07 and 2007/08, page 3 of 16 dated February 17, 2007.

the price to redeem the 8.41% debenture was 149.52 on a 100 par value debenture for a 49.52% call premium."

An examination of the redeemable feature in the term sheet provided by NTPC for the 6.33% redeemable sinking fund debentures, due October 27, 2018, shows that the redemption feature has dubious value.[60] The redemption feature should have value if interest rates go down but the exercise price of this particular redemption feature is the higher of par or the Canada Yield Price that reflects a 20 basis point premium over the Canada yield with the same remaining term to maturity. However, when interest rates or yields on Canada's go down, the Canada Yield Price will exceed par by an amount that grows with the decrease in the yield on Canada's with a comparable remaining term to maturity. By matching the term-to-maturity and not the duration on the benchmark Canada with the remaining term-to-maturity on this debenture, the price increase in the Canada from a decrease in market yields with be higher than the price increase in the redeemable debenture, all else held constant, because the Canada's will most likely have a lower coupon rate. By matching the term-to-maturity on the benchmark Canada with the remaining term-to-maturity of this debenture, any gain from a downward shift in the yield on Canada's is lost. Thus, the option will only have value if the yield spread between the yield that NTPC has to pay and Canada's narrows sufficiently to cover the added costs of redeeming the debenture and the effect of the 20 basis point kicker reflected in the Canada Yield Price.

Q. Why is the redeemable provision important?

A. First, it is important because it indicates that NTPC implemented risk management procedures that were not "best practice" for the three earlier issues given that, as we have pointed out earlier, "best practice" was to have the various

[60] NTPC response to Information Request, HC.NTPC-23, NTPC GRA 2006/07 and 2007/08, term sheet attached, dated February 17, 2007.

call and delivery provisions in the trust indentures for debt instruments with sinking fund provisions. Second, the value of the redemption option is illustrated by NTPC's exercise of this option in 2002 to retire the $20 million in principal of the 9 ⅜% redeemable sinking fund debentures due May 12, 2014. In 2003, NTPC issued $20 million in principal at a lower cost and with a considerably longer maturity (i.e., the 6.63% amortizing debenture due December 18, 2032). Third, if the three issues representing $65 million in face value had a call feature for early redemption, NTPC could have refinanced these issues at promised yields of less than 7 percent, which represents a 400 basis point reduction over what it continues to pay on these issues. This would have represented a debt service cost saving of over $2.6 million annually. Fourth, NTPC acknowledges that other forms of debentures (such as amortizing debentures) have several advantages over sinking fund debt such as lower costs, reduced cash flow impact, greater simplicity and lower administrative costs. These differences are magnified with the issue of debentures with sinking fund provisions that lack the various embedded options referred to earlier.[61] Fifth, NTPC acknowledges that it has no empirical evidence that issuing these debentures with sinking funds without embedded options or the type of redemption feature attached to two of these debentures was subject to rigorous comparative analysis or that they were the lowest cost option.[62]

Q. What factors would contribute to a firm not conforming to "best practice"?

A. The most likely reasons are agency and incentive problems. In a typical unregulated firm, the additional costs of issuing a sinking fund debenture when best practices would call for issuing debentures without a sinking fund or of <u>not</u> adopting a "best practice" sinking fund indenture is borne either fully or to a large extent by its shareholders since it is difficult to pass such additional costs along

[61] NTPC response to Information Request, HC.NTPC-20, NTPC GRA 2006/07 and 2007/08, page 2 of 2, dated February 17, 2007.
[62] NTPC response to Information Request, HC.NTPC-23, NTPC GRA 2006/07 and 2007/08, page 3 of 16, dated February 17, 2007.

to the firm's customers in a competitive non-regulated environment. In the case of a regulated utility, such costs are borne by its rate payers if approved by the regulator. For a regulated utility, the regulatory procedure for determining the cost of debt in the calculation of the weighted cost of capital is based on historic embedded costs for debt and on prospective costs only for new debt. Thus, the full additional costs of <u>not</u> adopting a "best practice" sinking fund indenture are borne by the rate payers and not the shareholders of the regulated utility. Since the management of a (non)regulated firm attempts to maximize the wealth of its shareholders, management has little incentive to adopt a "best practice" sinking fund indenture if the interests of shareholders are not materially affected unless this is enforced through the regulatory process. Not using "best practices" by NTPC's management or its major shareholder GNWT during these earlier periods also seems consistent with the "facts relating to the efficiency of management" documented by this Board in its decision 9-93.[63] We will subsequently address other agency problems when the sole shareholder of a utility is a government.

Q. Describe how the "general sinking funds" adopted by NTPC for its sinking fund debentures work.

A. NTPC uses invested sinking funds where the sinking funds consist of cash and certain permitted securities on a commingled basis. The sinking funds are established to contribute to the repayment of principal at maturity.

Q. Who determines the investment policy for the sinking funds of NTPC?

A. The general regulations governing the investment policy for the sinking funds of NTPC are determined by government regulation and not by the debenture documents since the debenture documents "only indicate the minimum annual

[63] The Public Utilities Board of the Northwest Territories, Decision 9-93, July 7, 1993, pages 68 and 69.

contribution and the timing of the contributions".[64] Specific investments made within these requirements are made by the management of NTPC in consultation with its investment advisors. Thus, the NWT government, which is also the sole shareholder of NTPC, determines the general requirements for the investment policy for the sinking funds of NTPC.

Q. Describe the sinking fund investment regulations prior to the fiscal year ending on March 31, 2001, and how they conform to the principles of "prudent" portfolio management.

A. To answer this question, our primary source of information was the notes that dealt with "Sinking Fund Investments" in the Annual Reports for NTPC from 1999/00 through 2005/06. We caution that the numbers for the years prior to 2002 include Nunavut. The makeup of the general sinking fund portfolio and the effective weighted average rates of return are summarized in Schedules 5.3 and 5.4.

According to the *Annual Reports* of NTPC for 1998/99 (page 22) and 1999/00 (page 26), sinking fund investments "consist of securities and short-term investments used or guaranteed by the municipal, provincial or federal governments of Canada, and paper issued by approved banks". Thus, given this constrained investment opportunity set consisting primarily of highly correlated assets, the sinking fund portfolio was forced to be poorly diversified. It prohibited any premiums from bearing credit risk or obtaining a market equity risk premium (or MERP) from investing a minority of its funds in equities. Furthermore, there was no explicit consideration given to the matching of the durations (or even maturities) of the sinking fund investments with the corresponding measures for the liabilities that are being funded by the sinking fund. In other words, there was no requirement in the regulations for prudent portfolio management and the prudent uses of asset and liability management (or ALM) techniques.

[64] NTPC response to BR.NTPC-17 from the Public Utilities Board, February 16, 2007.

That this was not a prudent investment policy was implicitly recognized in a review of electric generation and distribution in the NWT. The review committee in its report stated on page 58 that the "… removal of the FAA [Financial Administration Act] requirements provides NTPC with the ability to improve the return on its sinking fund investment …".[65] The imprudence of the investment policy was also recognized by NTPC (through its request) and by the responsible Minister, Honorable Jake Ootes during the November 2, 2000 Committee of Whole, which had meet to consider *Bill 9, An Act to Amend the NWT Power Corporation Act*. During the proceedings of the committee, the Honorable Mr. Ootes stated that:[66]

> "Territories Power Corporation has requested an amendment to the section of the Northwest Territories Power Corporation Act that governs and restricts the investing activities of the corporation. The amendment acknowledges the unique requirements of the corporation and recognizes that the best interest of its customers and its shareholder, the GNWT, will be served by allowing the corporation to expand their investment activities beyond the constraints currently placed on public agencies.
>
> The corporation is required under the terms and conditions of its long-term debt agreements to set aside funds on an annual basis to provide for the repayment of the debt at a later date.
>
> The advantage of this approach is that these funds can be invested and grow on their own accord. The more these funds can grow through **prudent and efficient investment** [our added emphasis], the less the corporation will be required to contribute to the funds.

[65] *A review of electric generation transmission and distribution in the Northwest Territories: A design for tomorrow*, December 6, 2000. This was conducted by a team under the authorization from the Cabinet of the Government of the Northwest on September 18, 2000. Available at: http://www.gov.nt.ca/research/publications/pdfs/PowerGenerationReviewRptone.pdf.
[66] *Northwest Territories Hansard*, 3rd Session Day 16 14th Assembly, November 2, 2000, page 691.

Reducing contributions will help reduce their need for rate increases. The board of directors of the corporation is charged under the Northwest Territories Power Corporation Act with directing the business of the corporation, and the amendment meets with their approval.

In addition, the **board of directors of the corporation has approved an investment policy that will maximize investment return for a level of risk that is deemed appropriate. This investment policy is conservative and mirrors the investment policy that governs the investment activities of the Workers' Compensation Board of the Northwest Territories** [our added emphasis].

Bill 9 will allow the corporation and their licensed professional investment advisors to **progress beyond a restrictive list of authorized investments and utilize modern theory and practices** [our added emphasis] to the construction of a pool of investments in the best interest of the corporation's customers and shareholder, the GNWT.

Failure to pass Bill 9 will prevent the corporation from utilizing its financial resources in an optimal manner to the benefit of its customers [our added emphasis]."

Thus, the GNWT and sole shareholder of NTPC knew that the investment policy in place at that point in time did not utilize its financial resources in an optimal manner to the benefit of its customers, did not facilitate prudent and efficient investment, did not allow for the utilization of modern investment theory and practice, and did not correspond to the more appropriate investment policy that governed other government agencies where the consequences of the policy was confined solely to the government (and indirectly to its taxpayers).

The movement to modernize and rectify the deficiencies in the investment policy was not surprising since NTPC was paying interest rates of 6.33% to 11% (weighted average of 8.13%) on its debentures with sinking funds in the fiscal years ending on March 31 of 2000 and 1999, and it had earned only 5.50% and 4.83% on its sinking funds in the fiscal years ending on March 31 of 2000 and 1999. This unfavorable rate spread was passed on to NTPC's customers. Similarly, NTPC paid interest rates of 8.41% to 11% (weighted average of 8.32%) on its debentures with sinking funds in the fiscal year ending on March 31, 1998, and earned only 5.76% on its sinking fund in that fiscal year. Thus, NTPC was paying over 8% on borrowed money that earned less than 6%, and was recouping some high ratio of the difference from its rate payers.

Q. Describe how the sinking fund investment policy evolved during the next two fiscal years (i.e., the fiscal years ending on March 31, 2001 and 2002), and how the investments of NTPC conformed with the principles of "prudent" portfolio management during those years.

A. While the legislation to allow for broadened investment by NTPC was passed by the GNWT in 2000/01, it was not enacted during that fiscal year, and the amended FAA regulations only came into force in October 2001. As shown in Schedule 5.4, the sinking fund had 94.60% and 96.62% of its sinking fund investments in cash and short-term investments in the fiscal years ending on March 31, 2001 and 2002, respectively. Not surprisingly, the sinking fund only earned 1.72% and 2.18%, respectively, for these two fiscal years. This was substantially below the amounts paid on the debt underlying these sinking funds (e.g., 8.13% in the fiscal year ending March 31, 2001). The sinking fund portfolios for those two years were poorly diversified, with maximum rollover risk, and with almost no chance of earning a ROR equal to or superior to that paid by NTPC on the debentures with sinking funds. The effect of these poor sinking fund RORs on the Comprehensive Negotiated Settlement Agreement filed with this Board on

November 20, 2001, and accepted by this Board in its Decision 1-2002, dated February 15, 2002, is unknown but is likely to be material.

Q. Describe the changes to NTPC's sinking fund investment policy after the amended FAA regulations came into force and how they conform to the principles of "prudent" portfolio management.

A. NTPC amended its investment policy to allow for up to 30% of the sinking fund investments to be made in equities. This not only allowed for better portfolio diversification but allowed the portfolio to capture an expected MERP on up to 30% of its investments. This change potentially added some market risk to the portfolio but this was offset to a large extent by greater portfolio diversification. If the fixed income part of the portfolio is considered to be a proxy for the long Canada rate, then the portfolio's market beta would be around 0.3. The remainder of the fund would continue to be held in fixed income securities (short- and long-term) with a minimum <u>average</u> credit rating of "A" from DBRS. The average credit rating criterion also added to portfolio diversification and allowed the fund to pick up a premium for bearing greater (but prudent) credit risk. As subsequent Annual Reports note, "equities are in … funds and are well diversified by sector, issuer, region and liquidity" [2003/4 *Annual Report*, page 24; 2004/5 *Annual Report*, p. 27].

While the amended investment policy was a good development, it was implemented too late since the term structure of interest rates had shifted downward substantially since most of the outstanding sinking fund debentures of NTPC had been issued when the term structure of interest rates was substantial higher. However, the change did result in considerably higher sinking fund RORs in the next four fiscal years (2003-2006) of 6.17%, 6.52%, 5.52% and 9.72%, respectively.

The most recent *Annual Report* for the fiscal year ending in March 2006 shows that NTPC has liquidated its equity position in its sinking fund and has immunized a portion of the sinking fund investments for the redemption of the 11% March 9, 2009, Sinking Fund Debenture. The liquidation of its equity position in its sinking fund suggests one or more of the following: (1) NTPC is practicing a risky market timing strategy with its equity investments in its sinking fund; (2) NTPC no longer feels that equity is needed in the sinking fund since the three nonredeemable debentures with sinking funds will mature in 2009, 2011 and 2012 (under the current method of calculating the embedded cost of these debentures, any shortfall in sinking fund earnings are compensated for by an increase in the embedded cost of these debentures), and (3) this is a preparatory move to lower sinking fund ROR expectations in the current rate-setting hearings (imputed ROR forecasts by NTPC are 3.62% for test year 2006/07 and 3.68% for test year 2007/08, which are considerably below Ms. McShane's long Canada forecasts for those test years).[67] The immunized investments consist of $11.239 million in Federal government guaranteed securities yielding 4.10%, which NTPC intends to hold to maturity. While this lowers the risk to the management of NTPC, it locks in a negative return differential of 6.9% that will be charged to rate payers under the current formula for calculating the embedded cost of debt for debentures with sinking funds for the 2006/07 and 2007/08 test years.

With regard to monitoring the investment performance of its sinking fund manager(s), NTPC uses four benchmarks none of which fully capture the investment opportunities available to the portfolio manager of its sinking fund.[68] For example, the portfolio manager can invest in international (nonUS) equities and has been invested in international equities in the 2002/03 and 2003/04 fiscal years. Nevertheless, the annual compound return on the sinking fund of nearly 7% has underperformed three of the four benchmarks and has underperformed the most relevant benchmark by about 40 basis points annually.

[67] NTPC, Schedule 3.7, of evidence.
[68] NTPC response to Information Request, HC.NTPC-23, NTPC GRA 2006/07 and 2007/08, pages 8 and 9 of 16, dated February 17, 2007.

Q. Are there any rulings by other Boards on how to determine the embedded cost of debt issues with sinking funds?

A. Yes, there are. The Public Utilities Board of Alberta has ruled against the use of the method being used by NTPC to calculate the embedded cost of debt for debt with sinking funds. Specifically, the Alberta Board's findings on page 52 in its *Decision E89097* are as follows:[69]

> "The Board agrees with TransAlta that EP's sinking fund and sinking fund earnings should be removed from EP's embedded cost of debt. The Board considers that the cost rate of a debt instrument should not be modified by the rate of return on the associated sinking fund.
>
> Accordingly, the Board directs EP to revise its embedded cost of debt included in the AFUDC calculations for Genesee 2 from 1980 to 1990 as follows:
>
> - The embedded cost of debt should be calculated based on the debt outstanding expressed as a percentage of debt interest. A mid-year rate should then be calculated. No sinking fund earnings should be included in this calculation either in the numerator or denominator. Alternatively, for a discounted cash flow debt rate no sinking fund cash flows should be considered.
> - The mid-year debt balance included in capital structure should reflect the mid-year debt outstanding net of mid-year sinking fund principal payments.
> - The mid-year common equity balance should not be adjusted for any sinking fund earnings."

[69] The Public Utilities Board, Alberta, Decision E89097, re: Transalta Utilities Corporation, Alberta Power Limited and Edmonton Power, December 15, 1989.

Although NTPC provides examples where this has not applied to Crown corporations,[70] these precedents are not convincing especially given the biases and inequities built into this calculation method that were noted earlier.

Q. What is your recommendation on how the embedded cost of debt should be calculated for NTPC's outstanding debentures with sinking funds?

A. Our recommendation is that the Board adopt the method of calculation prescribed by the Board in Alberta for this purpose, which considers no sinking fund earnings in the calculation. Further, we recommend that the resulting embedded cost of debt be used by NTPC for all its calculations, including but not restricted to AFUDC, working capital and capital lease. We recommend the method prescribed by the Board in Alberta because of the inequities in the current formula used by NTPC to calculate the cost of debt with sinking funds that are due to the formula's construction and because the costs that are generated from the current formula explode as the debentures approach maturity. The mathematics of the current formula used by NTPC are such that, when the rate of return earned on the sinking fund is less than the interest paid on the debentures with sinking funds, the annual percentage decreases in the denominator of the calculation are greater than the corresponding annual percentage decreases in the numerator of the calculation as the debenture approaches maturity. In contrast, when the rate of return earned on the sinking fund is more than the interest rate paid on the debentures with sinking funds, the annual percentage decrease in the denominator is now less than the corresponding annual percentage decrease in the numerator as the debenture approaches maturity. In both cases, the differences in the percentage decreases in the numerator and denominator for the same year get larger as the debenture approaches maturity. As a result, the current formula has an amplifying effect on the resulting interest cost when the rate of return earned on the sinking fund is less than the interest paid on the debentures with sinking funds and a dampening

[70] NTPC response to BR.NTPC-17 from the Public Utilities Board, February 16, 2007.

effect when the rate of return earned on the sinking funds is more than the interest paid on the debentures with sinking funds.

Q. Do you have any other recommendations dealing with the embedded cost of debentures with sinking funds?

A. Yes, we would recommend that the Board consider some cost sharing between the rate payers and shareholders of NTPC that recognizes the ongoing excessive costs associated with the three earlier debentures with sinking funds and with earlier management of the investment policy of the sinking fund in addition to our recommendations at page 107. The reason for the former is that these debentures did not conform to “best practice” because they did not include a call feature, and the reason for the latter is that the earlier investment policy did not conform to the principles of “prudent portfolio” management because the portfolio of investments was not well diversified and could have achieved a higher return with about the same risk.

Q. Based on your recommendations, what are the correct average debt costs for the two test years?

A. As we state above, the correct calculation of average debt cost should ignore all adjustments for sinking funds. The average cost of debt for a test year is the sum of interest expense amount and amortization of finance costs divided by the weighted average balance of debt. Turning to Schedule 3.7 in NTPC General Rate Application 2006/07 and 2007/08, we calculate the average debt cost as 8.29% and 8.31% for the two respective test years.[71]

COST OF THE CAPITAL LEASE

[71] For 2006/07: 8.29% = (10,778 + 126) / 131,510; for 2007/08: 8.31% = (10,755 + 124) / 130,843.

Q. What is your understanding of the arrangements between the three involved parties in NTPC's capital lease?

A. Our understanding of the arrangements are based primarily on the annual reports of NTPC and its response to our information requests. Our understanding is as follows:

A nonregulated subsidiary of NTPC loaned funds from 1994 to 1996 to Dogrib Power to finance the construction of a hydroelectric generating plant on the Snare River in the Northwest Territories. This loan involved equal monthly payments of $195,000 and bore an annual interest rate of 9.6%, which was the average rate of interest on NWT Energy Corporation Ltd.'s long-term debt issued to finance the loan. The loan has a 30-year term and is due in July 2026 (NTPC's 2002/3 *Annual Report*, page 24). The loan of the nonregulated subsidiary of NTPC is fully secured by a charge against the plant and lease agreement. The regulated part of NTPC entered into an initial 65-year capital lease until 2061 for the plant at an imputed rate of 9.6% from Dogrib Power.

Although the lease obligation of the regulated part of NTPC is sizeable ($24.478 million in 2001), the net lease obligation to the consolidated NTPC is much lower at $2,050 in 2001. This is because the loan receivable held by the nonregulated NWT Energy Corporation is offset with the capital lease obligation of the regulated part of NTPC. Upon consolidation, net payments occur in the early years and net receipts occur in later years until 2026 when the loan receivable is fully repaid. After 2026, only the capital lease obligation payments continue until 2061.[72] To illustrate the net cash flow impact of netting, the net lease obligation payments /(receipts) in $000s over the next five years as reported in NTPC's 2005/06 *Annual Report* are $58 in 2007, $20 in 2008, ($19) in 2009, ($61) in 2010 and ($108) in 2011 where the parentheses indicate receipts.

[72] NTPC, 2005-06 *Annual Report*, page 34.

Q. How is the cost of the capital lease calculated by NTPC for regulatory purposes?

A. The cost of the capital lease is calculated as a blended rate between the cost of equity and the cost of debt where the weights are respectively 6.74% and 93.26%, respectively.[73] The standard treatment is to use 100% debt.

Q. How is the capital lease dealt with in terms of determining the actual equity ratio?

A. The entirety of the capital lease is treated as if it were debt for capital structure purposes, which is inconsistent with the method used for calculating the cost of the capital lease for regulatory purposes by NTPC. This treatment for capital structure purposes understates the actual equity ratio of NTPC.

Q. Would you comment on the 9.6% imputed rate used to determine the payments under the 65-year capital lease.

A. We have three comments dealing with this rate.

First, the rate is too high. Standard practice is to set the imputed rate at the rate at which the entity can borrow the funds because the risk of making lease payments is no greater (and more likely less) than the risk of making payment on secured debt.[74] NTPC could borrow at a lower rate at that point in time. For example, in May of 1994, NTPC concluded a $20 million issue of 9.375% redeemable sinking fund debentures due May 12, 2014. In February of 2006, NTPC concluded a $20 million issue of 8.41% redeemable sinking fund debentures due February 27, 2026.

[73] Slide SM-4-YK/HR/FS-11Capital Lease interest rate, NTPC 2006/08 General Rate Application, GRA Phase 1 Workshop, January 8, 2007, page 66.
[74] Jonathan Birk and Peter DeMarzo, *Corporate Finance* (New York: Pearson Addison Wesley, 2007), page 814.

Second, we could find no evidence that NWT Energy Corporation Ltd. borrowed funds on its own account as is implied by the following statement in NTPC's various *Annual Reports* (e.g., 2005/06 *Annual Report*, page 34]: "The loan bears interest at an annual rate of 9.6%, which is the average rate of interest on NWT Energy Corporation Ltd.'s long-term debt issued to finance the loan". We suspect that NTPC used a centralized borrowing facility for its regulated and nonregulated entities at that point in time, and that the 9.6% may be some weighted-average embedded cost of its outstanding debt at that point in time. If our conjecture is correct, then this weighted-average must have included some portion of the three nonredeemable debentures issued with sinking funds prior to 1994. If this is the case, then some portion of these three nonredeemable debentures should be removed (carved out) when calculating the cost of debt for NTPC for regulatory purposes. This would have the effect of lowering the weight placed on higher cost debt issued in the more distant past and increase the weight placed on lower cost debt issued in the more recent past. Failure to do so would result in regulatory arbitrage. Specifically, the nonregulated part of NTPC would benefit at the expense of the (rate payers of) NTPC from the reduction in cost for more recently issued debt while receiving a rate on its loan to Dogrib that is based on the higher cost debt issued in the more distant past.

Third, if the cost of the Dogrib lease obligation is to have an equity component, the rate of return on equity for this purpose should be lower than the rate of return on equity for NTPC given that the risk of a capital lease is no higher than the risk of secured debt. The reason is that the equity component in the Dogrib lease obligation is of lower risk than the risk of NTPC. This appears to be reflected somewhat in the NTPC 2001/03 GRA Negotiated Settlement on page 3 where the ROE for NTPC was adjusted to 9.5% for both 2001/02 and 2002/03 and the ROE for the equity component under the Dogrib lease obligation was adjusted to 9.25% for both 2001/02 and 2002/03.

Q. Would you comment further on how the regulatory process and NTPC's tax-free status provides an additional benefit from this three-way capital lease financing arrangement?

A. A further benefit to NTPC from being nontaxable in terms of corporate taxes and being involved in this three-way capital lease financing arrangement is with the regulatory treatment of the amortization expense (commonly referred to as depreciation) associated with the capital lease.[75] If the nonregulated subsidiary of NTPC had entered into the capital lease, the cash-flow consequences of the amortization expenses associated with the capital lease would have been mute due to its nontaxable status. That is, the nonregulated sub could not obtain the tax shield from the amortization write-off. If a private-sector firm had entered into the capital lease, the cash-flow consequences of the amortization expenses associated with the capital lease would have been a fraction of the amortization expense (i.e., it would have been equal to the amortization charge times the firm's corporate tax rate). However, this is not the case for the regulated part of NTPC that entered into the capital lease. By entering into the capital lease, NTPC gains in the regulatory process by being able to include the **interest portion** of the annual cost of its operating lease (i.e., the portion of the annual lease payment that is essentially a pure financing cost) in its capital costs and also from including the full amount of the annual amortization expense in its operating cost structure. Thus, the cash-flow implication of the annual amortization expense associated with the capital lease is one where NTPC's implicit tax rate is 100%. This vividly illustrates one of the reasons given for leasing; namely, a "tax" (essentially cash-flow) gain occurs if the lease shifts the more valuable amortization deductions (herein amortization expense) to the party with the higher tax rate (herein implicit 100% tax rate).

[75] According to NTPC's 2005/06 *Annual Report*, page 24, the amortization of property, plant and equipment is provided on the straight-line average group useful life basis, at rates which are approved by the PUB, and the rates for electric power plants under capital lease during this fiscal year were 1.16 - 5.25.

Q. In summary, what is your major conclusion in terms of the capital lease for NTPC?

A. Our discussion in this section leads to the conclusion that the cost of the lease as presented by NTPC is overstated for four reasons. First, NTPC's calculation uses weights of 6.74% equity and 93.26% debt while the standard approach is to employ a debt weight of 100%. Second, if the cost of the lease is to include an equity component, the cost of equity should be lowered by more than 25 basis points to capture the lower risk of the lease. Third, the costs of debt used by NTPC are overstated due to the incorrect use of a sinking fund adjustment. Fourth, and finally, the costs of equity (drawn from Ms. McShane's evidence) are unreasonably high as we show in Section IV of this evidence.

Q. Based on this conclusion, what cost do you recommend for the lease?

A. In Schedule 5.5 we recalculate the lease cost for each test year employing adjustments based only on the third and fourth points above. The calculations produce a lease cost of 8.19% for 2006/07 and 8.24% for 2007/08. In the interests of conservatism, we make no further downward adjustments although such adjustments are warranted based on our first two points above.

Q. Does this conclude your evidence concerning the cost of debt with sinking funds and the cost of the lease?

A. Yes, it does.

VI. CRITIQUE OF EVIDENCE SUBMITTED BY MS. MCSHANE

INTRODUCTION

Q. Please explain what evidence is critiqued by you in this section.

A. In this section of our evidence, we critique the evidence of Ms. McShane dealing with the 2006/07 and 2007/08 recommended ROEs and capital structures for NTPC.

Q. What is the primary purpose of your critique of the evidence submitted by Ms. McShane?

A. The primary purpose of this critique is three-fold. First, it is to present the similarities and the differences between the recommendations made by Ms. McShane and us for the forecast of the 30-year Canada yield and the rate of return on equity for an average-risk utility, and the equity ratios and ROEs for NTPC for each of the two test years. Second, it is to show which adjustments made or not made to various standard methodologies by Ms. McShane result in her return on equity and equity ratio recommendations being different than ours. We show that these adjustments or non-adjustments consistently inflate the recommended values for the return on equity and the equity ratios of Ms. McShane compared to our recommendations. Third, it is to compare the recommendations for the return on equity for NTPC against that which would be obtained by using the adjustment formulas presently in use by a number of Canadian regulators.

Q. How is this section of your evidence organized?

A. We begin by comparing the test year forecasts of the 30-year Canada yield advanced by Ms. McShane for NTPC and ourselves. We show that despite several technical issues that we raise with her forecasts, our forecasts differ from her forecast by 15 basis points or less.

We then proceed to the first major area of disagreement; namely, the equity ratio for NTPC for the two test years. We examine the methodologies employed in determining common equity ratios (ranges) by Ms. McShane and show that they are flawed. As a result, her recommendations are overly generous when viewed in the context of the business risks of NTPC and benchmarked against recent awards by the Alberta Energy and Utilities Board.

We then proceed to the third major area of disagreement; namely, the rate of return on equity for the two test years. We show that the implementation of various standard methodologies for estimating the rate of return on equity by Ms. McShane for NTPC consistently lead to inflated rate of return on equity estimates. After we demonstrate the impact of introducing or not dealing with known biases in the evidence of Ms. McShane, we conclude that with the correction for all of these biases, the fair rate of return estimates made by Ms. McShane are quite close to our own recommended rates. We end this sub-section with a comparison of the recommendations for the return on equity for the two test years by Ms. McShane for NTPC and ourselves against the estimates that would be obtained if they were calculated using the various adjustment formulas presently in use by some Canadian regulators. Our recommendation reflects the current trend towards a lower MERP.

The comparison indicates that our own recommendations represent a reasonable choice should the Board wish to embrace our argument and adjust to the new market regime. However, if the Board wishes to move more cautiously, it could choose to set the allowed equity return for an average-risk utility in the range between our recommendation and the average of the regulatory formulas. Either way, our examination of the regulatory formulas and other evidence suggests that the Board should attach little weight to the rate of return recommendations of Ms. McShane for NTPC.

ECONOMIC AND CAPITAL MARKET TRENDS

Long Canada Rate Forecast

Q. Do you have any comments on the forecasts for 30-year Canada's advanced by Ms. McShane?

A. Yes, we do. Ms. McShane uses a methodology similar to ours although there are some differences in the details of implementation. She first obtains a forecast for 10-year Canada's from *Consensus Economics* and then adds an estimate of the average spread of 30-year Canada's over 10- year Canada's. Her forecasts, 4.3% for the 2006/07 test year and 4.5% for the 2007/08 test year lie within 15 basis points of ours. Nonetheless, it is important to identify and correct differences in implementation as these may lead to significant forecast errors in the future.

There are three areas in which Ms. McShane's implementation techniques differ from our own – the forecast used for 10 year Canada's, the spread calculation and our use of banks' 30-year forecasts as a check. Beginning with the 10-year forecast, we draw ours from an average of three banks' forecasts all for the end of September 2007 and 2008. Targeting September-end is consistent with past practice of the AEUB and other Canadian regulatory boards in which the average of a test year is determined as the forecast for the end of the second quarter.

Ms. McShane follows the same approach using only the *Consensus Economics* forecast. However, her reading of the October issue of *Consensus Economics* differs from ours: she finds a 12-month forecast of 4.2% where we read the forecast as 4.5%.

The second step involves adding a spread to the 10-year Canada forecast to obtain a forecast for 30-year Canada's. We measure this spread as the average over the most recent four quarters for which data are available and obtain a rounded estimate of 10 basis points. In contrast, Ms. McShane appears to be using the spread over the most recent month for her estimate of zero referring to "the prevailing flat yield curve" for test year 2006/07. For test year 2007/08 she draws on her historical estimate of the spread for an unspecified period as 30 basis points. While her resulting estimates are close to ours, projecting today's spread or using imprecise historical estimates could lead to an unrepresentative spread in some market conditions.

CAPITAL STRUCTURE

Q. What analytical framework underlies the capital structure recommendations offered by Ms. McShane?

A. The framework employed by Ms. McShane consists of bond rating guidelines coupled with the argument that the company in question must maintain a rating of A- or better in order to access capital markets. Ms. McShane refers to debt ratings in "the A category" as her "benchmark" on page 6, lines 158-160 of her evidence. She goes on to argue on page 18, lines 472-470:

> "Compared to the typical investor-owned utility, NTPC would require a more conservative capital structure to achieve a similar debt rating in light of its small size, higher business risk and non-taxability status.
>
> In my opinion, a common equity ratio in the range of 45-50% would be adequate to allow NTPC to achieve a BBB rating on a stand-alone basis, NTPC's actual equity ratios are forecast to be in that range. With the benchmark utility defined as an A-rated utility, NTPC's risk would remain

higher that that of the benchmark. Thus, an incremental equity risk premium is required."

Q. What are your views of this analytical framework?

A. We agree with Ms. McShane that the risk of NTPC is somewhat higher than that of the average investor-owned utility in Canada and that, therefore, "NTPC would require a more conservative capital structure". However, we regard her recommendation of 45-50% equity as excessive. Rather, we hold that an equity ratio of 42% is sufficient to compensate for this risk as we explain in detail in Section III of this evidence.

Further, we have two reasons why we disagree that any incremental equity risk premium is required. First, such an equity risk premium would have the effect of rewarding NTPC twice for the same incremental risk that is already reflected in our recommended capital structure which we benchmarked against high-risk utilities in Alberta. Second, Ms. McShane is mistaken when she argues that a rating of A- or higher is necessary for a Canadian utility. In Section III of this evidence, we show that BBB ratings are sufficient for the profitable functioning of a number of utilities in Canada.

FAIR RATE OF RETURN ESTIMATES BASED ON THE EQUITY RISK PREMIUM METHODOLOGY

Introduction

Q. Please describe how your equity risk premium (ERP) estimate for NTPC differs from that submitted by Ms. McShane?

A. We obtain ERP estimates above long Canada's that are substantially lower than those entered into evidence by Ms. McShane for NTPC. Ms. McShane arrives at overly generous estimates of both the betas for an average-risk utility, and of the magnitude or size of the ERP required to adequately compensate equity investors for bearing this level of risk. Basically, we find that Ms. McShane:

- adjusts her beta estimates when she should not;
- does not adjust her market equity risk premium (MERP) estimates for the significant reduction in trade costs, the benefits of easier and less costly diversification both across investment classes and internationally, and the near consensus view that not only is the realized MERP an overestimate of the MERP that investors expected historically, but also that the forward-looking MERP is expected to be significantly lower than that realized in the past; and
- chooses an inappropriate time period to measure historical MERPs that, for example, do not adequately capture the decline in the MERP over time.
- Recommends a rate of return on equity for NTPC of 10.5% for the test year 2007/08 that is only 25 basis points below her estimate of the required return on the market of 11.0% for the same test year.[76]

Q. What methods for estimating the rate of return does Ms. McShane use in her evidence for NTPC?

A. Ms. McShane uses three methods: Equity Risk Premium Method, Discounted Cash Flow Method and Comparable Earnings Method.[77]

Beta Estimates

[76] Ms. McShane, response to Information Request HC.NTPC-31, NTPC GRA 2006/07 and 2007/08, February 16, 2007.
[77] Ms. McShane, lines 36-42, of evidence.

Q. Please discuss the beta estimates used by Ms. McShane to determine the ERP for NTPC.

Q. Ms. McShane argues that utility betas are not very reliable because they became “decoupled” from the overall equity market.[78] Please comment on this position.

A. Decoupling (or its counterpart recoupling) are just words with negative connotations, which are used merely to describe the strength of the correlation between the returns of utilities and the market. When the returns on utilities become less correlated with the returns on the market (i.e., the correlations move towards zero), Ms. McShane describes this as being a decoupling. However, a lowering of the correlation between the returns of utilities and the market would be expected if regulators are focusing on rate stability while all else is held constant. In the extreme case where the returns on utilities did not vary, the correlations and, hence, the betas of the utilities would be equal to zero.

<u>Beta Estimation Problems</u>

1. *Use of adjusted betas:*

Q. Please discuss the validity of the use of adjusted beta estimates by Ms. McShane to calculate the own ERP for an average-risk utility and NTPC.[79]

A. Ms. McShane uses the Value Line method to adjust her betas upwards. Value Line’s beta adjustment procedure is quite simple in that it is a weighted average of the firm’s raw or unadjusted beta and the market beta of 1, where the weight placed on each is two-thirds and one-third, respectively. Since (Canadian) regulated utilities almost always have raw betas less than one, a Value Line type

---

[78] Ms. McShane, line 949, page 34 through line 991, page 36, of evidence.
[79] Ms. McShane, line 1029, page 38 through line 1051, page 39, of evidence.

of adjustment almost always results in an adjusted beta that is higher than its corresponding raw or unadjusted beta.

Adjusted betas were discussed in Section IV of our evidence, where they were shown to be inappropriate for Canadian utilities. One justification proposed for the use of this method is the argument that utility betas tend to revert to the mean market beta of one. In section IV of our evidence, we provide five substantive reasons why this is not the case for a sample of utilities, including evidence that using an adjusted beta to forecast future betas results in a substantial over-estimate of actual realized betas. Value Line type of betas are based on a dated empirical study that found that the average U.S. equity beta for a sample of all the stocks in the U.S. market regresses towards the market's or sample's beta of 1. This has to be true by construction since the market beta itself is by definition equal to one and is by definition equal to the weighted average of the betas of all the stocks in that market. In contrast, utility-specific studies find that a forecast of a U.S. equity utility beta is improved by either reflecting the tendency of utility-specific betas to regress to the sample average for utilities or incorporating estimation error into the derivation of the estimate. Mean reversion implies that the mean will be reached at some point in time, and fairly quickly given an assumed reversion rate of one-third. In fact in section IV, we showed that the rolling five-year average beta had become negative and was now positive but not even 0.5 (never mind one) for our sample of utilities. This is hardly the behavior that would occur if the average sample beta had a tendency to regress towards the market beta of one.

Since Ms. McShane basically uses the sample average utility beta as her estimate of the beta for an average-risk utility, no adjustment is needed to offset the tendency of the beta of a specific utility to regress to that same sample average utility beta. Ms. McShane should not have adjusted the raw sample betas. Furthermore, as we have shown in Section IV of our evidence, Ms.

McShane's beta mid-point estimate of 0.675 (range of 0.65-0.70)[80] is higher than the highest five-year mean beta of 0.583 for our sample of utilities (i.e., for the 1990-1994 period), and is substantially higher than the five-year mean beta of 0.118 for our sample of utilities for the 2002-2006 period. Thus, while the beta values proposed by Ms. McShane are beyond the upper end of the range of possible beta values based on historical values, we have chosen to use a beta value as our point estimate that is above the longer-term mean of that range, and substantially above the shorter-term mean of that range.

Q. What impact did the use of this inflated beta estimate have on Ms. McShane's calculated "CAPM" Risk Premium estimate?

A. Ms. McShane's benchmark utility risk premium estimate is obtained by multiplying her adjusted beta estimate of 0.65-0.70 times her MERP estimate of 6.5% to obtain her estimate of the own ERP of the benchmark utility of 4.25-4.5%.[81] Using the corresponding upper end of the range of the corresponding unadjusted or raw beta estimate for the benchmark utility of 0.48 yields a revised estimate of the own ERP of the benchmark of 3.1%, or a reduction of over 26% from her estimate of 4.25% using her estimation method. This is assuming, for the moment, that Ms. McShane's estimate of the MERP is not similarly too high. We will return to this point later.

Q. Ms. McShane provides reference to service vendors that provide such adjusted betas as support for the use of adjusted betas. Do you agree with her justification?

A. No. Vendors provide many products that are devoid of both theoretical and empirical justification. The studies by Drs. Kryzanowski and Jalilvand, Gombola

[80] Ms. McShane, line 1051, page 39, of evidence.
[81] Ms. McShane, lines 1061-1064, page 39, of evidence.

and Kahl, and others cited in section IV, provide support for the regression tendency for betas of utilities to regress toward their grand utility mean and not toward the grand or market average of 1.0. However, since Ms. McShane already effectively uses the grand utility mean for her benchmark utility, properly accounting for the tendency to regress to itself would not change the raw or unadjusted beta estimate for the benchmark utility.

Dr. Damodaran, the author of many textbooks, states that "it can be argued that the beta looking forward will be different from the historical beta" even if the latter is well estimated if the firm has changed in terms of business and financial risk. He states that "[o]ne simplistic way of adjusting historical betas is to assume that betas will move towards one in the long term and adjust beta estimates towards one", and then provides what he considers to be more accurate ways of estimating forward looking betas than using historically estimated betas.[82] Once again, it is important to emphasize that this is only for the case where the business and financial risks of the firm have materially changed. It also is important to emphasize that, by extension, Dr. Damodaran would suggest a reduction in the historically estimated beta if the firm has undergone a material lowering of its business and financial risks and all else remains constant. Thus, using a Value Line adjusted beta in this case would move the historically estimated beta in the wrong direction.

Q. Most (if not all) of the classic tests of the CAPM did not use Value Line type of adjusted betas. Could one not argue that these studies used raw betas because adjusted betas were not available over most of the time periods covered in these studies?

[82] A. Damodaran, Discussion issues and derivations, under his section 4. Available at: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/AppldCF/derivn/ch4deriv.html#ch4.3, and accessed on December 11, 2002.

A. No, this is a fallacious argument. If Value Line types of adjusted betas are superior to raw betas, then these studies would have been replicated using such betas, since such betas are easy to calculate. Furthermore, many studies on the CAPM have appeared since Value Line adjusted betas appeared, and most (if not all) of the published studies use raw betas. This includes numerous studies by Fama and French, amongst others, about whether or not the traditional CAPM is empirically supported.[83]

2. Validity of the CAPM:

Q. Ms. McShane questions the validity of the CAPM. Please comment on the validity of her arguments against the CAPM.

A. First, the empirical tests of the CAPM conducted by Ms. McShane are flawed in that they do not examine the cross-sectional nature of the conditional return-risk relationship postulated by the CAPM. Second, while most recent studies do not support the unconditional version of the traditional CAPM, the empirical evidence for multifactor or conditional CAPMs is much stronger. Quoting Ms. Mc Shane response to an information request from HC:[84]

> "Conditional models of the CAPM essentially hypothesize that betas and risk premiums are time varying. The empirical work that has been done using conditional models suggests that a conditional model may explain more of the cross-sectional of market returns".

However, the intuition behind the conditional model is used by many experts in determining the equity rate of return since they provide an updated estimate of

[83] Eugene F. Fama and Kenneth R. French, 1996, The CAPM is wanted, dead or alive, *Journal of Finance* 51:5 (December), pp. 1947-1958; Eugene F. Fama and Kenneth R. French, 1995, Size and book-to-market factors in earnings and returns, *Journal of Finance* 50:1, pp. 131-155; Eugene F. Fama and Kenneth R. French, 1996, Multifactor explanation of asset pricing anomalies, *Journal of Finance* 51:1 (March), pp. 55-84; and James L. Davis, Eugene F. Fama and Kenneth R. French, 2000, Characteristics, covariances, and average returns: 1929 To 1997, *Journal of Finance* 55:1 (February), pp. 389-406.
[84] Ms. McShane, response to Information Request HC.NTPC-37.

the utility-specific measure of risk, MERP and prospective long Canada yield in their successive testimonies.

The earlier studies that found biases in the CAPM have typically used U.S. 90-day Treasury bills as a proxy for the risk-free rate. These studies do find that the estimated intercept of the Security Market Line or SML is above the risk-free rate, and that the estimated slope of the SML is smaller than the difference between the mean return on the market proxy and the mean return on T-bills (i.e., the MERP measured relative to the T-bill rate). More recent studies find strong support for the zero-beta version of the CAPM where the estimated intercept is the return on the zero-beta portfolio and for conditional forms of the CAPM. The expectation of the CAPM is that the return on the zero-beta portfolio should exceed the return on T-bills.[85] The use of the higher long Canada rate as the proxy for the risk-free rate is consistent with these empirical findings.

Using the higher long Canada rate when constructing the SML already increases the intercept of the SML and flattens the slope of the SML. Thus, making a further adjustment to beta to account for a flatter-than-expected SML results in an over or double adjustment for the same empirical phenomenon. Thus, this represents another unsupported rationale that Ms. McShane uses to adjust her beta estimate for a sample of utilities upwards.

Q. Is there any adjustment that should be made to account for the empirical evidence for the traditional CAPM?

A. Yes, there is. The slope of the estimated security market line or SML of the traditional CAPM (i.e., MERP) needs to be reduced to account for its “flatter-than-expected” value. In other words, it is the slope of the SML and not the betas of the individual assets or portfolios that need to be adjusted.

---

[85] Robert F. Stambaugh, 1982, On the exclusion of assets from tests of the two-parameter model: A sensitivity analysis, *Journal of Financial Economics*, November, pp. 237-268.

Q. How do you arrive at this recommended adjustment?

A. We arrive at this recommended adjustment by using first principles, and by adding what we learn from an examination of the more recent evidence on the relationship between the MERP that was realized over past periods and what the MERP expectations of investors were estimated to be. We now detail our argument on this point.

First, one of the major assumptions made when testing the CAPM using realized returns is that realized returns are an unbiased estimate of expected returns. In other words, what happened was what investors expected, at least on average. Based on the assumption that realized returns are unbiased estimates of expected returns, the early empirical evidence is interpreted as showing that the estimated CAPM relationship has an estimated intercept that is higher than expected and has an estimated slope that is lower (or flatter) than expected. These tests generally consist of regressions of the realized returns or realized excess returns on portfolios formed to maximize the spread across portfolios in their betas. The interpretation that the estimated intercept is higher than expected is based on a comparison of the estimate against the average T-Bill *yield* over the period. The interpretation that the estimated slope is lower (flatter) than expected is based on a comparison of the estimate against the average realized MERP over the period.

Second, the more recent evidence indicates that realized returns are not unbiased estimates of expected returns, even over very long periods of time. In other words, what happened is not what investors expected, even over very long periods of time. As we discussed in Section IV and Appendix 4.B of our evidence, the more recent literature concludes that the realized MERP that investors earned exceeded the MERP that investors expected to earn. This is based on the finding that equity investors earned more than what they expected, and bond investors earned less than what they expected.

Third, it then follows that combining the literature referenced in our first and second points leads to the following conclusions:

- The finding that the estimated slope of the CAPM is flatter than expected is what one would expect given that the realized MERP exceeded the expected MERP over the period. This is prior to making any adjustment for the fact that these tests generally use T-bills and not long Governments as a proxy for the risk-free rate.
- The finding that the estimated intercept of the CAPM is higher than expected is also expected given that using lower MERPs for all the portfolios would shift the SML downwards if we assume that the true expected risk-free rate remains constant, and would result in a lower estimated intercept for the SML. Again, this is prior to making any adjustment for the fact that these tests generally use T-bills and not long Governments as a proxy for the risk-free rate.

Q. What are the implications for the determination of the ROE using the MERP method?

A. The implications are two-fold. First, the expected yield on the long Canada should be used since we have no evidence that it is not an unbiased expectation of the future one-period return for the true risk-free rate. Second, the realized mean MERP needs to be revised or adjusted downwards since the upward bias in mean realized equity returns exceeds the downward bias in mean realized bond returns when each is used as a proxy of investor expectations.

Q Are there any regulatory commissions, boards or régies that have reached a similar conclusion regarding the selective use of the empirical evidence for the CAPM to adjust the beta of the utility upwards?

A. Yes, various regulatory entities have addressed the validity of using the model used to implement the upward beta adjustment that is commonly referred to as the Empirical CAPM or ECAPM. Specifically, the Public Utilities Commission of the State of California in “D.99-06-057 rejected the ECAPM financial model because it artificially raises the ROE requirement”.[86] Similarly, in its decision for Hydro Quebec Distribution, the Regie de l’Energie found insufficient support for the use of the ECAPM. It also reaffirmed its earlier decision against the use of adjusted betas, and indicated that it did not support estimates obtained using the comparable earnings method or the DCF for individual firms.[87]

3. No downward beta adjustment with the use of U.S. MERP:

Q. You stated earlier that Ms. McShane not only adjusted betas when she should not have but also did not adjust betas when she should have. Would you please provide an example of the latter?

A. Ms. McShane uses the MERP estimates obtained from the Ibbotson Historical return data for the U.S., along with other estimates, to obtain an estimate of the MERP. She then applied her beta estimate of 0.65-0.70 to her MERP estimate to obtain an own ERP estimate for an average-risk Canadian utility. Thus, she effectively used the same beta estimate for both her Canadian MERP estimates

[86] As noted on pages 24 and 33 in the Proposed decision of A.L.J. Galvin (mailed 10/8/2002), Interim opinion on rates of return on equity for test year 2003 before the Public Utilities Commission of the State of California, Application of Pacific Gas and Electric Company for authority to establish its authorized rates of return on common equity for electric utility operations and gas distribution for test year 2003. (U39M), application 02-05-022, filed May 8, 2002. Available at: http://www.cpuc.ca.gov/published/comment_decision/19761.htm.

[87] Régie de L’énergie du Québec, D é c i s i o n, Demande relative à la détermination du coût du service du Distributeur et à la modification des tarifs d’électricité, phase I, D-2003-93, R-3492-2002, 21 mai 2003, pp. 71-73.

and her U.S. MERP estimates. Thus, Ms. McShane's use of an implicit scheme for weighting MERP from the U.S. and Canadian markets ignores the fact that the beta of a utility is different for each market proxy, and differs in a domestic-only context from that in an international context. As noted by Dr. René Stulz, a former editor of the *Journal of Finance*, "globalization reduces the beta of all companies whose profits and values are more strongly correlated with their local economies than with the global economy".[88] One would expect this to be the case for the portion of NTPC whose ROE is regulated by the Board

<u>MERP Estimation Problems</u>

1. Sole reliance on arithmetic mean returns and MERPs:

Q. Would you please comment on the validity of Ms. McShane's sole reliance on arithmetic means when deriving future estimates from historical MERPs?

A. Although Ms. McShane reports both types of averages,[89] she does not appear to use the geometric mean in any of her estimations of the MERP. Thus, given mixed evidence on which type of average is best in a forward-looking sense, she adopts the polar position that results in the highest going-forward MERP. We also use the arithmetic mean MERP in obtaining our going-forward MERP estimate. However, we also use a conservative approach in which we use a weighted-average of the arithmetic and geometric means as a further benchmark in determining how conservatively high our estimate is. We do this because there are advocates for three possible approaches; namely, the use of the arithmetic mean only, the use of the geometric mean only, and the use of a weighted average of both types of means. As we noted in section IV, fairness dictates that

[88] René M. Stulz, 1999. Globalization, corporate finance, and the cost of capital, *Journal of Applied Corporate Finance* 12:3 (Fall), p. 12.
[89] Ms. McShane, Schedule 7, of evidence.

a weighted average be used when there is no consensus on which polar position is best.

Q. Would you please discuss the references that are often cited in terms of the use of the arithmetic mean only?

A. The typical citations include the Brealey and Myers' basic finance textbook, *Principles of Corporate Finance*, and the Ibbotson Associates publications. As Dr. Ritter notes in the first paragraph of his article published in a scientific journal:[90]

> "When I started teaching at the University of Pennsylvania's Wharton School over twenty years ago, I used the very first edition of the Brealey and Myers textbook. The book had some mistakes in it, as almost all books do. For example, the first two editions had an incorrect formula for the valuation of warrants."

Dr. Ritter then goes on to focus on some of the conceptual mistakes that need to be corrected in what some academics teach in introductory finance courses, including the use of arithmetic rather than geometric returns. He concludes that the correct average return will be closer to the geometric (compounded) average than the arithmetic (simple) average if there is mean reversion in stock returns and/or mean aversion in bond returns.[91] Furthermore, since the difference between the arithmetic and geometric averages usually is higher for stocks than bonds, this inflates estimates of risk premia based on historical data.

In section IV and Appendix 4.A of our evidence, we provide numerous reasons why the historical MERP should not be measured using only the arithmetic mean return. We provide a multitude of evidence that concludes that a weighted

[90] Jay R. Ritter, 2002, The biggest mistakes we teach, *The Journal of Financial Research* 25:2 (Summer), p. 159.
[91] Jay R. Ritter, 2002, The biggest mistakes we teach, *The Journal of Financial Research* 25:2 (Summer), p. 160.

average of the arithmetic and geometric means should be used. Our evidence includes the more advanced textbook by Drs. Campbell and Viceira, *Strategic asset allocation: Portfolio choice in long-term investors* (2002), articles published in major finance peer-reviewed journals, such as the *Journal of Finance*, *Journal of Financial Research*, and the *Journal of the American Statistical Association*, by Drs. Fama, French, Ritter, Blume, Indro, Lee, amongst others; and support or non-objection by the participants at the *AIMR Risk Forum* by Drs. Campbell, Siegel, Ibbotson, amongst others. Nevertheless, **we opt for a very conservative position where we estimate the historical MERP using the arithmetic annual mean MERP and use a weighted-average of the arithmetic and geometric annual mean MERP as a benchmark for our estimate to provide one gauge of how conservatively high our estimate is**.

2. Choice of return series for determining the MERP

Q. Please discuss the return series used by Ms. McShane to determine the market or utility-specific ERP.

A. Ms. McShane uses the historic average MERP for Canada, the U.S. and the U.K. over the period 1947-2005. This results in an inappropriate estimate of the MERP going forward. First, the chosen time period results in an inflated estimate of the going-forward likelihood of achieving the high realized returns on equities and low realized returns on bonds that followed World War II. This period begins with rapid economic growth due to pent up demand from the war period and administered low interest rates. Second, minimal or no weight is placed on the declining trend of MERPs for the three markets over this time period. Third, no adjustments are made for differences in risks across the market proxies used to calculate the MERP in the different countries. Fourth, no adjustments are made for the effect of equity re-valuations over this period of time. Mr. Arnott and Mr. Bernstein (2002) find that a good part of the realized MERP over this period was caused by rising valuation multiples. Specifically, Mr. Arnott and Mr. Bernstein (2002) report that the price-to-dividend multiple increased from 18 to 70 times from 1926 to 2001, with most of the increase in the last 17 years of this period.[92] Thus, an adjustment should be made unless one believes that price-to-dividend multiples will exhibit a similar three-fold increase over the next 59 years.

While Ms. McShane is correct that the various smoothed annual market returns in the 3 pages of her Schedule 8 have not changed much over time, such is not the case for Long Government Bond Returns and, more importantly, the MERP. Using her 25-year rolling average market returns from page 1 of her Schedule 5, the Canada and U.S. risk premia are 9.8% and 11.7% for 1947-1971, 4.2% and 3.8% for 1962-1986 and -1.8% and 1.8% for 1981-2005, respectively. Using her increasing average market returns from page 2 of her Schedule 8, the Canada and U.S. risk premia are 9.9% and 11.7% for 1947-1971, 8.0% and 8.4% for 1947-1986, and 5.3% and 6.8% for 1947-2005, respectively. Using her increasing market returns from page 3 of her Schedule 5, the Canada and the U.S. risk premia are 5.2% and 6.9% for 1947-2005, 2.1% and 3.8% for 1962-2005, and -1.8% and 1.8% for 1981-2005, respectively. In other words, all of the series she presents indicate a steady decrease in the MERPs in both Canada and the U.S.

3. Validity of using a weighting formula of the risk premia from various country markets

Q. Would you please comment on the validity of using a scheme that weights various Canadian and U.S. MERP in order to estimate the required MERP for calculating the required own ERP for an average-risk utility or NTPC.

A. There are at least two serious problems with this approach.

[92] Robert D. Anrott and Peter L. Bernstein, 2002, What risk premium is "normal"?, *Financial Analysts Journal* 58:2 (March/April), pp. 64-85.

First, this approach ignores the benefits from international diversification. While the expected return of adding markets is linear, the risk is not linear in the risks of the individual markets unless all of the markets are perfectly correlated. In turn, the required MERP for bearing domestic risk is reduced in an international context.

Second, this approach makes no adjustment for the differences in the non-diversifiable or even in the total risks of the various market proxies used in this process. In Section IV of our evidence, we demonstrated that making an adjustment for differences in total risk makes a material difference in the MERP estimates when we use the DMS-Ibbotson data set for the 107-year period 1900-2006. Similarly, the reduction in total risk from international diversification is substantially higher for the Canadian market proxy than for the U.S. market proxy given the much smaller size of the Canadian market.

4. Optimism bias in forecasts of analysts:

Q. Ms. McShane uses the forecasts of analysts in her DCF analyses for individual utilities.[93] Would you comment on the accuracy of such forecasts?

A. Numerous studies have shown that analyst's forecasts are optimistic. One could argue that the DCF cost of equity will be an unbiased estimate of investors' expected returns if investors believe the forecasts, and price the securities accordingly. However, this would attribute considerably irrationality to investors in that they believe forecasts that they know have an optimistic bias. Such irrationality would invalidate a basic assumption of using the DCF method to estimate the cost of equity; namely, that prices are fair. Fair prices are needed to obtain estimates of fair rates of return for utilities using the DCF method.

[93] Ms. McShane, Schedules 16-19, of evidence.

In support of the relevance of the forecasts, one could refer to a number of dated studies that find that the forecasts of analysts are better than the use of time-series methods to forecast future growth rates. However, this is no longer the case. First, the information disclosure playing field has been leveled in both the U.S. and Canada as companies are now restricted from disclosing information first to financial analysts and then to the general public. Second, as has been discussed at length in the press, analysts have become increasingly optimistic in their forecasts to facilitate the underwriting side of their business. Third, forecasting accuracy has not been a criterion in retaining analysts, at least in more recent years where the emphasis has been on the revenue they generate for their employers. Fourth, as is discussed next, the optimism bias in analyst forecasts has been significant.

It is well documented in the published literature that the bottom-up market forecasts of financial analysts and top-down market forecasts of market strategists contain a large optimism bias. We discuss three representative studies next. Chopra (1998)[94] finds that the average consensus earnings per share growth forecasts made by analysts for the S&P500 index over the 1985-1997 time period is almost twice the actual growth rate. Chung and Kryzanowski (2000)[95] find a significant optimism bias in bottom-up and top-down forecasts of earnings per share by analysts for the S&P500 index for the current fiscal year (FY1) and subsequent fiscal year (FY2).[96] They find that the optimism bias is significantly higher in the bottom-up forecasts compared to the top-down forecasts on average. They examine the 218 months of such annual forecasts over the period from January 1982 through February 2000. The bottom-up forecasts of financial analysts exhibit a statistically significant mean optimism

[94] V. K. Chopra, Why so much error in analysts earning forecasts? *Financial Analysts Journal*, 54:6 (1998), pp. 35-42.
[95] R. Chung and L. Kryzanowski, Market timing using strategists' and analysts' forecasts of S&P500 earnings, *Financial Services Review*, 8:3 (2000).
[96] Similarly, Chung and Kryzanowski (1999) find that the quarterly EPS forecasts for the S&P400 and S&P500 are, on average, optimistically biased for the top-down forecasts of market strategists that are reported to I/B/E/S. R. Chung and L. Kryzanowski, Accuracy of consensus expectations for top-down earnings per share forecasts for two S&P indexes, *Applied Financial Economics* 9 (1999), pp. 233-238.

bias of 17.5% and 30.5% for the next and subsequent fiscal years (FY1 and FY2), respectively. They also find that these average biases grew substantially when the period from November 1995 through February 2000 was added to the January 1982 through October 1995 period.

In a paper published in the *Journal of Finance*, Drs. Chan, Karceski and Lakonishok conclude that:[97]

> "There is no persistence in long-term earnings growth beyond chance, and there is low predictability even with a variety of predictor variables. Specifically, IBES growth variables are overly optimistic and add little predictive power."

They also observe that (p. 672):

> "Notably, analysts' estimates are quite optimistic over the period 1982 to 1998, the median of the distribution of IBES growth forecasts is about 14.5 percent, a far cry from the median realized five-year growth rate of about 9 percent for income before extraordinary items.

They find that the level of over-optimism in the IBES forecasts varies somewhat but is substantial across all their five quintiles of firms. Based on the results presented in their table IX (p. 673), the over-optimism bias is still high at about 4.0% for quintile 1, which consists of the firms in their lowest growth grouping of firms. The actual and forecasted growth rates for income before extraordinary items are 2.0% and 6.0% for their quintile 1 group, where utilities are 25% of the membership in this quintile. This is a 200% overestimate when measured against the actual annual rate of growth of 2.0% for this quintile of firms.

In addition, analysts have been criticized for the aggressive "hyping" of stocks. The research director of the world's largest securities firm told its analysts to be more critical.[98]

---

[97] Louis K.C. Chan, Jason Karceski and Josef Lakonishok, 2003, The level and persistence of growth rates, *Journal of Finance* 58:2 (April), p. 643.
[98] Dave Ebner, Merrill Lynch tells analysts to be more critical, *Globe and Mail*, March 7, 2002, p. B18.

Furthermore, even if the recommendations of analysts influence market prices, this does not mean that investors do not make decisions after removing some or a great part of the bias inherent in such forecasts. Furthermore, the following question comes to mind: Why use earnings growth forecasts of investment analysts to generate extremely noisy and upwardly biased estimates of future return expectations when you can directly obtain the future return expectations of investment professionals from both the buy and sell sides of the market, as we have done in our evidence for the market proxy?

Q. Does Ms. McShane adjust for optimism in the forecasts of analysts?

A. No, there is no indication that she has made such an adjustment.

Q. What is your opinion on the use of forecasts by analysts to estimate the cost of capital?

A. We are reluctant to use these forecasts because they tend to be optimistic, sometimes excessively optimistic, and the amount of the bias varies in an unknown fashion over time. Some illustrations are:[99]

- Charles Hill, director of research at Thomson Financial/First Call noted that only 1.8% of all current stock recommendations are "sells", even in a bear market. He went on to complain that the compensation packages of many analysts are tied too closely to the performance of the lucrative investment banking operations of the major brokers.
- Mr. Clément Gignac, chief economist and strategist at National Bank Financial cautioned that the bottom-up consensus expecting S&P 500 earnings growth of 14 per cent in 2003 could turn out to be unrealistic again, and "would be more encouraging had not last year's similar

[99] Barrie McKenna, Enron analyst bristles at hoax, *The Globe and Mail*, February 28, 2002, pp. B1 and B2; and Marilyn Geewax, We were duped: analysts, *The Gazette*, February 28, 2002, p. E4.

projections been followed by a 22-per-cent decline in the [Standard & Poor's 500-stock index]".[100]

- Eleven of the 17 leading analysts who followed Enron still rated the stock as a "buy" or "strong buy" as late as November 8, 2001. This was after Enron restated $1 billion in profit as a loss, fired its chief financial officer and was under investigation by the U.S. SEC.
- Lehman Brothers maintained its "strong buy" rating on Enron as its stock price went from $80 a share to less than one dollar.

It is important to note that the performance of the rating agencies is often not better, and was not better in the case of Enron.

Q. What conclusion do you draw from this analysis?

A. We conclude that the estimates obtained using the DCF-based risk premium test conducted by Ms. McShane result in ERP estimates for individual firms that are too unreliable to be used as a proxy for the fair required return on equity capital. If the optimism bias is removed, such ERP estimates provide some very noisy indicative (or secondary) information about the fair required return on equity capital.

5. Use of DCF Estimates of fair return on a sample of utilities:

Q. Ms. McShane generates DCF estimates of a fair return on equity for a sample of U.S. gas and electric distributors.[101] Please provide a brief discussion of why you do not provide similar DCF estimates of a fair return on equity for a sample of utility firms?

[100] Crystal balls, *The Globe and Mail*, December 24, 2002, p. B12.
[101] Ms. McShane, Appendix B, of evidence.

A. Discounted cash flow (DCF) tests have a number of disadvantages that make them unreliable when applied to specific firms in the same industry. First, the DCF test depends critically on estimating the expected growth rate. Error in capturing the growth rate impacts directly on DCF estimates. Because estimates of the growth rate depend on past growth and/or analyst opinion, it is difficult to achieve any measure of precision. Furthermore, if firms are drawn from the same or similar industries, the growth rate errors will tend to be correlated, and the benefits in terms of forecast precision from an increasing sample size will be greatly reduced. Highly correlated forecast errors across individual firms in the same or similar industries arise due to the fact that the same industry analysts will make such forecasts.

Second, circularity also causes a problem in applying the DCF approach to individual firms in regulated industries. Analysts base their analysis of the future growth in earnings and dividends on the rate of return allowed by regulatory bodies, which translates into a market for the shares. If we, in turn, rely solely on the market price and dividend growth rate for our required return on equity, then we are being influenced by the market, which, in turn, is being influenced by the regulator's decision. Thus, by employing the DCF method, we would, in effect, be anticipating what the market is expecting the regulators to do thus introducing circularity. The same problem occurs if we use analyst forecasts.

Third, the DCF model assumes that returns are set competitively, and that no excess returns or "free lunches" are possible. If investors are on average overcompensated for the investment risk they bear for investing in regulated utility stocks, then the DCF model will generate implied returns that are too high. Ms. McShane provides evidence of such excess returns to Canadian utility investors. Specifically, she reports an annual arithmetic mean return of 12.7% for Canadian utilities over the 1956-2005 period.[102] The 12.7% mean return is materially higher than the arithmetic mean return of 11.0 percent for the

[102] Ms. McShane, Schedule 14, of evidence.

Canadian market over the same time period based on data from the CIA.[103] The corresponding geometric mean returns are 11.6% and 9.86%.

To obtain a better understanding of the materiality of these differences, we calculate the value at the end of 2005 of a $1000 investment that was made at the beginning of 1956 in both the utilities used by Ms. McShane and in the S&P/TSX Composite (or its predecessor). Using the geometric means as the historical growth rates, the $1000 portfolios of Canadian utilities and the S&P/TSX Composite have grown to a value of $241,663 and $110,149, respectively, at the end of 2005.

6. Use of Weighted Average ROE from Various Estimation Methods:

Q. Please critique some of the sets of estimation methods that are used by Ms. McShane to arrive at her recommended ROEs for NTPC for the test years 2006/07 and 2007/08.

A. Ms. McShane uses three estimation methods to arrive at her recommended ROEs for NTPC for the test years 2006/07 and 2007/08.[104] She places "some significant weight" on the comparable earnings test, which we argue both in Section IV and subsequently in this section of our evidence is inappropriate for arriving at a recommended ROE. She gives primary weight also to the DCF method, which we argued earlier in this section is appropriate at the market and not individual utility level, especially when the latter uses the earnings forecasts of financial analysts.

Q. What is the general theory on the use of various estimation methods?

[103] Ms. McShane confirms that investors earned a higher risk premium of almost 2% by investing in utilities as opposed to investing in the general market over this period of time. Ms. McShane, Response to Information Request HC.NTPC-33.
[104] Ms. McShane, lines 29-42, page 2, of evidence.

A. The general theory is that one can reduce estimation error by increasing the number or set of estimation methods provided they are not highly correlated and they do not include methods that are known to be relatively inferior with known bias. Adding the estimates from inferior methods (such as the the Comparable Earnings Test or the DCF Test applied to individual firms using the forecasts of analysts) to those from superior estimation methods (such as the Equity Risk Premium Test) will increase estimation error and bias. This notion appears to be well accepted by most Canadian Boards given the weight that they have placed on the estimates generated by experts using various ROE estimation methods.[105]

7. Ex Post Performance of Equity Investment in Utilities:

Q. Have the investors in Canadian gas and electric utilities earned a return that is commensurate with the investment risk borne by such an investment?

A. Yes, and in fact, they have earned a premium return from such investments, or what investment people refer to as a positive alpha or "free lunch".

Q. What is the basis for your conclusion?

A. We used a standard portfolio performance metric, a portfolio's Sharpe ratio, to evaluate the performance of holding the Sector sub-index 55, Utilities, of the S&P/TSX Composite index over the periods, 1987-2005 and 1996-2005 based on data available from CFMRC. This performance measure is commonly used to measure the investment performance of a managed portfolio such as a pension or mutual fund. This performance measure is appropriate for both diversified and undiversified portfolios because it uses total risk as the measure of risk.

---

[105] In testimony before this Board, Ms. McShane has acknowledged that "… a number of regulatory boards in the United States give no weight to the comparable earnings test" (The Public Utilities Board of the Northwest Territories, Board Decision 1-91, page 42).

We find that the utilities sector index outperformed the S&P/TSX Composite by 1.54% annually over the 1988-2005 period, and by 3.80% annually over the ten-year period 1996-2005 based on a comparison of their arithmetic means. Thus, investors that invested in a portfolio that mimicked this sector achieved an excess return or free lunch of almost 4% on an annual basis over the most recent ten-year period of 1996-2005. Over the period of 1988-2005, the utilities sector index had both a higher annualized mean return (12.04% versus 10.50%) and a lower standard deviation of return (12.881% versus 14.42%) than the S&P/TSX Composite Index. Similarly, over the most recent ten-year period, the utilities sector index also had both a higher annualized mean return (15.64% versus 11.84%) and a lower standard deviation of return (14.29% versus 16.49%) than the S&P/TSX Composite Index. When we adjust for risk by calculating the Sharpe ratios, we find that the risk-adjusted performance of the utilities sector index over the S&P/TSX Composite index has widened more recently. The respective Sharpe ratios are 0.49 and 0.33 for the longer time period and 0.84 and 0.50 for the more recent time period. Thus, investors earned an ERP per 1% of standard deviation that was almost 70% higher by investing in utilities versus investing in the general market over the most recent ten-year period.

These results suggest that investors in these groups of utilities have achieved results significantly higher than that intended by regulators when the regulators determined the allowed returns on equity, and additionally that the allowed returns exceeded what investors required to bear the investment risk of this group of utilities.

In other words, providing generous rates of return allowances to enhance the financial integrity and flexibility of these utilities without requiring these utilities to establish a reserve to account for these insurance premiums, may just over-compensate investors given the high dividend payout practices of many Canadian utilities.

Q. Does any evidence exist that investors in U.S. utilities had a similar superior investment performance where they experienced excess returns from utility investment?

A. Yes, there is similar but not as rigorously conducted evidence for the U.S. market. In a study that has received much media coverage, Mr. Richard Bernstein and Ms. Lisa Kirschner, two prominent strategists at Merrill Lynch in New York, find that the S&P Utility Index outperformed the NASDAQ Index since NASDAQ's inception in 1971.[106] The Utilities outperformed NASDAQ over the 30-year period while incurring less risk. From NASDAQ's inception through the end of September 2001, NASDAQ returned a compound annualized rate of return of 11.2% per year, whereas the S&P Utility Index returned a compound annualized rate of return of 12.0% per year. The authors of this report measure risk using both the standard deviation of rolling 12-month returns (about 26% for NASDAQ versus about 16% for the S&P Utility Index), and alternatively as the percent of the returns that were negative over a 12-month time horizon (over 23% for NASDAQ versus over 15% for the S&P Utility Index).[107]

Q. Does this evidence negate any statements made by buy-side professionals?

A. Yes, it does. For example, Ms. McShane quotes a portion of a report by CIBC World Markets entitled "Pipelines and Utilities: Time to Lighten Up", published in December 2001. Specifically:[108]

> "The magnitude of the reduction in the case of Newfoundland Power illustrates the flaw in using a brief snapshot of existing rates rather than a

[106] Richard Bernstein and Lisa Kirschner, 2001, Believe it or not: Utilities have outperformed NASDAQ since '71, *Quantitative Strategy Update*, October 25.
[107] This is based on a visual estimation of the values depicted on page 2 of Richard Bernstein and Lisa Kirschner, 2001, Believe it or not: Utilities have outperformed NASDAQ since '71, *Quantitative Strategy Update*, October 25.
[108] Ms. McShane, lines 1503-1516, page 55, of evidence.

forecast of rates that are expected to persist during the upcoming year. More importantly, however, it shows the shortcoming of the formula approach itself. Mechanically tying allowed returns on equity to long bond yields is an approach that is simple for regulators to apply; however, in recent years, with a steady decline in bond yields, it has produced-allowed returns that are out of sync with the cost of capital, and returns that are being achieved with comparable nonregulated companies or regulated returns that are achievable in the U.S."

Our finding of positive abnormal returns for Canadian utilities suggest that this quote is ill informed since the average Canadian utility outperformed the benchmark, which is a difficult task that the average Canadian mutual fund manager can only dream about.

The Relationship Between Accounting and Investor Rates of Return

Q. The Comparable Earnings Test relies on a mapping between accounting rates of return (ROEs) and investor expected rates of returns. In particular, it assumes that higher rates of accounting returns imply higher expected rates of return by investors. Would you please comment on the validity of this assumed relationship?

A. Unfortunately, there is no such mapping since the returns that investors expect depend upon the investment risk they bear, while accounting rates of return depend upon the investment risks that firms bear. This has been aptly stated as follows:

> "A word of caution: We all are accustomed to hearing that well-managed firms will provide high rates of return. We agree this is true if one measures the firm's return on investments in plant and equipment. The CAPM, however, predicts returns on investment in the *securities* of the firm.

Let us say that everyone knows a firm is well run. Its stock price will therefore be bid up and, consequently, returns to shareholders who buy at those high prices will not be excessive. Security prices, in other words, reflect public information about a firm's prospects, but only the risk of the company (as measured by beta in the context of the CAPM) should affect expected returns. In a rational market investors receive high expected returns only if they are willing to bear risk."[109]

Fair Rate of Return Estimates Based on the Comparable Earnings Methodology

Q. Please explain your criticism of the evidence of Ms. McShane based on the use of the Comparable Earnings Method.[110]

A. This test arises from the notion that capital should not be committed to a venture unless it can earn a return commensurate with that available prospectively in alternative ventures of comparable risk. While capital needs to be allocated efficiently so that the risk-adjusted returns are equivalent across firms and uses, the Comparable Earnings Test does not measure if this is the case. The Comparable Earnings Test measures rates of return but does not compare them with the opportunity cost of capital as is commonly done with measures such as Economic Value Added. Thus, we conclude that this Test should not be used as a tool to estimate a fair rate of return on equity for a utility.

Drs. Brigham, Shome and Vinson state that the comparable earnings method "has now been thoroughly discredited (see Robichek [15]), and has been replaced by three market-oriented (as opposed to accounting-oriented) approaches …".[111] Furthermore, there is widespread agreement among utility and intervener witnesses and Boards that the Comparable Earnings Test is not

[109] Zvi Bodie, Alex Kane, Alan J. Marcus, Stylianos Perrakis and Peter J. Ryan, *Investments* (McGraw-Hill Ryerson, 3rd Canadian edition, 2000), p. 249.
[110] Ms. McShane, beginning on line 1289, page 48, of evidence.
[111] E. F. Brigham, D. K. Shome and Steve R. Vinson, 1985, The risk premium approach to measuring a utility's cost of equity, *Financial Management* (Spring), pp. 33-45. See CG-AUI/AE/AG/AP-5(a).

appropriate for determining a fair rate of return.[112] For example, in 1999, the Alberta Energy and Utilities Board stated:[113]

> "In the Board's view, the comparable earnings test is sensitive to accounting practices of the sample firms, the sample selection, the selected business cycle and discontinuities caused by mergers, divestiture or restructuring. Given the historical corporate restructuring and economic uncertainty, which may adversely affect the test results, the Board gives little weight to the comparable earnings test in this proceeding for the purposes of determining an appropriate rate of return."

The Alberta Energy Utilities Board has re-iterated its position on the merits of the Comparable Earnings Method in its more recent decision on the application by AltaLink and TransAlta as follows:[114]

> "Accordingly, for all of the above reasons, the Board continues to consider that the comparable earnings method is not appropriate and, hence, gives no weight to the comparable earnings method in this proceeding for the purposes of determining the appropriate equity rate of return."

Despite this widespread agreement against its use, Ms. McShane places a significant weight on the results of applying the Comparable Earnings Method when determining her recommended fair rate of return on common equity for NTPC.

---

[112] The direct testimony of Dr. M.J. Vilbert for TransAlta Utilities Corporation, May 2000, is an example of a utility witness, and the direct testimony of Drs. L.D. Booth and M.K. Berkowitz for TRANSCO, August 2000, is an example of intervener witnesses.

[113] Alberta Energy Utilities Board Decision U099099, November 25, 1999, p. 326.

[114] Alberta Energy and Utilities Board, August 2003, Decision 2003-061: AltaLink Management Ltd. and TransAlta Utilities Corporation Transmission Tariff for May 1, 2002 – April 30, 2004, TransAlta Utilities Corporation Transmission Tariff for January 1, 2002 – April 30, 2002, p.115.

The widespread agreement against the use of the comparable earnings test is based on a number of problems with its use.

Q. What is the basic problem with the use of the Comparable Earnings Test for fair rate of return determination for utilities?

A. The basic problem is that there is neither a theoretical underpinning nor any empirical support for the comparable earnings approach to estimating a regulated fair rate of return for a utility. As an *ad hoc* approach to estimating a regulated fair rate of return, there are no agreed-upon rules for deciding upon how the Comparable Earnings Test should be implemented.

Q. Would you discuss some of the problems encountered in implementing a Comparable Earnings Test for fair rate of return determination?

A. We will review some of the problems encountered in implementing a Comparable Earnings Test.

First, there is no agreement on how long and what time period should be used in the test. Some analysts use a full business cycle while others use a fixed time period of five or ten years. The results tend to be sensitive to the choice of the time period.

Second, there is no agreement on how structural changes in the economy or a number of economic sectors should be dealt with. Furthermore, structural changes may invalidate the usefulness of past rate of return series for predicting future expected rates of return.

Third, the predictive usefulness of historical time series of rates of return on equity appears to remain untested. Unlike equity returns that are forward looking in that they incorporate expectations, (accounting) rates of return on equity are backward looking.

Fourth, as an accounting-based measure, comparable earnings will only coincide with the investor's opportunity cost (desired rate of return) by accident. There is no conceptual reason to expect that comparable earnings represent a rational expectation of an investor's desired rate of return from investing in the firm.

Fifth, as an accounting-based measure, comparable earnings are subject to variations in the quality of earnings caused by accounting reinstatements, business combinations and divestitures, accounting choice of what is extraordinary, accounting choices of what is expensed and what is capitalized, and managerial choices about accounting practice. The time-varying use of "aggressive accounting" by firms makes earnings numbers not very reliable for determining ERP.

Sixth, Comparable Earnings Tests suffer from survivorship and selection biases since they tend to be retrospective. This tends to inflate the average rates of return found for the comparable sample. For example, none of the firms in the Canadian sample used by Ms. McShane failed to reach the end of the time period that she examined.[115] In reality, even low-risk firms have a material probability of failure over a 12-year period if they are not subject to regulation.

[115] Ms. McShane, Schedule 21, of evidence.

Seventh, the Comparable Earnings Test is very dependent upon the criteria or screens used to select the sample members. Most analysts use accounting-based risk proxies to screen possible candidate firms. These screens are an attempt to identify a sample that is similar in risk to the low risk utilities. These accounting-based risk proxies measure total risk and not the systematic risk which is important to diversified investors. Thus, some firms with a high systematic risk survive the screening process. Some of the screens, such as ones that screen out firms with a high coefficient of variation for book returns, bias performance upwards. The coefficient of variation of book (or accounting) returns measures the uncertainty of returns divided by the mean return. Its inverse is a Sharpe-like measure of performance that provides the mean return per unit of standard deviation. High Sharpe-like ratios indicate better performance. For example, the CAPM (Capital Asset Pricing Model) assumes that the MERP per unit of standard deviation of return (essentially the Sharpe ratio) is positive and constant.[116] Thus, screening out firms with high coefficients of variation tends to screen out firms with low performance based on the Sharpe-like measure. Stated differently, the coefficient of variation of book returns screen retains firms that are most desired from an investor's viewpoint given their high return-to-variability ratios. Such firms include those with market power to earn sustainable economic rents.

Eighth, the screens used by some experts produce comparable samples with an average price-to-book ratio and an average price-to-earnings ratio that exceeds

[116] The literature using the Sharpe ratio to measure portfolio performance using market (not accounting) data is extensive. This literature includes S. Lalancette, L. Kryzanowski and M.C. To, Performance attribution using an APT with pre-specified macrofactors and time-varying risk premia," *Journal of Financial and Quantitative Analysis* 32:2 (June 1997), pp. 205-224; S. Lalancette, L. Kryzanowski and M.C. To, Performance attribution using a multivariate intertemporal asset pricing model with one state variable," *Canadian Journal of Administrative Sciences* 11:1 (March 1994), pp. 75-85; and L. Kryzanowski and A.B. Sim, Hypothesis testing with the Sharpe and Treynor portfolio performance measures given non-synchronous trading," *Economic Letters* 32 (1990), pp. 345-352.

that of a typical utility.[117] We know from basic valuation theory that the price-to-earnings ratio increases with increasing return-on-equity, and that the price-to-book ratio also increases with increasing return-on-equity. Thus, given this positive relationship between return-on-equity and both the price-to-earnings ratio and the price-to-book ratio, it should not be surprising that the average return-on-equity for the comparable sample exceeds that of the sample of utilities. A higher price-to-book ratio is an indication that investors think a firm has opportunities to earn a rate of return on their investment that exceeds the market capitalization rate. While Canadian Boards have appeared to be generous to utilities when viewed in hindsight, there is still an upper cap on how much their rate of return can exceed their true cost of capital. A higher price-to-earnings ratio is an indication that investors think that a firm has considerable and profitable future growth opportunities.

Ninth, while the current cost of new capital is based on current market values and inflation causes deviations between book and market values on the asset side, inflation also decreases the real value of long-term liabilities and part of the interest payment that represents a payment to debt holders for the depreciation of the real value of their holdings (i.e., a return of capital) is tax deductible. Thus, if the comparable earnings test were to be used, one would have to remove the benefit that utilities receive from the decrease in the real value of their liabilities resulting from inflation, and the tax benefit the utilities receive from the “interest” payments which represent a return of capital and not a return on capital. As firms with relatively higher debt ratios, the sum of both of these items is likely to be material.[118] Furthermore, much of the deviation between book and market values of assets for firms, including utilities, is caused by rates of return exceeding the cost of capital. The abnormal returns identified for Canadian utilities support this statement.

[117] Ms. McShane has agreed in testimony before this Board that “… the financial integrity of a company would not be impaired if the market to book [ratio] was 1.0 or greater” (The Public Utilities Board of the Northwest Territories, Board Decision 1-91, page 44).
[118] These items are primarily ignored by Ms. McShane in her evidence.

Tenth, unlike the sample of non-utility comparables, regulated utilities are fully compensated for the actual cost of debt through the regulatory process. NTPC is a good example where the high embedded cost of debt is used to determine rates charged to clients of NTPC.

Eleventh, and finally, as explained in Section III of our evidence, the use of regulatory deferral accounts reduces the business risk of utilities below that of comparable non-utilities.

Q. Would you please illustrate the net effect of these problems using one of the samples used by Ms. McShane in her evidence?

A. We calculated the performance of the sample of 20 low risk Canadian industrials used by Ms. McShane.[119]

We first calculated the average monthly return and standard deviation of monthly returns for her sample of 20 firms and for the S&P/TSX Composite over the 1994-2005 period that she used for calculating accounting ROEs. We find that not only does the annualized mean return for her sample of 12.47% exceeds the corresponding value of 11.09% for the S&P/TSX Composite but also that the annualized standard deviation of returns for her sample of 13.23% is lower than the corresponding value of 15.75% for the S&P/TSX Composite. Thus, Ms. McShane has used a sample that has outperformed the S&P/TSX Composite over her test period both in terms of realized return and risk. When we further adjust for risk using Sharpe ratios (i.e., the realized ERP over the T-bill return divided by the standard deviation of returns), her sample of 20 firms has once again outperformed the S&P/TSX Composite. The Sharpe ratios are 0.639 and

[119]Ms. McShane, Schedule 21, of evidence.

0.449 for the McShane sample of 20 firms and the S&P/TSX Composite Index, respectively.

Q. What recommendation do you draw from this analysis?

A. We recommend that the Board should not apply any weight to the Comparable Earnings evidence submitted by Ms. McShane. The method is not only devoid of scientific merit and theoretical underpinnings but its substantive implementation difficulties make it unsuitable to play a role in the determination of a fair rate of return for a utility.

Comparison of Witnesses' Rate of Return Evidence Against Adjustment Formulas

Q. Did you conduct any further analysis of the equity rate of return evidence submitted by Ms. McShane?

A. Yes, we compared her recommendation for the ERP for NTPC for the two test years against the generic formulas used for groups of utilities by two Canadian regulators: the Alberta Energy and Utilities Board (AEUB) and National Energy Board (NEB).

Q. Please explain the rationale for making these comparisons.

A. In its RH-2-94 Multi-Pipeline Cost of Capital Decision issued in March 1995, the National Energy Board adopted a formula to compute an equity risk premium over the consensus forecast of the long-Canada rate. While this formula was adopted as an administrative convenience, it has been used by the NEB since 1995. The current version is based on a minor revision in March 1997 to eliminate rounding. The AEUB adopted a similar formula in its Decision 2004-052.

We believe that, despite their limitations, these formulas provide useful benchmarks of the thinking of regulators in Canadian jurisdictions. With these benchmarks, we can assess the extent to which recommendations offered by particular witnesses lie within or beyond what these regulators regard as a reasonable range.

We begin with the NEB formula. This procedure takes the average 3-month out and 12-month out forecasts of 10-year Government of Canada bond yields as reported in the November issue of *Consensus Forecasts* (Consensus Economics, Inc., London, England.) To this is added the average daily spread between 10-year and 30-year Government of Canada bonds as reported in the *National Post* for October. An equity risk premium of 300 basis points was determined to be appropriate for the particular group of pipeline companies in 1995. This equity risk premium is added to the determined 30-year Canada rate to give a final allowed return on equity.

In order to acknowledge the NEB's belief that equity risk premiums decrease when rates are rising and increase when rates are falling, an adjustment mechanism allows for the cost of capital to be adjusted upwards or downwards by 75% of the increase in the long Canada rate occurring after 1995. The NEB decision also notes that the adjustment mechanism is not restricted to the range of rates in its table.

For calendar 2007, the NEB formula produced a rate of return on common equity of 8.46% based on a long-Canada forecast of 4.22% according to an NEB letter of November 23, 2006, File 4750-A000-11. These figures appear in Schedule 6.1 under Regulatory Boards, 2007 Actual.

However, it should be noted that the NEB acknowledged that the adjustment mechanism which it had approved "... should produce fair results and prove durable during the target period *for at least three years*."[120] [Emphasis added].The NEB reaffirmed its formula in June 2002. The only variable reflected in the adjustment mechanism relates to changes in forecast long-term Government of Canada bond yields. It does not in effect reflect changes in the level of risk premiums and, in particular, the lower levels currently being experienced and forecast into the future.

We can illustrate the workings of the NEB formula using our 2006/07 forecast of 4.20% for long Canada's. As stated earlier, the NEB's forecasted long-Canada rate for 2007 was 4.22%, resulting in an allowed return on equity of 8.51%. For our forecast of 4.20% for test year 2006/07, the new rate is 8.49%. Put into words, the NEB formula states that as rates fall from 4.22% to 4.20% (a drop of 2 basis points), 75% of that drop is reflected by lowering the new rate, and the remaining 25% of the drop is added to the risk premium. These figures appear in Schedule 6.1 under Regulatory Boards, 2006/07 projected based on Kryzanowski and Roberts' long-Canada forecast.

Turning to the AEUB formula, we see that it follows similar logic. In its Generic Cost of Capital Decision, the Board set the return at 9.60% in 1994 when the long-Canada rate was 5.68% for a risk premium of 392 basis points. The determination of the long-Canada forecast and 75% adjustment are similar to the NEB formula. Applying the formula for 2007, the AEUB set the long-Canada

[120] RH-2-94, p. 31.

forecast at 4.22% and its return on equity at 8.51%. This figure is shown in Schedule 6.1 under Regulatory Boards 2007 Actual.

Schedule 6.1 also displays projections for the two test years using our long-Canada forecasts and the AEUB formula. For test year 2006/07, the AEUB formula produces an allowed return of 8.49%. For 2007/08, the allowed return is 8.83%.

In summary, Schedule 6.1 shows that applying the two adjustment formulas for our test years using our interest rate forecasts produces rates in a narrow range from 8.45% to 8.49% for 2006/07 and 8.78% to 8.83% for 2007/08.

Q. Please comment on the reasonableness of the NEB and AEUB formulas.

A. The NEB formula provides an upwardly biased estimate of the allowed return on equity. The reason is that not only has the forecasted long-Canada rate dropped since 1995 but the current and future expected risk premiums are considerably lower than they were in 1995. The same comment applies to the AEUB formula as the risk premium is on the same order of magnitude.

Q. What does your summary of regulatory formulas tell us about the reasonableness of the recommendations of other witnesses in this hearing?

A. In order to draw on the results of the regulatory formulas, we must first establish how risk of the utilities for which the formulas were designed compares to the risk of NTPC. As discussed in detail in Section III of this evidence, the risk of NTPC lies somewhat above that of an average risk utility such as those used to establish the NEB and AEUB formulas. However, there are two reasons why this difference in risk does not invalidate the NEB and AEUB formulas as useful comparisons. First, as discussed in Section I of this evidence, we follow the practice of the AEUB in making an upward adjustment in equity in the capital structure to adjust for this risk. Second, as explained above, the formulas have a built-in upward bias that removes the need for any further adjustment to the rate of return. Put another way, even if, for the sake of argument, we were to accept Ms. McShane's view that *both* capital structure and rate of return should be adjusted upward to compensate for the above-average risk of NTPC, the latter adjustment would be already built into the generosity of the regulatory formulas.

Turning to the numbers in Schedule 6.1, it is apparent that the risk premium numbers recommended by the witnesses in this hearing and those resulting from regulatory formulas vary significantly. That said, the schedule reveals that the numbers fall into three distinct sets. At the high end are the recommendations of Ms. McShane, which are clearly substantially higher than the results of regulatory formulas. In the middle, lie the regulatory formulas. Below them are our own recommendations.

Q. What do you conclude from this comparison?

A. The regulatory formulas are drawn from the era of significantly higher risk premiums. Our earlier evidence presented a large body of argument showing that the equity risk premium has declined more recently and is expected to be lower in the future. Because they do not take this important trend into account, recommended returns drawn from regulatory formulas should be regarded as a generous upper bound. Our own recommendation reflects the current trend towards a lower equity risk premium. Our recommendation represents a reasonable choice should the Board wish to embrace our argument and adjust to the new market regime. If, however, should the Board wish to move more cautiously, it could choose to set the allowed equity return in the range between our recommendation and the average of the regulatory formulas. Either way, our examination of the regulatory formulas and other evidence suggests that the Board should attach little weight to the rate of return recommendations of Ms. McShane.

APPENDICES

APPENDIX 1.A

BRIEF CURRICULUM VITAE FOR LAWRENCE KRYZANOWSKI

Dr. Lawrence Kryzanowski is currently a Full Professor of Finance and Concordia University Research Chair in Finance (previously Ned Goodman Chair in Investment Finance) at Concordia University. He was until June 2002 the Co-Director of the Concordia-McGill-Xiamen (CMX) Project of the Canada-China University-Industry Partnership Program in Financial Services. He is currently a member of CIRPÉE, a Principal Researcher at CREF, a scientific committee member of Institut de Finance Mathématique de Montréal (IFM2), and the representative of retail investors on the Regulation Advisory Committee (RAC) of Market Regulation Services Inc. He is a member of the Board of Governors and the Pension Committee at Concordia University. He has been a visiting scholar at the University of British Columbia, a research associate at the University of Rochester, and a resident consultant at the Federal Department of Finance.

Dr. Kryzanowski has extensive experience teaching undergraduates, MBA, MSC and Ph.D. students, and executives for the Institute of Canadian Bankers, Shanghai Banking Institute, CMX, Concordia University, Dalhousie University, McGill University and York University. Dr. Kryzanowski has extensive experience in developing or managing the development of instructional textbooks for the Institute of Canadian Bankers (ICB) and the Canadian Securities Institute (CSI), which includes the *Business Solvency Analysis* and *Investment and Portfolio Management* texts for the ICB, and the *Canadian Securities Course* text for the CSI.

Dr. Kryzanowski is an active educator, mentor, consultant and expert witness in financial economics, including investment management, risk pricing and management, and regulation and operations of global financial markets, institutions and participants. He is author or co-author of over 95 refereed journal articles, seven books or monographs, and over 170 papers presented at academic conferences. Dr.

Kryzanowski is the first recipient of Prix ACFAS/Caisse de dépôt et placement du Québec, which recognizes an exceptional contribution to research in finance. Dr. Kryzanowski was the inaugural recipient, with co-authors, of the BGI Canada Award and OSFI Award (latter with Dr. Roberts) for excellence in research on capital markets and on regulation of financial institutions, respectively. His 13 other paper awards for co-authored work are from the *Multinational Finance Journal* and various North American academic conferences. Dr. Kryzanowski is a former co-editor of finance with Dr. Roberts at the *Canadian Journal of Administrative Studies*, and founding chairperson of the Northern Finance Association. Dr. Kryzanowski is currently an Advisory Editor of the *European Journal of Finance*, an Editor of the *Multinational Finance Journal*, an Associate Editor of the *International Review of Financial Analysis*, and is on the editorial boards of the *Canadian Investment Review* and *Finance India*.

Dr. Kryzanowski has experience in preparing evidence as an expert witness in utility rate of return applications, stock market insider trading court proceedings, and confidential final offer arbitration hearings for setting of fair rates for the movement of various products by rail. Together with Dr. Roberts, he prepared a report and briefed counsel on rate of return considerations in the pipeline application in 1997 of Maritimes and Northeast, and prepared evidence on the fair return on equity and the recommended capital structure for the 2001/2002 Distribution Tariff Application (DTA) of Atco Electric and the 2001/2002 DTA and the 2002 DTA (No. 1250392) of Utilicorp Networks Canada (Alberta) Ltd. before the Alberta Energy and Utilities Board. Together with Dr. Roberts, and on behalf of the Province of Nova Scotia, he provided evidence and testified before the Nova Scotia Utility and Review Board in the matter of Nova Scotia Power Inc. in 2002. Together with Dr. Roberts, and on behalf of the Fédération canadienne de l'entreprise indépendante ("FCEI") / Union des municipalities du Québec ("UMQ") & Option consommateurs ("OC"), he prepared testimony and testified on capital structure and fair return on equity in the matter of Hydro Québec Distribution before the Régie de l'Energie du Québec in 2003. Together with Dr. Roberts, and on behalf of Consumers Group, he prepared testimony and testified in Generic Hearing No. 1271597 before the Alberta Energy and Utilities Board in 2003-2004.

Dr. Kryzanowski is often sought for his technical ability and advice on various matters in financial economics. He has consulted for the Superintendent of Financial Institutions, Federal Department of Finance, CMHC, CDIC, External Affairs Canada, Canada Investment and Savings, Hydro Quebec, National Bank, Bombardier, and others.

Dr. Kryzanowski received a B.A. in Economics and Mathematics from the University of Calgary and earned his Ph.D. in Finance at the University of British Columbia.

BRIEF CURRICULUM VITAE FOR GORDON S. ROBERTS

Dr. Gordon S. Roberts is currently CIBC Professor of Financial Services at York University's Schulich School of Business. Prior to joining York University, he was Bank of Montreal Professor of Finance at the School of Business, Dalhousie University. Dr. Roberts has held positions as Visiting Professor and Visiting Scholar at the National Institute for Development Analysis (Bangkok, Thailand), the University of Chile, Tilburg University (the Netherlands), Deakin University (Melbourne, Australia), University of Toronto, University of Arizona, Xiamen University (China) and the University of Zimbabwe.

In addition to teaching undergraduates, MBA and Ph.D. students at these universities, Dr. Roberts has extensive experience in executive teaching for the Kellogg – Schulich Executive MBA Program, the Institute of Canadian Bankers and in the Pension Investment Management School sponsored by the Schulich School jointly with pension consulting firms William Mercer Inc. and Frank Russell.

An active researcher in the areas of corporate finance, bond investments and financial institutions, Dr. Roberts is author or co-author of over forty journal articles and three corporate finance textbooks. In 2000, he shared with Dr. Kryzanowski the OSFI award for excellence in research on the regulation of financial institutions. Dr. Roberts is a former co-editor of finance with Dr. Kryzanowski of the *Canadian Journal of Administrative Studies*. He is currently an Associate Editor of the *Journal of Banking and Finance*, and serves on the editorial boards of *FINECO* and the *Banking and Finance Law Review*.

Dr. Roberts is experienced in preparing evidence for utility rate of return hearings. From 1995–1997 he submitted prefiled testimony as a Board witness in rate hearings for Consumers' Gas. In 1996, he served as an expert advisor to the Ontario Energy Board in its Diversification Workshop. In 1997, he co-prepared (with Dr. Kryzanowski) a report for the Calgary law firm, MacLeod Dixon, on rate of return considerations in the pipeline application by Maritimes and Northeast. With Dr. Kryzanowski, he filed evidence on three electricity regulatory matters in Alberta in 2001, evidence on regulatory matters before the Alberta Energy and Utilities Board and the Nova Scotia Utility and Review Board in 2002, evidence on regulatory matters dealing with Hydro Quebec Distribution in 2003, and evidence in Generic Hearing No. 1271597 before the Alberta Energy and Utilities Board in 2003-2004.

Often sought for his advice on financial policy, Dr. Roberts has consulted for the Superintendent of Financial Institutions, the federal Department of Finance, Canada Investment and Savings, Canada Mortgage and Housing Corporation, and Canada Deposit Insurance Corporation, among others.

Dr. Roberts received a B.A. in Economics from Oberlin College and earned his Ph.D. at Boston College. He has been listed in the Canadian Who's Who since 1990.

APPENDIX 3.A

RECENT THINKING AND PRACTICE ON CAPITAL STRUCTURE

In formal academic research, the approach to determining capital structure taken in this evidence is called the trade-off theory. The name describes the central idea of this theory: firms determine a target optimal capital structure by balancing the tax-reduction benefits of debt against the expected costs of financial distress and loss of financial flexibility. This appendix reviews the standing of this theory in the academic literature and its following among financial executives.

The main conclusions are three-fold: first, among academic researchers, the trade-off theory enjoys reasonable support but faces serious challenges from a number of competing theories. Second, while it has moderate support among financial executives, a recent survey in the U.S. shows that executives look outside the implications of this theory when setting capital structures for their firms. Third, while the trade-off theory can offer useful qualitative guidance, it is a mistake to treat capital structure as if it were amenable to precise analysis by a formula.

To establish this conclusion, we draw importantly on recent survey papers by Barclay and Smith (2001) and by Graham and Harvey (2001).[121] Further, in addition to the papers they review, we add a discussion of selected research released after these papers were published. We follow their lead in organizing the discussion around theories or concepts argued to influence capital structure. Our review focuses on the findings for large, investment grade firms, as these are most relevant for the utilities industry.

1. Trade-off Theory:

As stated earlier, the trade-off theory holds that firms determine their capital structures through a trade-off of the principal benefit of debt, tax deductibility (Modigliani and Miller, 1963) against the costs: increased expected cost of financial distress (Scott,

[121] References cited are listed at the end of this appendix.

1976, inter alia) and the tax disadvantage of interest income for investors as compared with dividends or capital gains (Miller, 1977).

A number of researchers find support for the trade-off theory by testing its empirical implications. Bradley, Jarrell and Kim (1984), MacKie-Mason (1990) and Wald (1999), among others, find that riskier firms use less debt as suggested by the theory. Long and Malitz (1985) examine the most and least highly leveraged industries in the U.S. and find that industries with high leverage use fixed assets intensively and are mature and less risky. Barclay, Smith and Watts (1995) find that higher-growth, riskier firms use less debt. Kayhan and Titman (2006) find that, although firms' histories strongly influence their capital structures their capital structures tend to move towards target debt ratios over time that are consistent with the tradeoff theories of capital structure. Flannery and Rangan (2006) find that firms do have target capital structures when they use a more general, partial-adjustment model of firm leverage.

On the other side of the ledger, two studies document firm behavior inconsistent with the theory. Graham (2000) finds that firms use considerably less debt than implied by this theory given observed expected financial distress costs. Opler and Titman (1998) report that when share prices increase, firms tend to issue more equity. In contrast, the theory implies that, with higher prices, smaller or less frequent equity issues are appropriate to maintain a target debt-equity ratio.

The survey by Graham and Harvey (2001) reports similarly mixed results. Four factors central to the trade-off hypothesis received only moderate emphasis as very important by financial executives: volatility of earnings and cash flows (rated as "important" or "very important" by 48.08% of executives), tax deductibility of interest (44.85%), industry average debt ratio (23.40%) and financial distress costs (21.35%). Balancing these responses, credit ratings, which attempt to incorporate all four factors, are the second most important debt factor and are rated as important or very important by 57.10% of executives. When asked whether they have "somewhat strict" target debt-equity ratios, 55% of large firms answer positively. This percentage increases to 64%

for investment grade firms and 67% for regulated firms. This is more supportive of the trade-off theory but hardly conclusive.

A recent study by Faulkender and Petersen (2006) shows that, in addition to the firm characteristics which determine a firm's target debt-equity ratio under the trade-off theory, access to capital markets also encourages companies to borrow more. Mittoo and Zhang (2006) demonstrate that this effect is particularly important for Canadian firms particularly those of low credit quality.

Because the evidence backing the trade-off theory is less than overwhelming, academics have developed a number of competing theories and we review these next.

2. Competing Theories

2.1 Pecking Order Theory

According to the pecking order theory firms prefer internal financing and raise external funding as a last resort when internal funds are exhausted (Myers and Majluf, 1984; Myers, 1984). Managers have private information about the future prospects of their firms. Assuming that this private information is positive, the firm's securities are undervalued and equity is more undervalued than debt. As a result, firms first draw on internal funds, followed by debt and finally equity as the last choice. Since firms wish to avoid external financing according to this theory, they value financial flexibility. Shyam-Sunder and Myers (1999) find support for the pecking order model. Rajan and Zingales (1995) and Fama and French (2002) show that firms that have been more profitable in the past use less debt. This is consistent with the pecking order theory but not with the trade-off approach.

In their survey of executives, Graham and Harvey discover that financial flexibility and avoiding the sale of undervalued equity are important to financial executives. These factors are central to the pecking order theory. However, the pecking order theory holds that these factors are of greatest importance to firms most likely to have private information, small firms with significant growth opportunities, and this implication is not supported in the survey. Rather the survey reports that firms paying dividends (generally large, well established firms with less private information) are the ones that value the two factors most highly.

In addition, new studies reexamine the argument that when researchers find that more profitable firms use less debt this constitutes evidence against the trade-off theory. Sarkar and Zapatero (2003) point out that high earnings today can be coupled with expected low earnings in the future assuming that earnings follow mean reversion. In this case, we would expect profitable firms to use less debt and the trade-off theory could still hold. Their research supports the conclusions of Hovakimian, Opler and Titman (2001) that pecking order considerations influence firms' short-term adjustments toward target capital structures as envisaged under the trade-off theory.

2.2 Market Timing or "Window of Opportunity"

Managers attempt to issue common shares when the market is high and repurchase their shares in poor markets according to Loughran and Ritter (1995). Valuation is measured relative to book values or to past levels of the firm's share price. Firms that succeed in timing the market issue equity at high prices and consequently have low leverage ratios. To the extent that it is based on rational factors, such success could arise from waiting until yesterday's private information is reflected in today's stock price (Lucas and McDonald, 1990). Unsuccessful market timers have higher leverage ratios. Baker and Wurgler (2002) measure the relationship between leverage and shifts in market-to-book ratios over time arguing that their results are most consistent with the market timing explanation. Further support for this view is in Graham and Harvey which identifies recent stock price performance as number three in the list of factors explaining when firms issue equity and particularly highly ranked for less established firms that do not pay dividends.

2.3 Signaling

In a variation on the theme of private information, signaling theory argues that firms with good prospects that are not widely recognized issue debt to create a credible signal to the market that they will enjoy strong cash flows sufficient to meet their increased debt servicing obligations (Ross, 1977 and Leland and Pyle, 1977). The survey by Graham and Harvey finds little support for this theory.

2.4 Free Cash Flow

Jensen's (1986) free cash flow theory of leverage is rooted in agency conflicts between managers and shareholders. Managers of a firm with plentiful free cash flow enjoy an opportunity to waste the cash in excessive consumption of managerial perquisites, through empire building or other unproductive investments. Under the free cash flow theory, managers take on additional debt using the free cash flow for debt service. In this way, they make a commitment to avoid wasteful uses of the firm's cash flow. This argument is widely advanced in support of leveraged buyouts. In the survey of financial executives, however, it received a low rating.

2.5 Product Market and Industry Factors

As stated earlier, the use of leverage varies systematically across industries. While this has been viewed as evidence for the trade-off theory as discussed earlier, researchers have developed alternative theories as well. For example, Titman (1984) argues that prospective product purchasers are concerned with the firm's ability to stay in business and make good on product guarantees. As a result, he holds that firms producing unique products should use less debt. Graham and Harvey report mixed results on this theory. Although high tech firms produce unique products, they do not address such customer concerns in setting debt levels. However, growth firms do report considering such concerns in their debt policies.

3. Synthesis

A number of capital structure theories are supported in academic research and while the trade-off theory enjoys the greatest popularity due to seniority and coverage in textbooks, there are a number of competing theories challenging its conclusions. This disparity is reflected in practice by financial executives. Further, perhaps due to the lack of consensus among researchers, "best practices" managers focus on practical factors only loosely related to theory, such as financial flexibility and credit ratings, when they set capital structures for their firms. Barclay and Smith (2001) provide a clear statement on this point:

> "Empirical methods in corporate finance have lagged behind those in capital markets for several reasons. First, our models of capital structure decisions are less precise than asset pricing models. The major theories focus on the ways that capital structure choices are likely to affect firm value. Rather that being reducible, like the option pricing model to a precise mathematical formula, the existing theories of capital structure provide at best qualitative or directional predictions (p.198)."

4. References

Baker, Malcolm and Jeffrey Wurgler, 2002, Market timing and capital structure, *Journal of Finance* 57:1, February, pp. 1-32.

Barclay, Michael J. and Clifford W. Smith, 2001, The capital structure puzzle: Another look at the evidence, in Donald H. Chew, Jr., ed, *The New Corporate Finance: Where Theory Meets Practice*, Third Edition (McGraw-Hill Irwin), pp.197-209.

Barclay, Michael J., Clifford W. Smith, and Ross L. Watts, 1995, The determinants of corporate leverage and dividend policies, *Journal of Applied Corporate Finance* 7:4, Winter.

Bradley, Michael, Greg Jarrell and Han Kim, 1984, The existence of an optimal capital structure: Theory and evidence, *Journal of Finance* 39:3.

Fama, Eugene F. and Kenneth R. French, Taxes, financing decisions and firm value, *Journal of Finance* 53:3, pp. 819-844.

Faulkender, Michael and Mitchell A. Petersen, 2006, Does the source of capital affect capital structure?, *Review of Financial Studies* 19, pp. 45-79.

---, 2002, Testing trade-off and pecking order predictions about dividends and debt, *Review of Financial Studies* 15:1, Spring, pp. 1-33.

Flannery, Mark J. and Kasturi P. Rangan, 2006, Partial adjustment toward target capital structures, *Journal of Financial Economics* 79, pp. 469-506.

Graham, John R., 2000, How big are the tax benefits of debt?, *Journal of Finance* 55:5, pp. 1901-1942.

Graham, John R. and Campbell R. Harvey, 2001, The theory and practice of corporate finance: Evidence from the field, *Journal of Financial Economics* 60: 2-3, May/June, pp. 179-186.

Hovakimian, Armen, Tim Opler and Sheridan Titman, 2001, The debt-equity choice, *Journal of Financial and Quantitative Analysis* 36:1, March, pp. 1-24.

Jensen, Michael, 1986, Agency costs of free cash flow, corporate finance and takeovers, *American Economic Review* 76, pp. 323-339.

Kayhan, Ayla and Sheridan Titman, Firms' histories and their capital structures, 2004, Available at SSRN:http://ssrn.com/abstract=552144

Leland, Hayne E. and David H. Pyle, 1977, Information asymmetries, financial structure, and financial imtermediation, *Journal of Finance* 32, pp. 371-387.

Long, Michael and Ilene Malitz, 1985, The investment-financing nexus: Some empirical evidence, *Midland Corporate Finance Journal* 3:3.

Lucas, D.J. and R.L. McDonald, 1990, Equity issues and stock price dynamics, *Journal of Finance* 45, pp. 1019-1043.

MacKie-Mason, Jeffrey, 1990, Do taxes affect corporate financing decisions?, *Journal of Finance* 45, pp. 1471-1494.

Miller, Merton, 1977, Debt and taxes, *Journal of Finance* 32, pp. 261-275.

Mittoo, Usha R and Zhou Zhang, 2006, Bond market accessibility, credit quality and capital structure: Canadian evidence, University of Manitoba Working Paper, September 2006.

Myers, Stewart, 1984, The capital structure puzzle, *Journal of Finance* 39, pp. 575-592.

Myers, Stewart and Nicholas J. Majluf, 1984, Corporate financing and investment decisions when firms have information that investors do not have, *Journal of Financial Economics* 13, pp. 187-224.

Modigliani, Franco and Merton Miller, 1963, Corporate income taxes and the cost of capital: A correction, *American Economic Review* 53, pp. 433-443.

Opler, Tim and Sheridan Titman, 1998, The debt-equity choice, unpublished working paper, Ohio State University.

Rajan, Raghuram and Luigi Zingales, 1995, What do we know about capital structure? Some evidence from international data, *Journal of Finance* 50.

Ross, Stephen, 1977, The determination of financial structure: The incentive signaling approach, *Bell Journal of Economics* 8, pp. 23-40.

Sarkar, Sudipto and Fernando Zapatero, 2003, The trade-off model with mean reverting earnings: Theory and empirical tests, Working Paper, McMaster University.

Shyam-Sunder, Lakshmi and Stewart C. Myers, 1999, Testing static tradeoff against pecking order models of capital structure, *Journal of Financial Economics* 51:2, pp. 219-244.

Titman, Sheridan, 1984, The effect of capital structure on a firm's liquidation decision, *Journal of Financial Economics* 13, pp. 137-151.

Wald, John K., 1999, How firm characteristics affect capital structure: An international comparison, *Journal of Financial Research* 22:2, pp. 161-188.

APPENDIX 4.A

SHOULD THE ARITHMETIC OR GEOMETRIC MEAN BE USED TO ESTIMATE IMPLIED RISK PREMIUMS USING HISTORICAL REALIZED RETURNS?

1. The Choice:

It is preferable to use the geometric average (mean) historical risk premium when measuring historical holding period performance. The reason is that the geometric mean exactly represents the constant rate of return that is needed in each year to exactly match actual performance over that past investment period.[122] This is the reason why Canadian mutual funds are required to disclose compound rates of return, which is just a different name for a geometric mean return. Similarly, the annual yield-to-maturity quoted on a long-term bond is an annual geometric return.

It is preferable to use the arithmetic mean historical market equity risk premium (MERP) when making investment decisions for a one-period investment horizon when the investment horizon is identical to the interval of time over which the historical returns are measured. The reason is that the arithmetic mean is an unbiased estimate of an investment's expected future risk premium for a single period investment horizon. Thus, if historical MERPs are measured using annual returns, then the future investment horizon should be one year.

The arithmetic mean also is preferred when historical returns are normal IID or independently and identically distributed over the estimation period. This is the assumption implicitly invoked by the advocates of the use of the arithmetic average, such as Drs. Brealey and Myers, and Drs. Dimson, Marsh and Staunton (2003), and

[122] The superiority of the geometric mean over the arithmetic mean is easily shown using an example drawn from L. Kryzanowski, *Investment and Portfolio Management* (Montreal: Institute of Canadian Bankers, 1996), p. 82. The example concerns the investment portfolio of Mr. John Velco whose investment portfolio increases from $200,000 to $400,000 during the first year for an annual return of 100%, and then returns to its original $200,000 value during the second year for an annual return of –50%. The arithmetic and geometric mean annual returns are 25% and 0%. Of course, the correct constant annual return has to be 0% since the beginning and ending portfolio values are identical.

others, when they recommend the use of the arithmetic mean of historical premiums as the looking-forward expected MERP.[123] Unfortunately, the normal IID assumption is not appropriate for asset returns over long estimation periods. This assumption suffers from various important drawbacks. First, even if single-period returns are assumed to be normal, then multiperiod returns cannot also be normal since they are products (not sums) of the single-period returns. Second, several studies using longer-horizon or multi-year returns conclude that there is substantial mean-reversion in stock market prices at longer horizons. Third, the plausibility of the assumption that returns are IID diminishes as the estimation time period gets longer.

The geometric mean or some weighted-average of the geometric and arithmetic mean are preferred when returns are not normal IID due to, for example, long-run mean reversion in some asset returns (as has been found for stocks) and in MERPs, and mean aversion in others (as has been found for bonds). Dr. Siegel notes that his work on the risk premium using data for the period 1802-2001 provides support for mean reversion for a 30-year horizon (i.e., the horizon used for Long Canada's in rate of return regulation).[124] We provide further empirical support for mean reversion in both Canadian and American MERP in section IV of our evidence.

Dr. John Campbell at a recent *Equity Risk Forum* has aptly stated this argument as follows:[125]

> "Which is the right concept, arithmetic or geometric? Well, if you believe that the world is identically and independently distributed and that returns are drawn from the same distribution every period, the theoretically correct answer is that you should use the arithmetic average. Even if you're interested in a long-term forecast, take the arithmetic average and compound it over the appropriate horizon. However, if you think the world isn't i.i.d., the arithmetic average may not be the right answer.

[123] Elroy Dimson, Paul Marsh and Mike Staunton, Global evidence on the equity risk premium, forthcoming *Journal of Applied Corporate Finance* 15:4 (Summer 2003), p. 15.
[124] Jeremy J. Siegel, Historical results: Discussion, *Equity Risk Premium Forum*, November 8, 2001, p. 46.
[125] John Campbell, Historical results: Discussion, Equity Risk Premium Forum, November 8, 2001, p. 45.

I think that the world has some mean reversion. It isn't as extreme as in the highway example, but whenever any mean reversion is observed, using the arithmetic average makes you too optimistic. Thus, a measure somewhere between the geometric and the arithmetic averages would be the appropriate measure."

Similarly, Dr. Damordaran, author of numerous books on valuation, states:[126]

"The conventional wisdom is that the arithmetic mean is the better estimate. This is true if
(1) you consider each year to be a period (and the CAPM to be a one-period model)
(2) annual returns in the stock and bond markets are serially uncorrelated
As we move to longer time horizons, and as returns become more serially correlated (and empirical evidence suggests that they are), it is far better to use the geometric risk premium. In particular, when we use the risk premium to estimate the cost of equity to discount a cash flow in ten years, the single period in the CAPM is really ten years, and the appropriate returns are defined in geometric terms.
In summary, the arithmetic mean is more appropriate to use if you are using the Treasury bill rate as your riskfree rate, have a short time horizon and want to estimate expected returns over that horizon.
The geometric mean is more appropriate if you are using the Treasury bond rate as your risk free rate, have a long time horizon and want to estimate the expected return over that long time horizon."

Dr. Jay Ritter in his keynote address at the 2001 meetings of the Southern Finance Association states that "with mean reversion, the multiperiod arithmetic return will be closer to the geometric return".[127] He notes that stock returns show a tendency towards mean reversion and bond returns show a tendency towards mean aversion in the U.S.

[126] Aswath Damodaran, Discussion issues and derivatives, found on his website at: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/AppldCF/derivn/ch4deriv.html#ch4.3.
[127] Address published subsequently as: Jay R. Ritter, The biggest mistakes we teach, *The Journal of Financial Research* 25:2, Summer 2002, pp. 159-168.

In turn, based on the standard deviations of returns for data starting in 1802 (the Siegel data set), he shows that stocks are twice as risky as bonds for one-year holding periods, and stocks are less risky than bonds for holding periods of twenty or more years.

The use of the geometric mean is supported empirically. Fama and French estimate the nominal cost of capital for U.S. nonfinancial corporations for 1950-1996 as 10.72%. Since this is smaller than the nominal return on investment of 12.11%, average corporate investment has been profitable.[128] If the arithmetic mean of the simple annual returns is used instead to obtain an estimate of the nominal cost of capital, the resulting value of 12.12% is about the same as the return of investment of 12.11%. This implies that average investment by corporate U.S. has added no value over the 1950-1996 period, which seems unreasonable to Fama and French and ourselves given stock market performance over this period of time. Thus, Fama and French conclude that the geometric mean estimate of the cost of capital is more consistent with the data than the arithmetic mean estimate of the cost of capital over this period of time.

The expected one-period simple return (i.e., the arithmetic mean of the one-period simple return) is only an appropriate return concept for the cost of equity capital for a short future time horizon of one period (usually a year).[129] For multiple-period horizons, expected return estimates enter the present value expressions in a nonlinear manner. Thus, numerous articles have documented the biases in using arithmetic or geometric means of one-period returns or risk premia to assess long-run expected rates of return or risk premia.

[128] These two values are the IRRs on value and on cost, respectively. The geometric mean of simple annual returns on cost is almost identical. Eugene F. Fama and Kenneth R. French, 1999, The corporate cost of capital and the return on corporate investment, *The Journal of Finance* December, pp. 1939-1967. As in Copeland et al. (1990), the return on value is an estimate of the cost of capital when the cost of capital is taken to be an expected compound return. Tom Copeland, Tim Koller and Jack Murrin, 1990, *Valuation in measuring and managing the value of companies* (John Wiley and Sons, New York).
[129] Eugene F. Fama, 1996, Discounting under uncertainty, *Journal of Business* 69, pp. 415-428.

Other studies have documented the biases in using arithmetic or geometric means of one-period returns or risk premia to assess long-run expected rates of return or risk premia, without any reference to mean-reversion.

The first group of studies that examine which type of mean is appropriate for long horizon decision-making examines the biases caused by the fact that discount factors involve powers of the reciprocal of the rate of return. Blume (1974) and Indro and Lee (1997) show mathematically that for long-run expected returns and risk premia, the arithmetic average produces an estimate that is upwardly biased, and that the geometric average produces an estimate that is downwardly biased.[130] The simulation results of Indro and Lee (1997) support the use of a horizon-weighted average of the arithmetic and geometric averages proposed by Blume (1974). In the Blume average, the arithmetic average receives all the weight when the time horizon or project life (denoted by N) is one period, and the geometric average receives all the weight when the time horizon is equal to the number of time periods (denoted by T) used to obtain a historical estimate of average returns or risk premia.

To illustrate, if we deem that 30 years constitutes the long-run as is assumed for the cost of debt and we use the longest available time period up to 2002 without serious measurement errors to estimate the market risk premium in Canada (namely, the 45 year period, 1957-2001), the weight placed on the geometric average, w_G, is:

$$w_G = (N – 1) / (T – 1) = (30 – 1) / (45 – 1) = 29 / 44 = .66 \text{ or } 66\%.$$

Similarly, if we use the longest available time period up to 2002 for which we have data in Canada to estimate the MERP from the CIA (namely, the 78 year period, 1924—2001), the weight placed on the geometric average, w_G, is:

$$w_G = (N – 1) / (T – 1) = (30 – 1) / (78 – 1) = 29 / 77 = .38 \text{ or } 38\%.$$

Of course, the long run is longer than 30 years, and we would use it for bonds if such maturities were available.

[130] M.E. Blume, Unbiased estimators of long-run expected rates of return, *Journal of the American Statistical Association* 69:347 (September 1974), pp. 634-638; and D.C. Indro and W.Y. Lee, Biases in arithmetic and geometric averages as estimates of long-run expected returns and risk premia, *Financial Management* 26:4 (Winter 1997), pp. 81-90.

The second group of studies that examine which type of mean is appropriate for long horizon decision-making assesses the effect of estimation errors when the estimate is used for multi-period forecasting or decision-making. Drs. Jacquier, Kane and Marcus show that the use of the sample arithmetic mean produces an upward-biased forecast, and that this bias does not disappear, even if the sample mean is computed using long data series and *returns come from a stable distribution with no serial correlation*.[131] They show that, while a weighted-average of the arithmetic and geometric average returns provides an unbiased estimate of long-term returns, the best estimate of cumulative returns is even lower. They conclude that this "further compounds the recent sobering message in Fama-French (2002) and Jagannathan et al. (2000) who suggest that the equity risk premium is lower than once thought". They further conclude that:

> "Strong cases are made in recent studies that the estimate of the market risk premium should be revised downward. Our result compounds this argument by stating that even these lower estimates of mean return should be adjusted further downward when predicting long-term cumulative returns."

Thus, until the issue is resolved, a weighted-average of the arithmetic and geometric means is best. To err on the side of being conservative, a weighted average that places an equal or greater weight on the arithmetic mean appears to be most reasonable.

2. The Choice and Financial Integrity:

Although we do not believe that any additional return needs to be added to ensure the financial integrity of a utility, the use of a weighted average of the geometric and arithmetic mean historical market risk premia does provide some unspecified premium to that effect because the chosen weighted average is still likely to be optimistic.

[131] Eric Jacquier, Alex Kane and Alan J. Marcus, 2003, Geometric or arithmetic means: A reconsideration, *Financial Analysts Journal* 59: 6 (November-December), pp. 46-53; and working paper version of paper.

A further benefit of using a weighted average, or what equivalently is equal to adding the weight placed on the arithmetic mean multiplied by the difference in the two averages to the geometric mean, is that it provides a premium that increases or decreases with the level of investment risk as measured by the standard deviation of the market. When the market has no risk, the two means are identical. Thus, for the extreme case of no market risk, the use of the weighted average instead of the annual geometric market risk premium provides no extra risk premium that will ensure financial integrity, as none is needed. When market risk is present, the weight placed on the arithmetic mean multiplied by the positive numerical difference between the arithmetic mean MERP and the geometric mean MERP grows with higher levels of risk. Thus, the use of the annual geometric mean MERP plus the weight placed on the arithmetic mean multiplied by the difference between the annual arithmetic and geometric mean MERPs provides more risk premium coverage for ensuring financial integrity for greater levels of market risk.

This is best illustrated by referring to the example in Schedule 4.A1. In this example, we show what happens to the final wealth position of two typical investors who each invest $6,592.58 in two different utilities at the end of 1989. For ease of presentation, we assume that each utility is well diversified and has the same investment risk and return as the market. The first investor invests in the first utility whose value compounds at the annual geometric mean return for the S&P/TSX Composite over the ten-year period 1990-1999. As expected, the terminal value of the investment in the first utility by the first investor is equal to the ending value of $17,960.99 for the S&P/TSX Composite index for 1999. Thus, the first investor receives the same return as given by the market on his utility investment. In contrast, the second investor invests in the second utility whose value compounds at the annual arithmetic mean return for the S&P/TSX Composite over the ten-year period 1990-1999. As expected, the terminal value of the investment in the second utility by the second investor of $19,759.06 is now greater than the terminal value of $17,960.99 for the S&P/TSX Composite index at year-end 1999. Thus, this second investor has achieved what finance professionals refer to as an abnormal return or “free lunch”, and investment professionals refer to as a positive alpha. In fact, the second investor has achieved an above market return per dollar of initial investment without incurring any additional risk when performance is benchmarked against the performance of the market.

From the perspective of the second utility, the difference between the annual geometric and arithmetic mean returns of approximately 106 basis points represents the amount of return that it can forego before it begins to disappoint its equity investors. In a rating setting forum, the full 106 basis points would represent a very expensive insurance premium to pay annually to ensure that a utility is guaranteed financial integrity.

Schedule 4.A1

This table contains a comparison of the wealth implications for equity investors of using arithmetic versus geometric mean returns based on an assumed investment of $6592.58 by two different investors in two different utilities. For ease of exposition, the two utilities are assumed to have the same investment risk as the market (i.e., their betas are one) and to be relatively well diversified.

Year end	For the total return S&P/TSX Composite index:			Portfolio value when promised annual return is:	
	Index value	Annual return	Annual return relative	Geometric mean	Arithmetic mean
1989	6592.58			6592.58	6592.58
1990	5617.01	-0.14798	0.85202	7287.57	7357.44
1991	6291.90	0.120151	1.120151	8055.83	8211.03
1992	6201.72	-0.014333	0.985667	8905.08	9163.65
1993	8220.23	0.325476	1.325476	9843.86	10226.80
1994	8205.73	-0.001764	0.998236	10881.60	11413.29
1995	9397.97	0.145294	1.145294	12028.75	12737.43
1996	12061.95	0.283463	1.283463	13296.82	14215.20
1997	13868.54	0.149776	1.149776	14698.58	15864.41
1998	13648.84	-0.015842	0.984158	16248.11	17704.97
1999	17960.99	0.315935	1.315935	17960.99	19759.06

The annual arithmetic and geometric mean returns are 0.116018 and 0.10542, respectively.

APPENDIX 4.B
SOME MORE RECENT THINKING AND ESTIMATES OF U.S. AND OTHER COUNTRY EQUITY RISK PREMIA

1. Estimates on a Point-forward Basis:

There are three approaches to estimating the market equity risk premium (MERP) on a point-forward basis. The first approach extrapolates historical returns based on the premise that realized and expected returns are equivalent, and that the future will be like the past. The second approach uses a theoretical model to determine what the MERP should be based on plausible assumptions about investor risk tolerance. The third approach uses forward-looking information on current dividend yields and interest rates to forecast expected MERP.

Reichenstein (2001) summarizes the predictions of several academic and professional scholars that long-run real stock returns will be below historical standards and that the MERP will be well below historical standards, and even negative according to some scholars.[132] The academic studies are by Jagannathan, McGrattan and Scherbina (2000), Siegel (1999) and Fama and French (2001). The practitioner studies are by Brown (2000) and by Arnott and Ryan (2001). The real stock return estimates are 2.9% to 4.4% for Fama and French, 3.2% for Arnott and Ryan, 3.3% for Siegel, 4.8% for Jagannathan et al, and 5.2% for Brown.

Fama and French (2001) obtain estimates of the U.S. equity MERP of 2.55% and 4.32% for 1951-2000 when they use rates of dividend and earnings growth to measure the expected rate of capital gain. These MERP estimates are much lower than the 7.43% estimate produced by using the average stock return over this period of time. They conclude that their evidence shows that the high average realized return for 1951-2000 is due to a decline in discount rates that produces large unexpected capital gains.

[132] Cited articles in this appendix are listed in the references found between the text and the tables to this appendix.

Their main conclusion is that the stock returns (and realized MERPs) of the last half-century are a lot higher than what was expected by investors ex ante. The lower estimates of expected stock returns are less than the income return on investment that suggests that investment by corporate U.S. is on average profitable. In contrast, the much higher estimates of expected stock returns from using the traditional time-series means suggests that investment by corporate U.S. is on average unprofitable (its expected return is less than its cost of capital).

According to Fama and French (2001), "many papers suggest that the decline in the expected stock return is in part permanent, the result of (i) wider equity market participation by individuals and institutions and (ii) lower costs of obtaining diversified equity portfolios from mutual funds (Diamond, 1999; Heaton and Lucas, 1999; Siegel, 1999)".

Jagannathan et al (2000) demonstrate that the U.S. MERP has declined significantly during the last three decades. They calculate the MERP using a variation of a formula in the classic Gordon stock valuation model. While the premium averaged about 7 percentage points during 1926-70, it only averaged about 0.7 of a percentage point after that. They support this result by demonstrating that investments in stocks and consol bonds of the same duration would have earned about the same return between 1982 and 1999, a period over which the MERP estimate is about zero.

There are a number of studies not reviewed by Reichenstein (2001). These are reviewed next.

In a conference presentation on October 15, 2001, Mr. Robert A. Arnott of First Quadrant (and current editor of the *Financial Analysts Journal*) estimates the U.S. MERP for the 75 years from December 1925 to be 4.7%, and to have oscillated around zero beginning in the early 1980s.[133] He estimates the forward-looking U.S. MERP from October 2001 to be 0.3%±.

---

[133] Specifically, Exhibit 4a on page 21 of Arnott (2001).

In a study (undated) by Deutsche Asset Management, the expected long-run MERPs are 2.5% over government bonds or 3.0% over cash for the U.S., Euroland, Japan and the U.K. (see Schedule 4.B1). These MERPs are based on two approaches, where the first estimates what equities can return based on free cash flows that they generate, and the second estimates what equities need to return to get investors to hold them instead of less risky assets.

McGrattan and Prescott (2000) conclude that the case for a positive MERP appears weak based on a model that measures the value of corporate capital. They show that including intangibles reduces corporate profits. Since the values of overall productive assets and equity are nearly equal in the United States, they conclude that the MERP is close to zero percent.

Drs. Claus and Thomas (2001) use the implied risk premium methodology to derive an upper bound for the MERP for Canada, France, Germany, Japan, U.K., and the U.S. over the period from 1985-1998. Drs. Claus and Thomas find that MERP estimates are close to three percent rather than the eight percent MERP that have been reported based on the data from Ibbotson & Associates. They consider their estimates as being an upper bound because they use the earnings forecasts of analysts, which are typically optimistic, to forecast the MERP.

Based on reasonable priors and allowing for structural breaks, Drs. Pastor and Stambaugh (2002) obtain estimates of the MERP of between 3.9 and 6.0 percent over the period from January 1834 through June 1999. The estimated premium rises through much of the nineteenth century and the first few decades of the twentieth century. It declines fairly steadily after the 1930's except for a brief period in the mid 1970's. The estimated MERP exhibits its sharpest decline to 4.8% during the decade of the 1990's.

Drs. Ibbotson and Chen (2001) forecast the MERP through supply side models using historical information. They conclude that “contrary to several recent studies on equity risk premium that declare the forward looking equity risk premium to be close to zero or negative, we find the long-term supply of equity risk premium is only slightly lower than the straight historical estimate". Based on his co-authored paper with Dr. Chen, Dr. Ibbotson concluded that:[134]

> "My estimate of the average geometric equity risk premium is about 4 percent relative to the long-term bond yield. It is, however, 1.25 percent lower than the pure sample geometric mean from the risk premium of the Ibbotson and Sinquefield study (Ibbotson Associates 2001)."

Dr. Ibbotson goes on to state:[135]

> "The 4 percent (400 bps) equity risk premium forecast that I have presented here today is a geometric return in excess of the long-term government bond yield. It is a long-term forecast, under the assumption that today's market is fairly valued."

Hunt and Hoisington (2003, p. 28) conclude that their study "sheds new light on the risk premium of stocks over U.S. Treasury bonds, which indicates most research overstates the advantages of stocks over bonds". They go on to note that:

> "While results may be overstated due to the beginning-period bias, studies based upon past data have conclusively shown that stock returns are superior to bonds over very long time periods. On average, during these time periods, the better performance of stocks is due to inflationary situations, spreads between dividend and bond yields, and P/E ratios that currently do not exist."

Drs. Jacquier, Kane and Marcus (2003) show that, while a weighted-average of the arithmetic and geometric average returns provides an unbiased estimate of expected long-term returns, the best estimate of cumulative returns is even lower. They conclude that:

[134] Roger Ibbotson, Moderator, Implications for asset allocation, portfolio management, and future research: Discussion, Equity Risk Premium Forum, November 8, 2001, p. 103.
[135] Roger Ibbotson, Summary comments, *Equity Risk Premium Forum*, November 8, 2001, p. 108.

> "Strong cases are made in recent studies that the estimate of the market risk premium should be revised downward. Our result compounds this argument by stating that even these lower estimates of mean return should be adjusted further downward when predicting long-term cumulative returns."

Using the third approach to estimating MERPs, Dr. Ritter estimates that the MERP is only about 0.7% or 1 percent rounded up. He points out that lower future real stock returns have squeezed the MERP from the top and a higher real return on bonds has squeezed the MERP from the bottom.[136]

2. Actual versus Expected Equity Risk Premiums:

A few studies examine whether or not actual or realized MERPs are a good proxy for expected or required MERPs. The findings of two of these studies are summarized in Schedule 4.B2. The study (undated) by Deutsche Asset Management aptly summarizes these findings as follows:

> "In sum, a wealth of theoretical and empirical evidence suggests that the historical, realized equity premium (5% - 7%) exceeded what equities were expected to deliver in the past, and very likely exaggerates what they should be expected to deliver in the future. An equity premium of 3% - 4% may have been closer to the true, ex-ante premium in the past, and the lower end of that range seems the most that we should anticipate (and that investors will require) now that economic/political conditions are more stable and people are more 'plugged in' to the benefits of equity investing. So we take 3% as an upper bound for the equity premium going forward."

It should also be kept in mind that these equity risk premia are calculated in reference to short-term government bonds (such as T-bills) and **not long-term government bonds**.

[136] Jay R. Ritter, The biggest mistakes we teach, *The Journal of Financial Research* 25: 2, Summer 2002, p. 163.

Mr. Arnott and Mr. Bernstein (2002) show that the realized MERP over the last 75 years in the U.S. is overstated due to various accidents. Equity and bond investors obtained returns higher and lower than what they expected, respectively, due to a series of favourable accidents for equity holders and one major unfavourable accident for bondholders.

Mr. Oliver and Mr. Doyle of AMP Henderson Global Investors Limited note:

> "A strong case can be made that favourable forces now justify a lower share-risk premium than the 5% or 6% that prevailed over the past 100 years … The favourable forces include low inflation and a more stable business cycle that are expected to result in higher-quality and steadier earnings and share prices. As well, baby boomers saving for their post-work lives are buying shares. They are arguably less fearful of shares than previous generations and have (hopefully) longer-investment horizons….
>
> Our assessment is that the appropriate risk premium for US shares is about 3% [relative to bonds]. For the Australian shares, fewer opportunities for diversification justify a slightly higher premium of about 4%." [our insertion]

This was re-enforced by Mr. Dyer (2003) of the same firm more recently as follows:

> "For these reasons, **the historically realised ERP of the last 50 years or so is probably an exaggeration of what investors actually require and is absolutely no guide to what the likely ERP will be going forward."** [his emphasis]

Drs. Clarke and de Silva (2003) note that all of the expected MERPs by practitioners from such firms as Frank Russell (3%), Goldman Sachs (3%), Ibbotson (4%) and Alliance Bernstein (4.5%) are lower than the historical experience in the U.S. Drs. Clarke and de Silva conclude their study by noting: "What seems clear from the historical evidence is that a reasonable expectation for the long-run equity risk premium is probably in the 3-6% range." Interesting, the **expected MERP estimates** of Drs. Clarke and de Silva and the others are based on **geometric means**.

3. Synthesis:

All of the studies conclude that the U.S. MERP has narrowed (most conclude substantially), and is expected to be lower in the future. The U.S. MERP estimates vary from zero or slightly negative (Jagannathan et al, 2000) to about 6 % (Ibbotson and Chen, 2001). These studies strongly suggest that any forecast **for the U.S.** over 5% based on T-bills is in the optimistic tail of the distribution of possible MERP estimates.

The two studies dealing with realized and expected MERP find that the expected equity MERP when measured **against short-term** government bonds in the U.S. has ranged between 3.4% and 4.2% depending on the time period considered, and has averaged 3.5% over 101 years for a sample of 15 developed countries.

4. Relative Risk of Equities Versus Bonds

It would appear on the surface that a zero or negative required MERP going forward is inconsistent with the belief that equities are more risky than bonds. However, some market professionals believe that equities may not be more risky than bonds in terms of investment risk. Many studies find that the ratio of the standard deviations of returns on equities to bonds is above one, approaches one, and goes below one as the measurement period over which returns are measured gets longer. The ratio would remain constant, as the measurement period over which returns are measured gets longer, if stock and bond returns did not exhibit mean reversion/aversion.

In a 2001 study, W.M. Mercer evaluated the investment riskiness of Canadian stocks, bonds and cash over varying time horizons.[137] These results confirm existing U.S. results that:[138]

---

[137] William M. Mercer Limited, Are stocks riskier than bonds? New Mercer research indicates that stocks become less risky in the long run, news release, February 15, 2001. Available at www.wmmercer.com/Canada/english/resource/resource_news02152001.html.

[138] The historical results reported by the CIA suggest that the standard deviation results are obtainable for periods as short as 5 years. Over 5-year periods, they report standard deviations of returns of 6.75%, 5.69% and 3.53% for stocks, long Canadas and 91-day T-bills, respectively. Over 10-year periods, the

- Stocks are riskier than both bonds and cash over shorter time horizons, such as one year;
- Stock returns exhibit decreasing variability (measured by the standard deviation of returns) over time;[139]
- For 20-year rolling time periods, stocks outperform bonds in terms of returns, and both asset classes have about the same risk;
- For 30-year rolling time periods, stocks outperform both bonds and cash, and stocks are less risky than both bonds and cash.

In their book, Campbell and Viceira (2002, pp. 108 and 109) provide evidence that the annualized standard deviation of K-period returns is lower for equities than T-bills (rolled) or long bonds (rolled) for long holding periods in the United States. Campbell and Viceira (2002, p. 108) state that: “We see that stocks are mean-reverting – their long-horizon returns are less volatile than their short-horizon returns – while bills are mean-averting – their long-horizon returns are actually more volatile than their short-horizon returns.” Campbell and Viceira (2002, p. 108) draw the following inference from their analysis: “These effects are strong enough to make bills actually riskier than stocks at sufficiently long investment horizons, a point emphasized by Siegel (1994)”.

Thus, based on the long-run perspective underlying rate-of-return rate-setting, equities may in fact not be more risky than traditional debt instruments from an investment risk perspective. Since the MERP is based on the notion that stocks are riskier than bonds, these results attack the validity of a fundamental notion behind the existence and magnitude of a MERP.

References:

corresponding standard deviations are 2.98%, 4.59% and 3.26%. Canadian Institute of Actuaries, *Report on Canadian Economic Statistics*, 1924-2000, September 2001, Table 2A, p. 8.

[139] This is consistent with mean reversion in stock returns.

Arnott, Robert D., 2001, Is the risk premium still dead?, Microsoft PowerPoint Presentation, YMG Conference, October 15. Available at:

http://www.ymg.ca/news/Conferences/Conference2001/Rob%20Arnott%20-%20First%20Quadrant.pdf.

Arnott, Robert D. and Peter L. Bernstein, 2002, What risk premium is "normal"?, *Financial Analysts Journal* 58:2 (March/April), pp. 64-85.

Arnott, Robert D. and Ronald J. Ryan, 2001, The death of the risk premium, *Journal of Portfolio Management*, Summer, pp. 61-74.

Brown, Anthony, 2000, What's next for the S&P 500?, *Journal of Investing*, Winter, pp. 60-66.

Campbell, John Y. and Luis M. Viceira, 2002, *Strategic Asset Allocation: Portfolio Choice for Long-Term Investors* (Oxford University Press).

Clarke, Roger and Harindra de Silva, 2003, Reasonable expectations for the long-run U.S. equity risk premium, Risk Management PERSPECTIVES, April.

Deutsche Asset Management, undated, What can we expect for asset returns in the long term? *Deutsche Asset Management's view*.

Diamond, Peter A., 1999, *What stock market returns to expect for the future?* Center of Retirement Research at Boston College, September, Number 2.

Dimson, Elroy, Paul Marsh, and Mike Staunton, 2000, *Millennium Book II: 101 Years of Investment Returns*, London Business School and ABN-AMRO.

Dyer, Paul, 2003, The equity risk premium – what is it and is it enough?, *Investment Insights*, AMP Henderson Global Investors (New Zealand) Limited, March 5, 2003.

Fama, Eugene F. and Kenneth R. French, 2001, The equity premium, Working Paper no. 522, The Center for Research in Security Prices, Graduate School of Business, University of Chicago, April.

Heaton, John, and Deborah Lucas, 1999, Stock prices and fundamentals, In: *Macroeconomics Annual 1999*, Ben Bernanke and Julio Rotemberg (eds.), National Bureau of Economic Research, MIT Press, Cambridge, MA, pp. 213-242.

Hunt, Lacy H. and David M. Hoisington, 2003 Estimating the stock/bond risk premium: An alternative approach, *The Journal of Portfolio Management* (Winter), pp. 28-34.

Ibbotson, Roger G. and Peng Chen, 2001, The supply of stock market returns, working paper, June.

Jagannathan, Ravi, Ellen R. McGrattan and Anna Scherbina, 2000, The declining U.S. equity premium, *Quarterly Review of Federal Reserve Bank of Minneapolis*, Fall, pp. 3-19.

Eric Jacquier, Alex Kane and Alan J. Marcus, 2003, Geometric or arithmetic means: A reconsideration, *Financial Analysts Journal* 59: 6 (November-December), pp. 46-53; and working paper version of paper.

McGrattan, E. R., and E. C. Prescott, 2000. Is the stock market overvalued?, *Quarterly Review*, Federal Reserve Bank of Minneapolis 24: 4 (Fall), pp. 20–40.

Oliver, Shane and Simon Doyle, Share-risk premium: What is the appropriate level?, 2001, *Oliver's Insights*, AMP Henderson Global Investors Limited, August.

Pastor, Lubos and Robert F. Stambaugh, 2002, The equity premium and structural breaks, Forthcoming *Journal of Financial Economics*.

Reichenstein, William, 2001, The investment implications of lower stock return prospects, *AAII Journal*, October, pp. 4-7.

Rozeff, M.S., 1984, Dividend Yields are Equity Risk Premiums, Journal of Portfolio Management 11, pp. 68-75.

Siegel, Jeremy J., 1999, The shrinking equity premium, *Journal of Portfolio Management*, Fall, pp. 10-17.

Siegel, Jeremy J., 1994, *Stocks for the Long Run* (New York: McGraw-Hill.

Schedule 4.B1. Expected long-run returns in local currency terms (annualized, percent)

	Cash		Gov't Bonds		Equities	
	Nominal	Real	Nominal	Real	Nominal	Real
U.S.	4.50	2.00	5.00	2.50	7.50	5.00
Euroland	3.75	2.00	4.25	2.50	6.75	5.00
Japan	3.00	2.00	3.50	2.50	6.00	5.00
U.K.	4.50	2.00	5.00	2.50	7.50	5.00

Source: Deutsche Asset Management, undated, 2.

Schedule 4.B2. Actual versus 'expected' equity risk premium in %[a]

Study	Country	Dates	Actual	Expected
Fama & French (2001)	U.S.	1872-2000	5.6	3.5
Fama & French (2001)	U.S.	1872-1950	4.4	4.2
Fama & French (2001)	U.S.	1951-2000	7.4	3.4
Dimson et al. (2000)	U.S.	1900-2000	5.6	4.0
Dimson et al. (2000)	15 countries[b]	1900-2000	5.1	3.5

[a]The actual premium is the compound, annualized rate of return less the compound, annualized return on short-term government debt. The expected premium uses dividend growth and earnings growth models to estimate equity returns.
[b]Australia, Belgium, Canada, Denmark (from 1915), France, Germany (ex. 1922/23), Ireland, Italy, Japan, Netherlands, Spain, Sweden, Switzerland (from 1911), U.K. and U.S.

Source: Deutsche Asset Management, undated.

APPENDIX 4.C

INDIRECT DECOMPOSITION METHOD TO ESTIMATE INDUSTRY-LEVEL MONTHLY VARIANCES

An interesting feature of the indirect volatility decomposition method proposed by Campbell et al. (2001) for those that are opposed to using an asset pricing model (APM) is that neither covariances nor betas need to be estimated.[140] In the decomposition, the value-weighted variance for a representative industry *i* for month *t* (i.e., $\sigma^2_{I,t}$) is given by $\sigma^2_{I,t} = \sum_i w_{i,t} \cdot \sigma^2_{\varepsilon_{i,t}}$, where $\sigma^2_{\varepsilon_{i,t}} = \sum_{d \in t} \varepsilon^2_{i,d,t}$ is the aggregation of the daily squared excess returns for industry *i* over those of the market over the days *d* in month *t*; $\varepsilon_{i,d,t} = R_{i,d,t} - R_{m,d,t}$ is the excess return for industry *i* over that of the market for day *d* in month *t*; and $R_{m,d,t}$ is the value-weighted excess return for all stocks for day *d* in month *t*. An interesting feature of this decomposition method is that it minimizes selection and survivorship biases by using all stocks that have at least one month of publicly available trade data.

[140] As in Campbell et al. (2001), the closing numbers of outstanding shares for the previous month are used to compute all market capitalization weights. John Y. Campbell, Martin Lettau, Burton Malkiel and Yexiao Xu, 2001. Have individual stocks become more volatile? An empirical exploration of idiosyncratic risk, *Journal of Finance* 56(1), pp. 1-43.

APPENDIX 4.D
BETA ADJUSTMENT TO REFLECT SENSITIVITY TO INTEREST RATE CHANGES

One of the mainly flawed rationales for using a variant of the adjusted beta method for utilities is that raw utility betas need to be adjusted upward due to their sensitivity to interest rate changes, and that the appropriate adjustment is one that is intermediate between the raw and adjusted betas.

As is the case for the S&P/TSX Composite index, the returns of utilities are sensitive to changes in both market and bond returns. This suggests that utility returns may be better modeled using these two potential return determinants or factors. However, one should not confuse the sensitivity of utility returns with the premium required by investors to bear market and interest rate risk when investing in utility equities.

In the traditional one-factor CAPM, where the only factor is the market, one measures relative risk by estimating the utility's beta by running the regression $r_i = a_i + b_i R_m + e_i$, where r_i and R_m are the return on utility *i* and the market *m*, respectively; and b_i is the beta coefficient of utility *i*. The utility's required rate of return then is given by $\bar{r}_i = r_f + b_i(\bar{R}_m - r_f)$, where r_f is the risk-free rate, which is proxied here by the yield on a long-term Canada; $(\bar{R}_m - r_f)$ is the so-called market equity risk premium; and all the other terms are defined as before.

In a two-factor CAPM, one obtains the relative priced risks for utility *i* by estimating the utility's betas by running the regression $r_i = a_i + b_{1i} R_m + b_{2i} R_b + e_i$, where r_i, R_m and R_b are the return on utility *i*, the equity market *m*, and long Canada's, respectively; and b_{1i} and b_{2i} are the beta coefficients of utility *i* (i.e., the sensitivities to market and interest rate risk, respectively).[141]

[141] This two-step procedure for testing asset pricing models, such as the CAPM, originates with Eugene Fama and James MacBeth, Risk, return, and equilibrium: Empirical tests, *Journal of Political Economy* 71 (1973), pp. 607-636.

The utility's required rate of return then is given by $\bar{r}_i = r_f + b_i(\bar{R}_m - r_f) + b_i(\bar{R}_b - r_f)$, where r_f is the risk-free rate, which is proxied here by the yield on a long-term Canada; $(\bar{R}_m - r_f)$ is the so-called market equity risk premium; $(\bar{R}_b - r_f)$ is the so-called interest rate risk (bond market) premium; and all the other terms are defined as before.

While one would expect the estimates of R_m, R_b and $(\bar{R}_m - r_f)$ to be positive and significant, such is not the case for $(\bar{R}_b - r_f)$. Over the long run, we would expect the average return on long Canada's to be equal to the yield on long Canada's (the proxy for the risk-free rate in rate of return settings). This is because our expectation is that interest rates would fluctuate randomly so that bond returns would be above yields to maturity in some periods and below them in other periods. Thus, while it is true that utility equity returns are sensitive to interest rate changes, it is not true that interest rate risk will have a materially positive equity risk premium over the long run.

We now illustrate the above by first calculating the betas for the two-factor CAPM for our sample of seven utilities over the 1990-2002 period that have full data. In doing so, we use correct econometric procedures by using the orthogonalized long Canada bond returns. When this correct econometric procedure is used, **the market betas are the same as those obtained using the single-factor CAPM for each utility**, and the interest rate betas are the same as those obtained using the two-factor CAPM (without orthogonalization) for each utility. These results are reported in Schedule 4.D1. As expected, the beta estimates for each factor are positive (and generally) statistical significant at conventional levels.

Next, we calculate the bond market risk premia over various time periods up to 2003 that correspond to those used previously to calculate the MERPs. These results are reported in Schedule 4.D2. As expected, over long periods, such as 1965-2002, the mean bond market risk premium is only 30 basis points, and it becomes negative over the three progressively longer time periods of 1957-2002, 1951-2002 and 1936-2002. While it is positive and quite material over the 1980-2002 period at 1.745%, this is offset by the relatively low MERP of 2.797%. Furthermore, according to our expectations, all of the mean bond risk premiums are not significantly different from zero at conventional levels. In contrast, the mean MERPs are significantly different from zero for the two longest time periods of 1936-2002 (at 5% level) and 1951-2002 (at 12% level).

The two series of risk premiums (i.e., equities and bonds) are essentially uncorrelated at 0.02 over the full time period of 1936-2002. The highest correlation between these two series of risk premiums is 0.04 for the 1965-2002 time period.

Schedule 4.D1

This table provides the market and bond return betas for a sample of seven utilities based on the estimation of a two-factor CAPM over the period, 1990-2002. The three utilities that do not have data for the full time period are eliminated from the sample. They are Emera (Nova Scotia Power), Pacific Northern Gas and Enbridge. All betas are calculated using monthly total returns for the utility and the S&P/TSX Composite index.

Variable	BC Gas	Cdn Util.	Trans Alta Corp.	Trans Canada	Westcoast Energy	Atco Ltd.	Fortis Inc.	Mean, with Atco:		Highest, with Atco in
								In	Out	
Market beta	0.260	0.345	0.242	0.112	0.197	0.397	0.220	0.253	0.229	0.397
Orthogonalized bond return beta	0.364	0.443	0.568	0.756	0.409	0.494	0.415	0.493	0.493	0.756

Schedule 4.D2

This table provides the equity and bond market premiums over yields on long Canada's for various time periods. Since the data are drawn from the Canadian Institute of Actuaries, the longest time series with Canada bond data is for the time period, 1936-2002

Time Period	Equity market risk premia	Bond market risk premia	Total risk premia[a]		
			Atco In	Atco Out	Atco In; Highest Individual Beta
1936-2002	4.659	-0.069	1.147	1.035	1.798
1951-2002	3.653	-0.240	0.807	0.719	1.269
1957-2002	2.273	-0.013	0.569	0.515	0.893
1965-2002	1.574	0.301	0.547	0.509	0.852
1977-2002	2.797	1.745	1.568	1.501	2.430

[a]This is calculated using the mean betas for the utility sample given in Schedule 4.D1. For example, 1.147 = (.253 *x* 4.659) + (0.493 *x* -0.069).

Schedule 2.1

Forecasts for Canadian Interest Rates

September 30, 2007

Source	10-year Canada's	30-Year Canada's
Consensus Economics	4.50%	--
Bank of Montreal	4.10	4.20%
Bank of Nova Scotia	3.70	3.80
Toronto Dominion Bank	4.40	4.55
Average of bank forecasts	**4.07**	**4.18**
Average of bank forecasts plus 10 basis points rounded spread		**4.17**
Kryzanowski and Roberts forecast		**4.20**

September 30, 2008

Consensus Economics*	--	--
Bank of Montreal	4.90%	5.00%
Bank of Nova Scotia**	4.05	4.15
Toronto Dominion Bank	4.70	4.75
Average of bank forecasts	**4.55**	**4.63**
Average of bank forecasts plus 10 basis points rounded spread		**4.65**
Kryzanowski and Roberts forecast		**4.65**

*Consensus Economics does not provide a 2008 forecast
** Bank of Nova Scotia's forecast is for Q2 2008, the longest available.

Sources: Consensus Economics, September 2006; www.bmo.com/economic, North American Outlook, November 14, 2006; http://www.scotiacapital.com/English/bns_econ/forecast.pdf, Forecast Update, January 9, 2007, TD Quarterly Economic Forecast, December 19, 2006.

Schedule 2.2

Forecasts for U.S. Interest Rates

September 30, 2007

Source	10-year Treasuries	30-Year Treasuries
Consensus Economics	5.10%	--
Bank of Montreal	4.50	4.60%
Bank of Nova Scotia	4.25	4.35
Toronto Dominion Bank	4.80	4.95
Average of bank forecasts	**4.52**	**4.63**
Average of bank forecasts plus 8 basis points spread		**4.60**
Kryzanowski and Roberts forecast		**4.70**

September 30, 2008

Consensus Economics*	--	--
Bank of Montreal	5.20%	5.30%
Bank of Nova Scotia**	4.65	4.80
Toronto Dominion Bank	5.25	5.35
Average of bank forecasts	**5.03**	**5.15**
Average of bank forecasts plus 8 basis points spread		**5.11**
Kryzanowski and Roberts forecast		**5.20**

*Consensus Economics does not provide a 2008 forecast
** Bank of Nova Scotia's forecast is for Q2 2008, the longest available.

Sources: Consensus Economics, September 2006; www.bmo.com/economic, North American Outlook, November 14, 2006; http://www.scotiacapital.com/English/bns_econ/forecast.pdf, Forecast Update, January 9, 2007, TD Quarterly Economic Forecast, December 19, 2006.

Schedule 3.1

Senior Unsecured Debt Ratings for the Sample of Canadian Utilities

Corporate Issuer	DBRS		Standard & Poor's Rating
	Rating	Debt Rated	
Atco Ltd.	A (low)	Corporate	A
Canadian Utilities	A	Corporate	A
Emera Incorporated	BBB (high)	MTN	BBB
Enbridge Inc.	A	MTN and Unsecured Debentures	A-
Fortis Inc.	BBB (high)	Unsecured Debentures	BBB+
Pacific Northern Gas	BBB (low)	Secured Debentures	NR
TransAlta Corp.	BBB	MTN and Unsecured Debentures	BBB
TransCanada Corporation	A	Unsecured Debentures & Notes	A-
Median	A (low) / BBB(high)		A-

Sources: Dominion Bond Rating Service website: www.dbrs.com, Standard & Poor's website: www.standardandpoors.com, Bloomberg, February 2, 2007.

Schedule 3.2

Capital Structures for Utilities 2003-2005 (percentage of long-term capital)

Utility:	Long-term debt & debentures			Preferred Shares			Common Equity		
	2005	2004	2003	2005	2004	2003	2005	2004	2003
ATCO LTD.	67.51%	69.07%	68.50%	3.29%	3.33%	3.68%	29.19%	27.61%	27.84%
CANADIAN UTILITIES LIMITED	50.20%	51.57%	50.93%	11.01%	11.20%	12.42%	38.81%	37.25%	36.65%
EMERA INCORPORATED	50.00%	50.47%	50.27%	8.00%	8.10%	8.25%	42.03%	41.47%	41.51%
ENBRIDGE INC.	58.83%	60.34%	61.65%	1.17%	1.25%	1.33%	40.00%	38.41%	37.03%
FORTIS INC.	58.09%	58.76%	58.27%	8.72%	10.01%	6.95%	33.16%	31.27%	34.77%
PACIFIC NORTHERN GAS LIMITED	48.07%	50.78%	52.87%	3.14%	3.12%	3.08%	48.79%	46.10%	44.05%
TRANSALTA CORPORATION	41.09%	48.26%	50.31%	3.81%	3.42%	8.07%	55.10%	48.32%	41.63%
TRANS CANADA PIPELINES LTD.	55.93%	58.28%	59.36%	2.26%	2.33%	2.44%	41.81%	39.39%	38.20%
Average	53.72%	55.94%	56.52%	5.18%	5.35%	5.78%	41.11%	38.73%	37.71%

Source: Calculated with data from Scotia Capital and Financial Post Advisor.

Schedule 3.3

Coverage ratios, allowed and earned ROEs for selected utilities 2003-2005

Utility	Interest Coverage			Cash Flow to Debt			ROE		
	2005	2004	2003	2005	2004	2003	2005	2004	2003
ATCO LTD.	3.13	3.30	2.95	24.82	21.84	18.09	11.57	13.41	12.05
CANADIAN UTILITIES LIMITED	3.24	3.44	3.33	25.30	21.43	17.80	12.24	15.19	13.71
EMERA INCORPORATED	2.46	2.62	2.46	8.71	16.23	12.71	9.03	9.80	9.77
ENBRIDGE INC.	2.41	2.73	2.90	9.57	10.94	5.37	13.90	16.43	17.31
FORTIS INC.	2.24	2.25	2.25	11.97	11.18	13.68	12.39	11.25	12.28
PACIFIC NORTHERN GAS LIMITED	2.46	2.19	2.29	12.89	17.81	13.13	8.34	6.97	7.59
TRANSALTA CORPORATION	2.24	1.94	2.71	22.18	18.77	23.05	7.45	5.97	8.67
TRANS CANADA CORPORATION	3.03	2.72	2.53	15.21	14.35	17.19	17.56	15.49	12.80
Average	2.65	2.65	2.68	16.33	16.57	15.13	11.56	11.81	11.77

Source: Financial Post Advisor.

Schedule 3.4

Allowed vs. Actual Rates of Return on Equity for 2005

Utility	Allowed Return (%)	Actual ROE for Consolidated Company (%)
ATCO LTD.		11.57
ATCO ELECTRIC TRANSMISSION	9.50	
ATCO ELECTRIC DISTRIBUTION	9.50	
ATCO GAS	9.50	
ATCO PIPELINES	9.50	
CANADIAN UTILITIES LIMITED		
EMERA (NOVA SCOTIA POWER)	9.55	9.03
ENBRIDGE	9.57	13.90
FORTIS INC.		12.39
ALBERTA	9.50	
BRITISH COLUMBIA	9.43	
PACIFIC NORTHERN GAS LIMITED	9.68	8.34
TRANSALTA CORPORATION	9.50	7.45
TRANS CANADA PIPELINES LTD.	9.46	17.56
Average	**9.56**	**11.46**

Sources: Schedule 4, Board decisions.

Schedule 3.5

Allowed Common Equity Ratios

Utility	Allowed	Decision
ATCO LTD.		
ATCO ELECTRIC		
TRANSMISSION	33.00	EUB 2004-052,
DISTRIBUTION	37.00	U2005-410
ATCO GAS	38.00	
ATCOM PIPELINES	42.00	
CANADIAN UTILITIES LIMITED		
ENBRIDGE GAS DISTRIBUTION	35.00	RP-2002-0158
EMERA (NOVA SCOTIA POWER)	37.50	NSUARB-P-882
FORTIS INC.		
ALBERTA	37.00	EUB 2004-052
BRITISH COLUMBIA	40.00	G-14-06
PACIFIC NORTHERN GAS LIMITED	40.00	G-14-06
TRANSALTA CORPORATION	45.00	U99099
TRANS CANADA PIPELINES LTD.	36.00	RH-2-2004
Average	**38.22**	

Source: Board decisions.

Schedule 3.6
Past Board Decisions for Northwest Territories Power Corporation

Test Year	Allowed Equity Ratio	Allowed Equity Return	Decision
2002-3	43%	9.50%	1-2002
2001-2	40%	9.50%	
1997-8	43.017%	11.50%	1-1997
1996-7	43.213%	11.75%	
1995-6	45.796%	11.75%	
1992-3	44.759%	11.00%	9-1993
1991-2	47.294%	11.00%	
1990-91	46.90%	13.50%	1-1991
1989-90	49.16%	13.50%	

Source: Board decisions

Schedule 3.7

Four Benchmarks for Common Equity Ratio

1. Average of actual equity ratios for 10 traded utilities (Schedule 3.2)	41.11%
2. Average allowed equity ratio for sample of 11 regulated utilities (Schedule 3.5)	38.22%
3. Range of allowed equity ratios for Alberta high-risk utilities	40 - 43%
4. Range of past Board decisions for NTPC 1997 to present	40-43%
Range of benchmarks (rounded)	**38 – 43%**

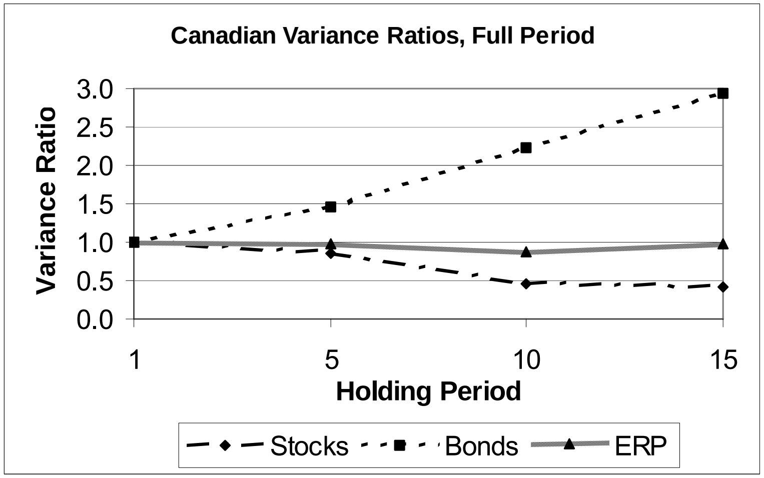
Schedule 4.1

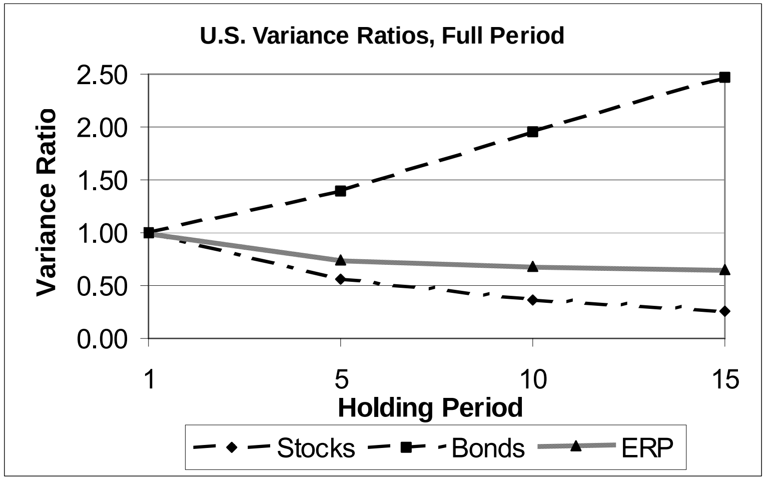
This schedule reports the variance ratios for holding periods of 5, 10 and 15 years relative to a benchmark holding period of 1 year for stocks, long bonds and risk premia for Canada and the United States. The Canada data are annual from the Canadian Institute of Actuaries for the period 1924-2002. The US data are annual from Ibbotson for the period 1927-2002. A variance ratio of one indicates no aversion or reversion of the mean of the series. A variance ratio less than one indicates mean reversion, and a variance ratio greater than one indicates mean aversion. MERP is the market equity risk premium.

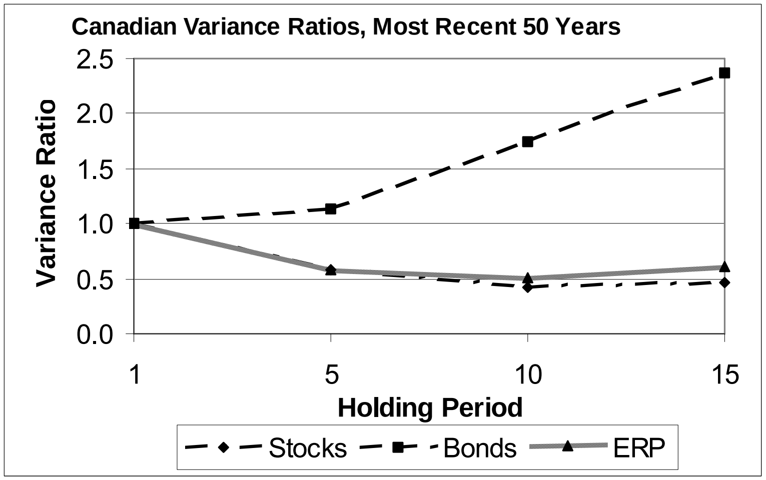
	1 year Holding Periods			5 Year Holding Periods			10 Year Holding Periods			15 Year Holding Periods		
	Stocks	Bonds	MERP	Stocks	Bonds	MERP	Stocks	Bonds	MERP	Stocks	Bonds	MERP
Panel A: CIA data, 1924-2002 (79 years)												
Var.	0.0348	0.0080	0.0415	0.1476	0.0581	0.2012	0.1563	0.1791	0.3614	0.2127	0.3533	0.6031
Var. Ratio	1.0000	1.0000	1.0000	0.8475	1.4487	0.9698	0.4487	2.2327	0.8710	0.4070	2.9363	0.9689
Panel B: CIA data, 1953-2002 (Most recent 50 years ending in 2002)												
Var.	0.0271	0.0108	0.0370	0.0767	0.0749	0.1381	0.1007	0.2112	0.2522	0.1043	0.4002	0.3605
Var. Ratio	1.0000	1.0000	1.0000	0.5648	1.3856	0.7472	0.3711	1.9541	0.6821	0.2560	2.4684	0.6500
Panel C: Ibbotson data, 1927-2002 (76 years)												
Var.	0.0425	0.0090	0.0465	0.1223	0.0510	0.1353	0.1812	0.1561	0.2353	0.3011	0.3172	0.4231
Var. Ratio	1.0000	1.0000	1.0000	0.5749	1.1391	0.5816	0.4259	1.7436	0.5059	0.4718	2.3628	0.6063
Panel D: Ibbotson data, 1953-2002 (Most recent 50 years ending in 2002)												
Var.	0.0317	0.0121	0.0379	0.0885	0.0664	0.0941	0.1931	0.1846	0.1201	0.3312	0.3660	0.1609
Var. Ratio	1.0000	1.0000	1.0000	0.5585	1.0992	0.4964	0.6094	1.5267	0.3168	0.6971	2.0184	0.2829

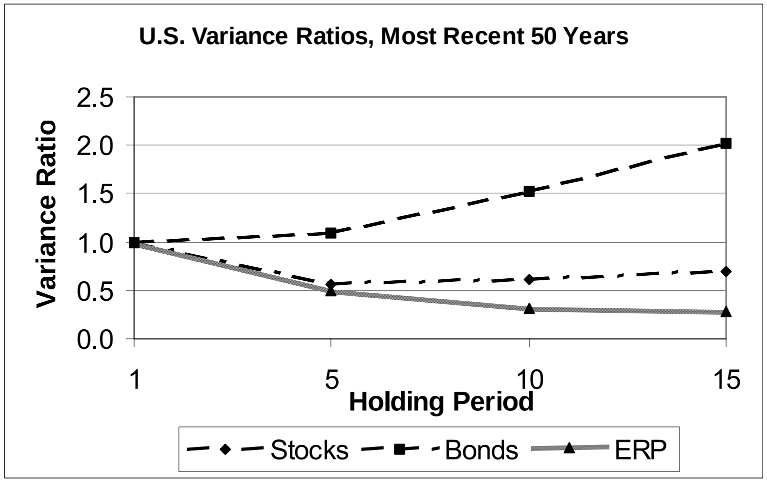
Schedule 4.2

The following are plots of the variance ratios presented in Schedule 4.1. A variance ratio of one indicates no aversion or reversion of the mean of the series. A variance ratio greater than one indicates mean aversion, and a variance ratio less than one indicates mean reversion. ERP is the equity risk premium at the market level.









Drs. Kryzanowski and Roberts, NTPC GRA 2006/07 and 2007/08, March 2007.

Schedule 4.3

This table contains various estimates of the historical annual risk premiums of stocks over the risk-free rate for various time periods using both nominal and real returns. Stocks are proxied by the returns on the S&P/TSX Composite index or its counterpart for more distant time periods. The risk-free rate is proxied by the returns on Long Canada's or its counterpart for more distant time periods.

Time Period	Arithmetic Mean			Geometric mean			Weighted Risk Premium[a]
	Stock Returns	Long Canada Returns	Risk Premium	Stock Returns	Long Canada Returns	Risk Premium	
Panel A: Based on updated Dimson et al. data (N for nominal returns; R for real returns)[b,c]							
1900-2006 (107 yrs), N			5.78			4.28	5.41
1900-2006 (107 yrs), R			5.13			3.54	4.73
Panel B: Based on CIA nominal return data[c]							
1924-2006 (83 yrs)	11.87%	6.50%	5.36%	10.30%	6.16%	3.42%	4.88%
1936-2006 (71 yrs)	11.67%	6.53%	5.14%	10.46%	6.16%	3.50%	4.73%
1951-2006 (56 yrs)	11.82%	7.34%	4.47%	10.65%	6.91%	2.81%	4.06%
1957-2006 (50 yrs)	11.12%	8.06%	3.06%	9.94%	7.60%	1.39%	2.64%
1965-2006 (42 yrs)	11.24%	8.95%	2.29%	10.13%	8.45%	0.66%	1.89%
1977-2006 (30 yrs)	13.24%	10.73%	2.51%	12.15%	10.19%	0.78%	2.08%
Panel C: Based on CIA real return data[c]							
1924-2006 (83 yrs)	8.60%	3.48%	5.12%	7.06%	3.05%	3.25%	4.65%
1936-2006 (71 yrs)	7.61%	2.65%	4.96%	6.35%	2.21%	3.47%	4.59%
1951-2006 (56 yrs)	7.69%	3.41%	4.29%	6.52%	2.91%	2.77%	3.91%
1957-2006 (50 yrs)	6.79%	3.87%	2.92%	5.60%	3.35%	1.41%	2.54%
1965-2006 (42 yrs)	6.43%	4.28%	2.15%	5.30%	3.70%	0.69%	1.78%
1977-2006 (30 yrs)	8.68%	6.35%	2.33%	7.64%	5.76%	0.78%	1.94%

[a]The weighted risk premium is found by taking 75% of the arithmetic mean risk premium plus 25% of the geometric mean risk premium.
[b]Updated using data from CIA for 2003-5.
[c]Updated using data from Scotia Capital, Fixed Income Research, *Annual Investment Returns*, January 2007.
Source: Canadian Institute of Actuaries (CIA), *Report on Canadian Economic Statistics, 1924-2005*. DMS module, Ibbotson Associates, 1900-2003.

Schedule 4.4

This schedule reports historical real returns and equity risk premia for the United States for the period, 1802-September 2001. "Comp." refers to the compound or geometric mean annual rate of return; "Arith." refers to the arithmetic mean annual rate of return; and "Weighted" refers to our equal-weighted average of the geometric and arithmetic mean annual rates of return. The data are drawn from Table 1 in Jeremy J. Siegel, Historical results I, *Equity Risk Premium Forum*, November 8, 2001, p. 31, available on the AIMR website.

	Real Return				Equity Risk Premium Over Bonds		
	Stocks		Bonds				
Period	Comp.	Arith.	Comp.	Arith.	Comp.	Arith.	Weighted
1802-2001	6.8	8.4	3.5	3.9	3.4	4.5	4.0
1871-2001	6.8	8.5	2.8	3.2	3.9	5.3	4.6
Major Subperiods							
1802-1870	7.0	8.3	4.8	5.1	2.2	3.2	2.7
1871-1925	6.6	7.9	3.7	3.9	2.9	4.0	3.5
1926-2001	6.9	8.9	2.2	2.7	4.7	6.2	5.5
Post World War II							
1946-2001	7.0	8.5	1.3	1.9	5.7	6.6	6.2
1946-1965	10.0	11.4	-1.2	-1.0	11.2	12.3	11.8
1966-1981	-0.4	1.4	-4.2	-3.9	3.8	5.2	4.5
1982-1999	13.6	14.3	8.4	9.3	5.2	5.0	5.1
1982-2001	10.2	11.2	8.5	9.4	1.7	1.9	1.8

Schedule 4.5

This schedule reports historical returns for stock and long governments and equity risk premia for the United States for the period, 1900-2006, and various subsets thereof.

Time Period	Arithmetic Mean Returns			Geometric Mean Returns			Weighted Risk Premium[a]
	Stock	Long Gov't	Risk Premium	Stock	Long Gov't	Risk Premium	
Panel A: Based on updated Dimson et al. data (N for nominal returns; R for real returns)[b]							
1900-2006 (107 yrs), N			0.0656			0.0461	0.0607
1900-2006 (107 yrs), R			0.0620			0.0417	0.0569
Panel B: Based on nominal return data from Ibbotson Associates							
1926-2006 (81 yrs)	0.1234	0.0579	0.0655	0.1042	0.0542	0.0439	0.0601
1936-2006 (71 yrs)	0.1256	0.0588	0.0668	0.1108	0.0548	0.0491	0.0624
1951-2006 (56 yrs)	0.1299	0.0652	0.0647	0.1167	0.0604	0.0472	0.0603
1957-2006 (50 yrs)	0.1191	0.0728	0.0462	0.1062	0.0677	0.0295	0.0421
1965-2006 (42 yrs)	0.1173	0.0806	0.0367	0.1046	0.0750	0.0213	0.0329
1977-2006 (30 yrs)	0.1356	0.0962	0.0394	0.1247	0.0897	0.0239	0.0355
Panel C: Based on real return data from Ibbotson Associates							
1926-2006 (81 yrs)	0.0912	0.0281	0.0631	0.0717	0.0231	0.0419	0.0578
1936-2006 (71 yrs)	0.0860	0.0207	0.0653	0.0697	0.0157	0.0489	0.0612
1951-2006 (56 yrs)	0.0901	0.0271	0.0630	0.0758	0.0215	0.0468	0.0590
1957-2006 (50 yrs)	0.0767	0.0319	0.0448	0.0631	0.0261	0.0294	0.0409
1965-2006 (42 yrs)	0.0701	0.0350	0.0352	0.0566	0.0283	0.0212	0.0317
1977-2006 (30 yrs)	0.0900	0.0532	0.0368	0.0790	0.0455	0.0226	0.0333

[a]The weighted risk premium is found by taking 75% of the arithmetic mean risk premium plus 25% of the geometric mean risk premium.
[b]Updated using data from Bloomberg for equities and Ibbotson for Long Gov't.
Source: Ibbotson Associates.

Schedule 4.6

This schedule reports the arithmetic mean equity risk premiums based on nominal and real returns for three different time periods for Canada and the US. It also reports the US nominal and real equity risk premiums after they are adjusted for any differences in risk from the Canadian equity risk premium. This procedure is valid for market indices but not market sectors or individual firms. The data sources for the equity risk premiums are given in the previous schedules.

Country	Type of Return	Mean	Standard Deviation	Adjusted Mean
Panel A: 1900-2006 based on updated Dimson data				
Canada	Nominal	0.0578	0.1789	
US	Nominal	0.0656	0.2008	0.0585
Canada	Real	0.0513	0.1798	
US	Real	0.0620	0.2026	0.0550
Panel A: 1926-2006 based on Ibbotson data				
Canada	Nominal	0.0516	0.2010	
US	Nominal	0.0655	0.2107	0.0625
Canada	Real	0.0492	0.1963	
US	Real	0.0631	0.2076	0.0597
Panel A: 1957-2006 based on Ibbotson data (most recent 50 years)				
Canada	Nominal	0.0306	0.1864	
US	Nominal	0.0462	0.1846	0.0467
Canada	Real	0.0292	0.1774	
US	Real	0.0448	0.1772	0.0448

Schedule 4.7

This schedule reports the implied market equity risk premiums for the S&P/TSX Composite index using various growth rates and both the one- and two-stage dividend growth models. The implied MERP is found by subtracting the then Long Canada rate from the implied rate of return generated from solving the specific DDM. g(D) and g(GNP) are the trailing annual growth rates in index dividends and in nominal GNP, which are smoothed by using a 10-year equally-weighted average. g_1(D) and g_2(GNP) are the growth rates for the first and second stage of the DDM, respectively. D/P adj. is equal to 1.5 times the dividend yield to adjust for nondividend cash distributions. L10yrs and L20yrs refer to the most recent 10 and 20 years of implied MERPs.

Year	1-stage DDM			2-stage DDM	Year	1-stage DDM			2-stage DDM
	Using g(D) & No D/Padj.	Using g(GNP) No D/P adj.	Using g(GNP) D/P adj.	Using g_1(D) & g_2(GNP) No D/P adj.		Using g(D) & No D/P adj.	Using g(GNP) No D/P adj.	Using g(GNP) D/P adj.	Using g_1(D) & g_2(GNP) No D/P adj.
1971	1.48	6.05	7.78	5.43	1989	-0.01	2.70	4.47	2.32
1972	-0.19	5.21	6.64	4.61	1990	-2.09	1.55	3.62	0.96
1973	0.79	6.27	8.02	5.54	1991	-2.90	1.10	2.79	0.55
1974	3.38	8.85	11.95	7.64	1992	-2.44	1.04	2.67	0.58
1975	1.02	7.70	10.45	6.39	1993	-2.71	1.12	2.32	0.74
1976	1.16	8.75	11.37	7.35	1994	-5.12	-1.11	0.15	-1.53
1977	1.12	8.79	11.44	7.36	1995	-3.11	0.20	1.40	-0.13
1978	1.33	7.64	10.12	6.51	1996	-2.85	0.22	1.18	-0.04
1979	1.51	5.88	8.13	5.15	1997	-2.57	0.62	1.47	0.38
1980	1.42	4.68	6.75	4.17	1998	-3.77	0.74	1.60	0.41
1981	0.88	3.48	6.03	2.99	1999	-6.39	-0.77	-0.09	-1.09
1982	2.70	5.86	8.13	5.31	2000	-5.23	0.57	1.23	0.25
1983	0.09	3.75	5.55	3.24	2001	-3.52	0.88	1.69	0.58
1984	-0.59	3.59	5.64	2.93	2002	-1.29	1.92	2.92	1.64
1985	0.48	4.08	5.81	3.59					
1986	1.19	3.76	5.40	3.42	Mean, full	-0.79	3.46	5.18	2.88
1987	0.21	2.67	4.36	2.34	Mean, L20 yrs	-2.10	1.57	2.94	1.18
1988	0.65	2.86	4.70	2.53	Mean, L10 yrs	-3.66	0.44	1.39	0.12

Schedule 4.8

This schedule reports the implied market equity risk premia for the S&P500 index using various growth rates and both the one- and two-stage dividend growth models. The implied MERP is found by subtracting the then Long bond rate from the implied rate of return generated from solving the specific DDM. g(D) and g(GNP) are the trailing annual growth rates in index dividends and in nominal GNP, which are smoothed by using a 10-year equally-weighted average. g_1(D) and g_2(GNP) are the growth rates for the first and second stage of the DDM, respectively. D/P adj. is equal to 1.5 times the dividend yield to adjust for nondividend cash distributions. L10yrs and L20yrs refer to the most recent 10 and 20 years of implied MERPs.

	1-stage DDM			2-stage DDM		1-stage DDM			2-stage DDM
	Using g(D) & No D/Padj.	Using g(GNP)		Using g_1(D) & g_2(GNP)		Using g(D) & No D/P adj.	Using g(GNP)		Using g_1(D) & g_2(GNP)
Year		No D/P adj.	D/P adj.	No D/P adj.	Year		D/P adj.	No D/P adj.	No D/P adj.
1971	1.88	4.96	6.62	4.54	1989	2.81	3.32	5.11	3.25
1972	0.57	4.88	6.34	4.38	1990	2.76	2.67	4.67	2.69
1973	1.63	5.68	7.68	5.04	1991	2.96	3.01	4.67	3.00
1974	2.01	6.92	9.86	5.85	1992	2.63	3.10	4.64	3.03
1975	-0.85	5.20	7.45	4.18	1993	3.20	3.15	4.59	3.15
1976	1.23	6.48	8.62	5.63	1994	0.90	1.16	2.70	1.12
1977	2.86	7.29	10.08	6.37	1995	2.48	2.43	3.65	2.44
1978	2.31	6.89	9.85	5.89	1996	2.12	1.65	2.71	1.69
1979	2.00	6.21	9.26	5.27	1997	1.39	1.55	2.40	1.54
1980	-0.30	3.23	5.85	2.53	1998	1.53	2.12	2.82	2.08
1981	0.43	2.87	5.94	2.31	1999	-1.47	0.27	0.87	0.17
1982	3.01	4.64	7.34	4.30	2000	-1.13	1.49	2.14	1.34
1983	-0.03	3.10	5.48	2.53	2001	-1.68	1.57	2.29	1.36
1984	1.38	3.81	6.39	3.33	2002	0.21	2.88	3.83	2.66
1985	3.22	4.46	6.58	4.25					
1986	3.46	5.59	7.43	5.27	Mean, full	1.47	3.72	5.58	3.35
1987	1.61	3.74	5.75	3.39	Mean, L20 yrs	1.52	2.70	4.18	2.55
1988	1.97	2.91	4.90	2.76	Mean, L10 yrs	0.75	1.83	2.80	1.76

Schedule 4.9

This schedule reports the implied market equity risk premiums or MERPs for the S&P/TSX Composite and S&P500 index using various forecasts of future growth in dividends based on the one- and two-stage dividend discount models or DDMs. The implied MERP is found by subtracting a long-term bond rate estimate from the implied rate of return generated from solving the one- or two-stage DDM. The Long Bond Rate is the consensus forecast for 10-year Government bonds for Canada and the United States for 2007 (Consensus Economics, Consensus Forecasts, October 9, 2006). The level of the respective indexes and their dividend (div.) yields are obtained from Bloomberg as of February 1, 2007. For case 1, the short-term growth estimate is obtained from Bloomberg as the change in index earnings forecast for 2007 compared to the estimated index earnings for 2006, and the long-term growth rate is the consensus estimate of nominal GNP growth for 2012 (Consensus Economics, Consensus Forecasts, October 9, 2006). For case 2, the growth estimates for the first five years are the consensus estimates of nominal GNP growth for those years and the long-term growth rate is the consensus estimate of nominal GNP growth for 2012 (Consensus Economics, Consensus Forecasts, October 9, 2006). For case 3, the growth estimates for the first five years are the consensus estimates of pre-tax corporate profit growth for those years and the long-term growth rate is the consensus estimate of pre-tax corporate profit growth for 2012 (Consensus Economics, Consensus Forecasts, November 13, 2006). For case 4, 2% is added to the growth estimates for each year in case 3. For cases 2, 3 and 4, the reported short-term growth rate and one-stage DDM use the average consensus expectations for the first five years going forward.

Case	Div. Yield %	Short-term Growth Estimate %	Long-term Growth Estimate %	Long Bond Rate %	Implied MERP %: Two-stage DDM	Implied MERP %: One-stage DDM using short-term growth	Implied MERP %: One-stage DDM using long-term growth
S&P/TSX Composite (Canada)							
1	2.33%	3.01%	4.60%	4.20%	2.67%	1.21%	2.84%
2	2.33%	4.74%	4.60%	4.20%	2.86%	2.98%	2.84%
3	2.33%	4.42%	4.70%	4.20%	2.91%	2.65%	2.94%
4	2.33%	6.74%	6.60%	4.20%	4.91%	5.03%	4.88%
S&P 500 (United States)							
1	1.77%	5.97%	5.30%	5.00%	2.22%	2.85%	2.16%
2	1.77%	5.34%	5.30%	5.00%	2.86%	2.20%	2.16%
3	1.77%	4.70%	4.90%	5.00%	2.91%	1.55%	1.76%
4	1.77%	7.34%	7.30%	5.00%	4.20%	4.24%	4.20%

Schedule 4.10

This table provides the rolling five-year betas for our sample of ten utilities. If thin or no trading plagues any five-year period, we do not calculate a beta for that utility. This was the case for Emera for the first three rolling five-year time periods, for Pacific Northern Gas for the first six rolling five-year time periods, and Enbridge for the first two rolling five-year time periods. All betas are calculated using monthly total returns for the utility and the S&P/TSX Composite index. "w/o" refers to without.

Five-year period	Terasen[c]	Cdn Utilities	Emera[a]	Pacific Northern Gas	TransAlta Corp.	Trans Canada Pipe	Duke[b]	Enbridge Inc.	Atco Ltd.	Fortis Inc.	Mean	Mean, w/o Duke	Mean, w/o Atco	Mean, w/o Duke & Atco	Mean, w/o Terasen & Duke
1990-94	0.608	0.592			0.558	0.574	0.571		0.715	0.462	0.583	0.585	0.561	0.559	0.580
1991-95	0.635	0.498			0.606	0.540	0.557		0.712	0.533	0.583	0.587	0.561	0.562	0.578
1992-96	0.562	0.561			0.585	0.489	0.611	0.498	0.600	0.390	0.537	0.526	0.528	0.514	0.520
1993-97	0.474	0.634	0.405		0.462	0.338	0.531	0.440	0.546	0.310	0.460	0.451	0.449	0.438	0.448
1994-98	0.479	0.616	0.564		0.536	0.544	0.453	0.478	0.623	0.484	0.531	0.540	0.519	0.529	0.549
1995-99	0.352	0.530	0.415		0.265	0.224	0.253	0.237	0.509	0.320	0.345	0.357	0.325	0.335	0.357
1996-00	0.243	0.361	0.276	0.457	0.048	0.170	0.128	0.046	0.377	0.216	0.232	0.244	0.216	0.227	0.244
1997-01	0.168	0.249	0.206	0.437	0.061	-0.068	-0.098	-0.128	0.280	0.133	0.124	0.149	0.107	0.132	0.146
1998-02	0.115	0.184	0.155	0.453	0.082	-0.079	-0.011	-0.199	0.210	0.132	0.104	0.117	0.093	0.106	0.117
1999-03	0.020	0.050	-0.053	0.354	-0.063	-0.377	-0.087	-0.398	0.039	-0.046	-0.056	-0.053	-0.067	-0.064	-0.062
2000-04	-0.007	0.033	-0.015	0.468	0.138	-0.170	0.006	-0.318	0.092	0.031	0.026	0.028	0.018	0.020	0.032
2001-05	0.074	0.112	0.054	0.507	0.417	-0.173	0.094	-0.182	0.282	0.227	0.141	0.146	0.126	0.129	0.156
2002-06		0.210	0.084	0.472	0.427	0.318	0.813	0.221	0.354	0.480	0.375	0.321	0.378	0.316	0.321
Mean	0.310	0.356	0.209	0.450	0.317	0.179	0.294	0.063	0.411	0.282	0.307	0.308	0.293	0.293	0.307
First eight rolling periods											0.424	0.430	0.408	0.412	0.428
Last five rolling periods											0.118	0.112	0.110	0.101	0.113

[a]Holding company for Nova Scotia Power. [b]Holding company for Westcoast Energy. [c]Formerly B.C. Gas & bought by Kinder Morgan Inc. in November 30, 2005. The Kinder Morgan family trades as 3 separate firms on the NYSE.
Source: *CFMRC*. Updated using Bloomberg for 2006.

Schedule 4.11

This table provides the rolling five-year correlations for our sample of ten utilities with the market. If thin or no trading plagues any five-year period, we do not calculate a correlation for that utility. This was the case for Emera for the first three rolling five-year time periods, for Pacific Northern Gas for the first six rolling five-year time periods, and Enbridge for the first two rolling five-year time periods. All correlations (rhos) are calculated using monthly total returns for the utility and the S&P/TSX Composite index.

Five-year period	Terasen	Cdn Utilities	Emera	Pacific North. Gas	Trans Alta Corp.	Trans Canada Pipe	Duke	Enbridge Inc.	Atco Ltd.	Fortis Inc.	Mean Rho				
											All In	Atco Out	DukeOut	Atco & Duke Out	Terasen & Duke Out
1990-94	0.571	0.581			0.458	0.492	0.407		0.468	0.485	0.495	0.483	0.509	0.517	0.497
1991-95	0.544	0.485			0.523	0.506	0.362		0.447	0.494	0.480	0.490	0.500	0.510	0.491
1992-96	0.513	0.512			0.579	0.481	0.415	0.440	0.439	0.391	0.471	0.476	0.479	0.486	0.474
1993-97	0.476	0.619	0.445		0.456	0.310	0.414	0.325	0.451	0.361	0.429	0.426	0.430	0.428	0.424
1994-98	0.557	0.655	0.605		0.553	0.464	0.440	0.442	0.571	0.603	0.543	0.540	0.556	0.554	0.531
1995-99	0.363	0.554	0.427		0.229	0.171	0.282	0.221	0.480	0.424	0.350	0.334	0.359	0.341	0.358
1996-00	0.238	0.358	0.300	0.289	0.043	0.117	0.114	0.042	0.291	0.311	0.210	0.201	0.221	0.212	0.219
1997-01	0.167	0.274	0.236	0.233	0.050	-0.049	-0.085	-0.110	0.237	0.188	0.114	0.101	0.136	0.124	0.132
1998-02	0.114	0.204	0.180	0.224	0.068	-0.058	-0.008	-0.201	0.173	0.180	0.087	0.078	0.098	0.089	0.096
1999-03	0.018	0.051	-0.059	0.150	-0.047	-0.272	-0.049	-0.351	0.029	-0.056	-0.059	-0.068	-0.060	-0.071	-0.069
2000-04	-0.006	0.032	-0.017	0.185	0.106	-0.136	0.003	-0.260	0.064	0.035	0.001	-0.006	0.000	-0.008	0.001
2001-05	0.065	0.062	0.055	0.211	0.300	-0.188	0.049	-0.162	0.230	0.187	0.081	0.064	0.084	0.066	0.087
2002-06		0.089	0.071	0.223	0.300	0.303	0.367	0.201	0.208	0.291	0.228	0.231	0.211	0.211	0.211
Mean	0.302	0.344	0.224	0.217	0.278	0.165	0.209	0.053	0.315	0.300	0.264	0.258	0.271	0.266	0.265
First 8 rolling periods											0.387	0.381	0.399	0.397	0.391
Last 5 rolling periods											0.068	0.060	0.067	0.058	0.065

Source: *CFMRC*. Updated using Bloomberg for 2006.

Schedule 4.12

This schedule reports time-series mean monthly variances (in decimal) at the industry-level using the indirect decomposition method of Campbell et al (2001) based on all firms on the TSX for the 1975-2003 and 1994-2003 periods. The 47 industry groups, which are arranged in alphabetical order, are those used by Fama and French (1997). The number of firms is based on the total period. "Utilities as % of 44-industry mean" results from the elimination of the 3 industries with the highest variances. "40-Industry mean" is the cross-sectional mean of the time-series means of all industries with at least 10 firms in them. "Utilities as % of 39-industry mean" results from the elimination of the industry with the highest variance from the 40-Industry mean.

Industry	# Firms	1973-2003	1994-2003	Industry	# Firms	1973-2003	1994-2003
Agriculture	3	0.0135	0.0259	Nonmetallic Mining	240	0.0022	0.0019
Aircraft	17	0.0062	0.0083	Personal Services	13	0.0114	0.0090
Alcoholic Beverages	26	0.0028	0.0027	Petrol & Natural Gas	656	0.0017	0.0019
Apparel	22	0.0048	0.0055	Pharmaceutical	59	0.0077	0.0064
Automobiles & Trucks	50	0.0032	0.0030	Precious Metals	366	0.0071	0.0098
Banking	98	0.0019	0.0024	Printing & Publishing	26	0.0761	0.2158
Business Services	218	0.0034	0.0034	Real Estate	90	0.0025	0.0018
Business Supplies	52	0.0019	0.0019	Recreational Products	15	0.0092	0.0129
Candy and Soda	6	0.0083	0.0153	Restaurants, Hotel, Motel	34	0.0034	0.0035
Chemicals	44	0.0029	0.0032	Retail	117	0.0015	0.0015
Coal	9	0.0373	0.0853	Rubber & Plastic	13	0.0040	0.0046
Computers	48	0.0036	0.0056	Shipbuilding, Railroad	3	0.0704	0.0124
Construction	23	0.0050	0.0065	Shipping Containers	4	0.0196	0.0290
Construction Materials	42	0.0029	0.0019	Steel Works, Etc.	43	0.0025	0.0037
Consumer Goods	24	0.0034	0.0031	Telecommunications	93	0.0026	0.0039
Defense	1	0.0137	0.0065	Textiles	15	0.0086	0.0118
Electrical Equipment	21	0.0079	0.0154	Tobacco Products	1	0.0881	0.2452
Electronic Equipment	73	0.0064	0.0119	Trading	331	0.0016	0.0010
Entertainment	45	0.0036	0.0045	Transportation	66	0.0019	0.0018
Food Products	34	0.0030	0.0040	Utilities	52	0.0017	0.0020
Healthcare	16	0.0056	0.0056	Wholesale	120	0.0021	0.0018
Insurance	41	0.0019	0.0018	47-industry mean		0.0109	0.0180
Machinery	91	0.0023	0.0018	Utilities as % of 47-industry mean		15.33%	11.19%
Measure & Control Equip.	11	0.0190	0.0199	Utilities as % of 44-industry mean		26.54%	29.51%
Medical Equipment	13	0.0171	0.0160	40-industry mean		0.0065	0.0107
Miscellaneous	11	0.0036	0.0039	Utilities as % of 40-industry mean		25.64%	18.87%
				Utilities as % of 39-industry mean		35.35%	37.16%

Schedule 4.13

This table reports the % issue fees for Canadian utilities based on issues over the five-year period, 1997-2001

Type of financing	Maturity[a]	Number of issues	Median %Fee	Amortization period in years	Annual Amortized % Fee
Debt	< 10 years	52	0.37		
Debt	> 10 years	52	0.50	20	0.025
Preferred		16	3.00	50	0.06
Common		15	4.00	50	0.08

Issuers with following SIC codes: 4612 (crude petroleum pipelines), 4911 (electric services), 4922 (natural gas transmission), 4923 (natural gas transmission and distribution), and 4924 (natural gas distribution). Debt maturity is measured as maturity date compared to announcement date of the issue.

Source: *Financial Post Data Group*.

Schedule 5.1

This schedule lists the five outstanding debt issues with sinking funds for NTPC. It also provides the issue dates of the five issues with sinking funds and their outstanding amounts for the six fiscal year ends from 2001 through 2006.

Debentures with sinking funds	Issue Date	Amount Outstanding (000s)					
		2006	2005	2004	2003	2002	2001
11% sinking fund debentures, due March 9, 2009	09/03/1989	20,000	20,000	20,000	20,000	20,000	20,000
10 ¾% sinking fund debentures, due May 28, 2012	28/05/1992	20,000	20,000	20,000	20,000	20,000	20,000
11 1/8% sinking fund debentures, due June 6, 2011	06/06/1991	15,000	15,000	15,000	15,000	15,000	15,000
6.33% redeemable sinking fund debentures, due October 27, 2018	27/10/1998	10,000	10,000	10,000	10,000	10,000	10,000
8.41% redeemable sinking fund debentures, due February 27, 2026	27/02/1996	8,700	8,700	8,700	8,700	8,700	20,000

Source: Various Annual Reports, NTPC.

Schedule 5.2

This schedule illustrates the effect on the embedded cost of debt from using the NTPC method of calculation and a mid-year convention. The example assumes the following: The regulated utility issues $20 million of 10% debentures with a ten-year maturity and a sinking fund that has no embedded options, and that the bond indenture specifies annual end-of-year payments of $2 million into the sinking fund less sinking fund earnings for the year. It also assumes that the sinking fund earns a constant annual rate of return (ROR) of 6%, 8%, 10% or 12% over its life.

Variable:	End of Year									
	1	2	3	4	5	6	7	8	9	10
Interest Paid	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**
Sinking Fund Earnings:										
With 6% ROR	**0.00**	**0.12**	**0.24**	**0.36**	**0.48**	**0.60**	**0.72**	**0.84**	**0.96**	**1.08**
With 8% ROR	**0.00**	**0.16**	**0.32**	**0.48**	**0.64**	**0.80**	**0.96**	**1.12**	**1.28**	**1.44**
With 10% ROR	**0.00**	**0.20**	**0.40**	**0.60**	**0.80**	**1.00**	**1.20**	**1.40**	**1.60**	**1.80**
With 12% ROR	**0.00**	**0.24**	**0.48**	**0.72**	**0.96**	**1.20**	**1.44**	**1.68**	**1.92**	**2.16**
Loan Principal	**20.00**	**20.00**	**20.00**	**20.00**	**20.00**	**20.00**	**20.00**	**20.00**	**20.00**	**20.00**
Sinking Fund Value	**2.00**	**4.00**	**6.00**	**8.00**	**10.00**	**12.00**	**14.00**	**16.00**	**18.00**	**20.00**

Embedded cost of debt based on the mid-year convention and the NTPC method of calculation:

Given a sinking fund ROR of:	Mid-year								
	1/2	2/3	3/4	4/5	5/6	6/7	7/8	8/9	9/10
6%	**11.41%**	**12.13%**	**13.08%**	**14.36%**	**16.22%**	**19.14%**	**24.40%**	**36.67%**	**98.00%**
8%	**11.29%**	**11.73%**	**12.31%**	**13.09%**	**14.22%**	**16.00%**	**19.20%**	**26.67%**	**64.00%**
10%	**11.18%**	**11.33%**	**11.54%**	**11.82%**	**12.22%**	**12.86%**	**14.00%**	**16.67%**	**30.00%**
12%	**11.06%**	**10.93%**	**10.77%**	**10.55%**	**10.22%**	**9.71%**	**8.80%**	**6.67%**	**-4.00%**

Schedule 5.3

This schedule reports the sinking fund investments for NTPC for the fiscal years ending March 31, 2002 through March 31, 2006. The data are obtained from the Annual Reports for NTPC. Carrying value is in 000's of Canadian dollars. "Av. EROR" refers to the weighted average effective rate of return, and is calculated on market yield for cash and fixed income securities. Note that the Av. EROR of 6.17% reported in note 11 on page 24 of the 2003/04 *Annual Report* differs from the Av. EROR of 3.81% reported in note 11 on page 22 of the 2002/03 *Annual Report*.

	Carrying Value	Av. EROR	Carrying Value	Av. EROR	Carrying Value	Av. EROR	Carrying Value	Av. EROR	Carrying Value	Av. EROR
General Portfolio	2006		2005		2004		2003		2002	
Fixed Income Securities:										
Federal Government guaranteed	$13,786	4.72%	$9,953	4.74%	$6,524	3.80%	$4,437	4.00%	$228	4.79%
Corporate Bonds	$8,697	5.35%	$6,414	5.27%	$6,388	3.80%	$4,470	5.30%		
Municipal Government guaranteed	$2,961	5.67%	$2,639	5.64%	$2,638	4.90%	$1,748	5.70%	$49	5.37%
Provincial Government guaranteed	$1,103	5.23%	$672	5.29%	$582	4.50%	$1,054	5.30%	$262	7.30%
Cash and short-term investments	$18	0.30%	$3,770	2.56%	$966	2.60%	$2,325	3.10%	$15,418	2.02%
Equities:										
Canadian			5,402		4,838		3,635			
US					1,411		1,406			
International					735		575			
Sub-total	26,565		28,850		$24,082		$19,650	3.81%	15957	2.18%
Immunized Investments										
Federal Government guaranteed	11,239	4.10%								
Total	37804	9.72%	$28,850	5.52%	$24,082	6.52%	$19,650	6.17%	15957	2.18%

Schedule 5.4

This schedule reports the sinking fund investment allocations or weights in percentages by asset class for NTPC for the fiscal years ending March 31, 2002 through March 31, 2006.

Asset Classes:	2006	2005	2004	2003	2002
Fixed Income Securities					
Federal Government guaranteed	36.47%	34.50%	27.09%	22.58%	1.43%
Corporate Bonds	23.01%	22.23%	26.53%	22.75%	
Municipal Government guaranteed	7.83%	9.15%	10.95%	8.90%	0.31%
Provincial Government guaranteed	2.92%	2.33%	2.42%	5.36%	1.64%
Cash and short-term investments[a]	0.05%	13.07%	4.01%	11.83%	96.62%
Equities					
Canadian		18.72%	20.09%	18.50%	
US			5.86%	7.16%	
International			3.05%	2.93%	
Immunized Investments					
Federal Government guaranteed	29.73%				
	100.00%	100.00%	100.00%	100.00%	100.00%

[a]This asset class represented 94.60% of total sinking fund investments in 2001.

Schedule 5.5

This schedule shows the calculation of the cost of the lease following NTPC's practice of assuming 6.74% equity and 93.26% debt. The costs of equity and debt are from the texts of Section IV and V, respectively.

Measure	2006/07	2007/08
Average % equity	**6.74%**	**6.74%**
Return on equity	**6.75%**	**7.20%**
Average % debt	**93.26%**	**93.26%**
Average debt cost	**8.29%**	**8.31%**
Weighted cost	**8.19%**	**8.24%**

Schedule 6.1

This schedule provides a comparison of witnesses' rate of return evidence against selected adjustment formulas.

Source	Long-Canada Forecast	Recommended Return	Risk Premium (Basis Points)
I. Witnesses			
2006/07			
Kryzanowski/ Roberts	4.20%	6.75%	255
McShane	4.30%	10.50%	620
2007/08			
Kryzanowski/ Roberts	4.65%	7.20%	255
McShane	4.50%	10.75%	625
II. Regulatory Boards			
2007 Actual			
AEUB	4.22%	8.51%	429
NEB	4.22%	8.46%	424
2006/07 Projected based on Kryzanowski / Roberts Long-Canada forecast			
AEUB	4.20%	8.49%	429
NEB	4.20%	8.45%	425
2007/08 Projected			
AEUB	4.65%	8.83%	418
NEB	4.65%	8.78%	413
Average Risk Premium for Boards			**421**

GEC-PEMBINA-OSEA INTERROGATORY #1 TO POLLUTION PROBE

Interrogatory:

Mr. Chernick in his evidence states:

> There are at least two benefits of separate costs of capital for OPG's two lines of business. First, if the OEB establishes separate costs of capital and the mix of OPG's investment changes, due to nuclear retrofits or refurbishment or new nuclear or hydro capacity, OPG's average allowed return would automatically shift in the direction of the investment mix. The return would only need to be updated for changes in market rates or the underlying risk in either OPG business segment.
>
> Second, when OPG is reviewing options for capital investments—capital to reduce operating cost, capital to increase output, capital to extend operating lives—it's analysis should reflect the different costs of capital for nuclear and hydro investments.

Please comment on this suggestion of distinct costs of capital for the nuclear and hydraulic businesses on the rationale above and on the compatibility of that approach with the cost of capital proposal you have made. Assuming that the combined cost of capital would equal the value you have recommended for the initial rate period, what spread between the two divisions would you suggest (for both ratio and ROE as appropriate) if such a spread were to be utilized by the Board?

Response:

In Section 3 of their Evidence, Drs. Kryzanowski and Roberts recommend a distinct capital structure for OPG's hydro and nuclear businesses based on the risk assessment of each. They summarize their analysis on page 25 as follows:

> Drawing on the basic principle that the level of equity in the deemed capital structure of a utility should reflect its business risk and combining our risk assessments, we conclude that being considerably riskier than a generic transmission and somewhat riskier than an integrated company or a generic distribution company, OPG hydro should carry a higher level of equity than any of these three comparators. We assign 40% as the appropriate equity ratio for OPG's hydro assets. Following similar logic, we set 50% as the fair level of equity for OPG's nuclear assets. To achieve a recommendation for OPG's combined regulated assets we take a weighted average of our two recommendations based on regulated MW (megawatts): 6,606 for nuclear (66.47%) and 3,332 MW for hydro (33.53%) to attain an overall recommended capital structure of 47% equity.

Drs. Kryzanowski and Roberts note that the weights assigned to each business could adjust over time so that their approach is consistent with Mr. Chernick's recommendation quoted in the preamble to this Interrogatory. They further note that their approach follows prior practice of the

Board and does not assign a separate ROE to individual companies (or divisions). Please refer to pages 98-99 of their Evidence for a detailed explanation of this approach.

Although Drs. Kryzanowski and Roberts provide the overall cost of capital calculations in their Schedule 3.8, the specific costs of capital for hydro and nuclear are easily obtained by using their recommended equity ratios of 40% and 50% for hydro and nuclear, respectively, instead of the overall equity ratio of 47% in Schedule 3.8.