BEFORE THE
ALBERTA UTILITIES COMMISSION

WRITTEN EVIDENCE
OF
BENTE VILLADSEN

FOR
THE ATCO UTILITIES
ALTAGAS UTILITIES INC.

2018-20 Generic Cost of Capital

Proceeding ID No. 22570

October 31, 2017

The Brattle Group
One Beacon Street, Suite 2600
Boston, MA 02108
+1.617.864.7900

TABLE OF CONTENTS

I. INTRODUCTION AND SUMMARY

Q1. Please state your name and address.

A1. My name is Bente Villadsen and my business address is The Brattle Group, One Beacon St., Boston, MA 02108, USA.

Q2. What have you been asked to do in this proceeding?

A2. I have been asked by The ATCO Utilities (ATCO) and AltaGas Utilities Inc. (AUI) to estimate the cost of equity and capital structure that should be allowed for the period 2018-20 and to recommend an appropriate capital structure for ATCO and AUI (jointly the "Utilities"). I have also been asked to comment on the following:

> (i) If there is a wide range of beta values provided by the experts, will the Commission be able to identify, with any reasonable degree of confidence, a method that allows the Commission to narrow the range of these betas?
>
> (ii) Will there be a clear and objective measure on the record by which the Commission can determine which factor or factors explain any changes in utility credit spreads?

Q3. Please summarize your qualifications.

A3. I am a principal of The Brattle Group and have more than 17 years of experience working with regulated utilities on cost of capital and related matters. My practice focuses on cost of capital, regulatory finance and accounting issues. I have testified or filed expert reports on cost of capital and related issues in Alberta, Alaska, Arizona, California, Illinois, New Mexico, Ontario, Oregon as well as before Bonneville Power Administration and the Surface Transportation Board. I have provided white papers to the British Columbia Utilities Commission and the Canadian Transportation Agency as

well as before European and Australian regulators on cost of capital.[1] I am a co-author of the recent text, "Risk and Return for Regulated Industries"[2] and a frequent speaker on cost of capital, capital structure and related issues. In addition to cost of capital, I have testified or filed testimony on regulatory accounting issues before the FERC, the Regulatory Commission of Alaska, the Michigan PSC as well as in international and U.S. arbitrations. I also advise utilities on regulatory matters as well as risk management. I hold a Ph.D. from Yale University and a BS/MS from University of Aarhus, Denmark. Appendix A contains more information on my professional qualifications.

I note also that I submitted evidence in the Alberta Utilities Commission's (AUC or the Commission) 2016 Generic Cost of Capital proceeding (2016 GCOC).

Q4. What topics do you address in your evidence?

A4. In its letter initiating the 2018 Generic Cost of Capital proceeding the Commission asked the following questions:[3]

- Whether changes in the approved ROE and deemed equity ratios, established in Decision 20622-D01-2016 (the 2016 GCOC decision) are warranted.
- How should the Commission consider the traditional approaches and models used in previous GCOC proceedings for determining an approved ROE and equity ratios?

  (i) If there is a wide range of beta values provided by the experts, will the Commission be able to identify, with any reasonable

[1] In Europe, I have written white papers for the Netherlands Competition Authority (NMa) and the Netherlands Independent Post and Telecommunications Authority (OPTA) and provided an expert report on behalf of Telecom Italia to Communications Regulatory Authority of Italy. In Australia, I have provided expert reports to the Australian Energy Regulator (AER) and the Economic Regulation Authority of Western Australia on behalf of the Australian Pipeline Industry Association and before the Queensland Competition Authority on behalf of Aurizon Network (a railroad).

[2] Bente Villadsen, Michael J. Vilbert, Dan Harris, and A. Lawrence Kolbe, "Risk and Return for Regulated Industries," Elsevier, May 2017.

[3] Alberta Utilities Commission, "2018 Generic Cost of Capital, Proceeding 22570," April 20, 2017.

degree of confidence, a method that allows the Commission to narrow the range of these betas?

(ii) Will there be a clear and objective measure on the record by which the Commission can determine which factor or factors explain any changes in utility credit spreads?

- What are the short-term and long-term effects of employing the two commonly used income tax methodologies, flow-through and future income tax, on areas such as cost of capital and overall revenue requirement? How should the Commission consider for the purposes of rate setting, factors such as differences in the sum of the present discounted value of the revenue requirement and impacts on funds from operations (FFO)/debt, in deciding which method should be applied to utilities? Should the Commission consider moving the utilities to one standard methodology?

I address the questions in the first two bullet points below, while the tax methodology question is addressed in separate evidence.

Q5. Please summarize your evidence.

A5. I rely on estimates from a Canadian Utility sample, a U.S. Gas Distribution sample, a sample of U.S. Pipelines and support my analysis with data from a U.S. Water Utility sample. I include results from a U.S. Electric sample for consistency with my 2016 GCOC evidence, but do not rely on the results as the sample is very diverse with many companies facing unique circumstances that are not applicable to the Utilities.[4] My capital structure recommendation is based on a review of commonly allowed equity ratios for regulated utilities, credit metric benchmarks as well as a review and analysis of credit rating agencies commentary on capital structures. Based on my analyses, I conclude that the equity thickness most recently granted the Utilities are below the industry standard and insufficient to meet the three components of the fair return standard (i.e., comparability, capital attraction, and financial integrity). Consequently, I recommend a 3 percentage point increase in the deemed equity thickness, such that the benchmark

[4] For example, retirement of coal and nuclear generation, the penetration of distributed generation, etc.

"average risk" Alberta Utility would be awarded an equity ratio of 40%. This recommendation is consistent with the equity thickness observed among regulated utilities in Canada.

Regarding the ROE, I consider results from CAPM-based, single and multi-stage DCF models and consider the business risk analysis of Dr. Carpenter[5] and the economic conditions study of Mr. Buttke.[6] Based on my analyses, I find a wide range of estimated ROEs, but am able to focus my recommendation on the Gas LDC and the Pipelines sample based on Dr. Carpenter's business risk analysis. The Canadian Utility and the Water sample in turn support the recommendation.[7]

Taking into account that the Commission in the past has preferred to look to figures that do not consider financial risk, I provided results that take financial risk into account and results that do not. The financial risk adjusted results fall in a reasonable range of 9½ to 11½ percent, while unadjusted results range from 8¼ to 9¾ percent.

Based on these figures and in recognition of the Commission's preference for results that do not take financial leverage into account, I find that a conservative range is 9.5% to 10.5% and recommend 10.0% as the allowed ROE for 2018-2020.

Pertaining to the Commission's questions regarding betas and credit spreads, I conclude as follows:

- The variability in beta values is driven by two factors: (i) randomness in the data used for the statistical measurement, and (ii) differences in measurable systematic risk of the various samples and companies. I find that the effect of idiosyncrasies in the data can be minimized by using a larger sample of representative return observations and by taking averages or constructing portfolios from the individual sample companies. I further find that real differences in systematic market risk are driven both by

[5] 2018 GCOC Written Evidence of Paul R. Carpenter ("Carpenter Evidence")

[6] 2018 GCOC Written Evidence of Robert Buttke ("Buttke Evidence")

[7] As noted previously, I do not rely on the Electric Utility sample but include it to be consistent with my evidence in the 2016 GCOC proceeding.

different business risk characteristics (e.g., of different samples) and by differences in financial risk associated with the amount of debt in the capital structure. I explain that financial risk differences can be controlled for by unlevering the beta, such that variation in the unlevered "asset" betas and resulting leverage-adjusted CAPM estimates for the different samples reflects actual measured differences in systematic business risk. The variability across asset betas is, as expected, lower than the variability across equity betas because the asset beta adjusts for difference in risk.

- There is, to my knowledge, no definitive model or consensus set of factors that precisely and quantitatively explain changes in utility credit spreads. Multiple models and explanatory factors have been put forth in the academic literature, but no universal explanation has been agreed upon. In addition, I know of no academic analyses that are utility specific. However, I explain that the academic evidence is broadly consistent with the proposition that credit spread and equity risk premiums are both influenced by some factors in common, such that sustained changes in credit spreads can provide a directional indicator of movements in risk premiums.

Q6. How have you structured your direct evidence?

A6. In Section II, I explain my approach to cost of capital estimation including my reliance on samples and financial models; Section III discusses how capital market conditions impact the current cost of equity – this section also addresses the spread between utility bonds and government bonds; Section I explains the procedures I used to estimate the cost of equity based on selected samples and presents my results; Section V provides a capital structure analysis; Section VI provides my ultimate recommendation on ROE and capital structure taking into account the prior sections as well as the business risk discussion of Dr. Paul R. Carpenter and the capital markets discussion of Mr. Robert Buttke. Finally, Section VII provides responses to the Commission's specific questions about betas and credit spreads.

II. APPROACH TO ESTIMATING THE COST OF CAPITAL

Q7. How do you approach your estimation of the cost of capital for the Utilities?

A7. My evidence for this proceeding is prepared using the same financial principles I applied in the 2016 Generic Cost of Capital proceeding (2016 GCOC), so the evidence is fully consistent. The samples' composition differs as companies have changed – primarily due to merger and acquisition activity or because more data has become available. However, the selection process is the same. This time I include a sample of regulated pipelines because, as Dr. Carpenter explains in his evidence, the business risk of the Utilities has increased relative to 2016 and relative to the U.S. regulated utilities, so that the business risk now is between that of the gas LDC sample and a pipeline sample.[8] I also include a sample of regulated water utilities to support the findings from the gas LDC sample, which has seen substantial merger and acquisition activity in the last couple of years.

The Commission in its scope letter confirmed that the 2018 GCOC will establish approved ROE and capital structures for the years 2018 through 2020 although I note that the 2016 GCOC Decision stated that "[t]he allowed ROE for 2017 of 8.50 per cent awarded in this [2016 GCOC] decision will remain in place on an interim basis for 2018 and for subsequent years until changed by the Commission"[9]. Consistent with the Commission's letter, I estimate and recommend return on equity (ROE) and capital structures for 2018-2020 for the Utilities. I note up front that Dr. Carpenter finds that the business risk of the Utilities has increased, which – combined with increasing interest rates – indicates an increasing cost of equity environment.

The 2016 GCOC Decision also continued the Commission's historical precedent of allowing a 50 basis point adder to compensate for flotation cost.[10] Consequently, I present my results including 50 basis point flotation cost allowance.

---

8 Carpenter Evidence, Section V.

9 2016 GCOC ¶339.

10 *Ibid.*, ¶157.

A. THE FAIR RETURN STANDARD

Q8. What are the guiding principles for determining allowed utility returns?

A8. The Canadian Supreme Court (as well as the U.S. Supreme Court) has made clear that one part of a "fair return" is that the return is comparable to what investors would receive if investing in alternative securities with the same risk characteristics. As noted in the Northwestern Utilities case:

> By a fair return is meant that the company will be allowed as large a return on the capital invested in its enterprise (which will be net to the company) as it would receive if it were investing the same amount in other securities possessing an attractiveness, stability and certainty equal to that of the company's enterprise.[11] [emphasis added]

In addition to this comparability standard, the return allowed to the Utilities must be such that it enables them to attract capital on reasonable terms and maintain their financial integrity. The components of the fair return standard have been summarized by the Commission in past GCOC decisions as comprising of "three factors, namely 'comparable investments,' 'capital attraction' and 'financial integrity.'"[12] The Commission has also stated that these factors are separate but interrelated in the manner of "leg[s] of a three legged stool," and found that each factor must be applied to determine a fair return for rate-setting purposes.[13] Importantly, the Commission has also recognized that the fair return standard applies equally (and in my opinion *jointly*) to determination of both the allowed return on equity and the deemed regulatory capital structure.

---

[11] *Northwestern Utilities Limited v. City of Edmonton*, (1929) S.C.R. 186 (*Northwestern*). A similar sentiment is reflected in the U.S. Supreme Court decisions of *Bluefield Water Works Co. v. Public Service Commission*, 262 U.S. 679 (1923) (*Bluefield*) and Federal Power Com'n v. Hope Natural Gas Co., 320 U.S. 591 (1944) (*Hope*).

[12] AUC Decision 2009-216 ("2009 GCOC Decision"), paragraph 94.

[13] 2009 GCOC Decision, paragraphs 107-108.

Q9. How do you follow these principles in conducting your analysis and making your recommendations?

A9. The "comparable investments" component of the fair return standard defines comparability in terms of equal "attractiveness, stability, and uncertainty." In the decision establishing that standard, the Canadian Supreme Court did not distinguish between sources of stability and sources of uncertainty. Thus, it is essential to consider risk factors that affect the potential variability in expected returns, as well as the average level of those returns. In short, the "comparability" of investments and returns must be considered on a risk-adjusted basis.

The impact of risk on investors' required returns is central to the financial concept of the opportunity cost of capital, and to the "comparable investments" and "capital attraction" components of the fair return standard. Put simply, a fair return must be sufficiently *attractive* to compensate investors for forgoing the opportunity to earn a return from an alternative investment of comparable risk. The return that investors require to compensate for this opportunity cost *is* the cost of capital. Therefore, a fair allowed return must be at least as high as that available on comparable investments (i.e., it must meet the comparability criteria). However, as discussed by Dr. Carpenter, investors are also concerned with the possibility of non-recovery of their invested capital (akin to the concept of default on a fixed income investment), such that a given allowed return may not be sufficient to attract capital even if it is equivalent to that available in capital markets for investments of comparable *systematic* risk.[14]

The third component of the fair return standard requires that the allowed return be sufficient to maintain the company's financial integrity, such that its operations are not hampered by inadequate cash flows. This is a necessary component for a fair return, but not a sufficient one, as even a return that provides cash flow adequate to support operations may not be sufficient to attract investment capital in competition with comparably risky alternative investments.

[14] Carpenter Evidence, Section II.B.

In sum, the concept of risk is central to the fair return standard and to cost of capital estimation. Therefore, in evaluating the returns of comparable companies when determining an appropriate allowed rate of return, I consider all risk factors that may impact those returns as well as those of the Utilities.

Q10. What guides your choice of methodologies for estimating the cost of capital and informing your recommendations for the Utilities' allowed returns?

A10. I note that the Canadian Supreme Court did not specify any specific methodology for determining a fair return and because each methodology has its advantages and disadvantages, I strongly suggest that more than one method be used in the estimation process. This sentiment is echoed by well-known academics such as Stewart C. Myers, Robert C. Merton Professor of Finance of MIT, who has so concisely and eloquently stated:

> Use more than one model when you can. Because estimating the opportunity cost of capital is difficult, only a fool throws away useful information.[15]

Other scholars agree. For example, professors Berk and DeMarzo of Stanford and Harvard Universities, respectively, in their corporate finance textbook comment on the use of the CAPM, DCF and other models by practitioners as follows:

> It is not difficult to see why there is so little consensus in practice about which technique to use. All the techniques we covered are imprecise. Financial economics has not yet reached the point where we can provide a theory of expected returns that gives a precise estimate of the cost of capital. Consider, too, that all techniques are not equally simple to implement. Because the tradeoff between simplicity and precision varies across sectors, practitioners apply the techniques that best suit their particular circumstances.[16]

The reliance on multiple methods is also consistent with the Commission's recent orders on cost of capital, where the Commission in 2016 looked to the DCF model and "placed

---

[15] Stewart C. Myers, "On the Use of Modern Portfolio Theory in Public Utility Rate Cases: Comment," *Financial Management*, Autumn 1978, p. 67.

[16] Jonathan Berk and Peter DeMarzo, *Corporate Finance: The Core*, 3rd edition, 2013, (Berk & DeMarzo 2014) p. 466.

less weight on the parties CAPM estimates of ROE" relative to the 2013 GCOC Decision.[17] The Commission was explicit in its 2013 GCOC Decision that "benchmark generic ROE should be established on the results of multiple tests…"[18]

The view that multiple tests are preferable is also consistent with the approach taken by other provincial regulators in Canada.[19] The weight assigned to each methodology varies across jurisdiction and time.[20]

B. APPROACH TO ESTIMATING THE UTILITIES' COST OF EQUITY

Q11. How did you estimate the cost of equity for the Utilities?

A11. To assess the cost of capital for the Utilities, I start by selecting multiple samples of regulated utilities: a Canadian Utility sample and samples of U.S. Electric utilities, U.S. Gas utilities, U.S. Water utilities, and U.S. regulated Pipeline companies.[21] The Canadian Utility sample provides insights into the risk and return of Canadian-based companies with regulated utility operations. The U.S. Gas Distribution and Water Utility samples provide insights into the risk and returns associated with regulated distribution activities. The U.S. Electric sample is a more generic sample—albeit one predominantly focused on provision of regulated electric utility services—which has many more companies available for consideration. The larger sample comes with the caveat that the

---

17 2016 GCOC Decision, ¶317.

18 2013 GCOC Decision, ¶271.

19 See, for example, British Columbia Utilities Commission, "Generic Cost of Capital Proceeding (Stage 1) Decision," Decided May 10, 2013 (BCUC 2013 Decision), p. 80 and confirmed in British Columbia Utilities Commission, "Decision and Order G-129-16," August 10, 2016, p. 47; Ontario Energy Board, EB-2009-0084, "Report of the Board on the Cost of Capital for Ontario's Regulated Utilities," December 11, 2009, p. 36, and Newfoundland & Labrador Board of Commissioners of Public Utilities, "Order No. P.U. 18(2016); issued June 8, 2016, p. 27.

20 In the 2013 GCOC ¶270-277, the Commission considered the DCF and CAPM results as well as other evidence, but did not specify a weighting. In the 2016 GCOC, ¶189, "the Commission [placed] less weight on the resulting CAPM estimates in this decision."

21 My selection and consideration of multiple industry-based samples is consistent with my approach in the 2016 GCOC proceeding. In that proceeding, I evaluated a Canadian Utility sample, a U.S. Gas LDC sample, and a U.S. Electric sample as I do here. My additional consideration of U.S. Water utility and U.S. Pipeline samples in the instant proceeding is discussed later in this Q&A as well as in Section IV below.

business risk characteristics of the companies within the Electric sample are quite heterogeneous—the Electric sample companies include vertically integrated companies that operate regulated and/or unregulated generation plants, as well as mixed utilities that provide both gas and electric service. Consequently, I do not assign weight to the model results for the Electric sample, but report them for consistency with my approach in the last GCOC. As Dr. Carpenter notes in his evidence, the Pipeline sample provides insights into utilities that provide regulated commodity transmission services without monopoly franchises and operate under a regulatory framework with a higher degree of regulatory lag.[22] I look to results from several financial models to assess the cost of equity and also summarize recently allowed returns to arrive at my recommendation.

Sample companies are ideally selected to be very comparable to the target company, but there are only a limited number of publicly traded companies with significant utility operations in Canadian jurisdictions, and even those companies are somewhat diversified in terms of geography and lines of business. Therefore, as explained above, I consider the estimates from the samples in light of the characteristics that make each one comparable to the Utilities. My consideration of the sample results is informed by Dr. Carpenter's assessment that the Pipeline sample has relatively higher business risk compared to the pure-play distribution utilities in the Gas LDC and Water samples, and his statement that the Alberta Utilities (generically) have greater business risk than the Gas LDC sample companies but lower business risk than the Pipeline sample companies.

For each company in my samples, I then estimate the cost of equity using standard methods including two versions of the Capital Asset Pricing Model (CAPM) and two versions of the Discounted Cash Flow (DCF) model. I also present summary results on what ROE and capital structure is commonly allowed among regulated utilities in Canada and the U.S. I include CAPM results for individual companies as well as portfolio based results, where estimates of the systematic risk (beta) are based on the market-capitalization weights of the individual utilities.

[22] Carpenter Evidence, Section IV.C.

Finally, I look at the allowed returns granted by other Canadian and U.S. regulators relative to those allowed for the Utilities. The Commission has in the past considered such evidence 'ad hoc' but has also recognized that the "method does provide the Commission with information on the direction in which a fair allowed ROE must move in order to meet utility investors' perceptions of changes in risk."[23] I concur that the returns afforded to other utilities provides information about the comparability of the ROE to that of similarly situated utilities. Additionally, I respectfully submit that this information is relevant and both complements and provides context to estimates from market-based models.[24] The data is available to investors, who can use it to inform their investment decisions. Notably, I provide a careful summary that distinguishes data from settlements vs. fully litigated matters in the U.S.

To arrive at my final ROE recommendation, I consider (i) the range of estimates I have derived, (ii) the current economic outlook, (iii) the financial risk differences, and (iv) the business risks of the Utilities relative to that of the benchmark samples. In consideration of the comparable returns component of the fair return standard I rely on samples with relevant features of business risk comparability and ensure that other observable differences in risk (e.g., leverage) are properly accounted for. To ensure that the financial integrity standard is met, I ensure that the combined ROE and capital structure is such that the Utilities are expected to maintain credit ratings in the A range, and to meet the capital attraction standard I additionally consider how the Utilities' ROE and capital structure (considered together) compare to that available in other jurisdictions. My evaluation and recommendations draw on the evidence of Dr. Paul R. Carpenter and the evidence of Mr. Robert Buttke.

---

[23] 2016 GCOC Decision, paragraph 229.

[24] Unlike the market-based estimates that can only be derived for companies with exchange traded stock, data on allowed returns pertains directly to pure play regulated utilities—which commonly have operations and regulatory environments that (notwithstanding any Alberta specific regulatory or operating issues) make them more directly comparable to the Alberta Utilities.

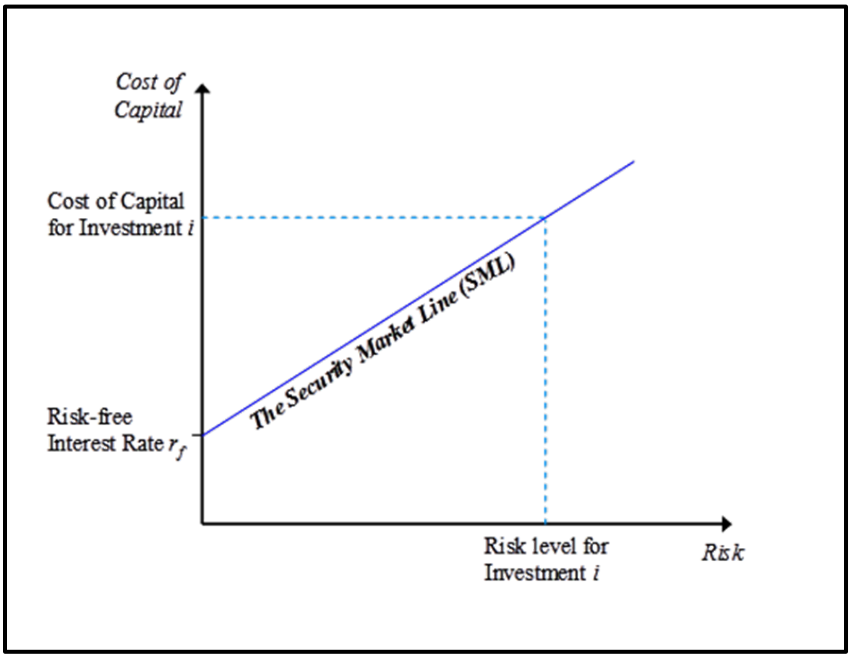
1. Cost of Capital and Risk

Q12. How is the "cost of capital" defined?

A12. The cost of capital is defined as the expected rate of return in capital markets on alternative investments of equivalent risk. The cost of capital is a type of opportunity cost: it represents the rate of return that investors could expect to earn elsewhere without bearing more risk. "Expected" is used in the statistical sense: the mean of the distribution of possible outcomes. The terms "expect" and "expected," as in the definition of the cost of capital itself, refer to the probability-weighted average over all possible outcomes.

The definition of the cost of capital recognizes a tradeoff between risk and return that can be represented by the "security market risk-return line" or "Security Market Line" for short. This line is depicted in Figure 1 below. The higher the risk, the higher the cost of capital required.

Figure 1: The Security Market Line



Q13. Why is the cost of capital relevant in rate regulation?

A13. The "cost of capital" is the return that investors expect to earn on investments of comparable risk.[25] As noted above, this is consistent with the Canadian Supreme Court's decision in *Northwestern* and also with the U.S. Supreme Court's decisions in *Hope* and *Bluefield*, which concluded that

> [T]he return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks[26]
>
> The return should be reasonably sufficient to assure confidence in the financial soundness of the utility; and […]
>
> […] should be adequate, under efficient and economical management to maintain and support its credit and enable it to raise the money necessary for the proper discharge of its public duties.[27]

The U.S. Court's decisions establish a three part standard analogous to the three-legged stool mentioned in past GCOC Decisions.[28] It is not enough that that the return (both the ROE and capital structure components) supports the credit of the Utilities and assures confidence in financial soundness; the return must also meet the comparability standard and enable the Utilities to attract capital.

While the comparable returns criteria goes to the importance of equity investors earning a return that is comparable to that available elsewhere on comparable risk investments, the second and especially the third criteria have implications for the need for regulated companies to provide a return sufficient to compensate investors for any risk of capital non-recovery and to maintain healthy finances, including a solid credit rating and credit metrics.

From an economic perspective, rate levels that give investors a fair opportunity to earn the cost of capital are the *lowest levels* that compensate investors for the risks they bear.

---

[25] See also Stewart C. Myers, "The Application of Finance Theory to Public Utility Rate Cases," *The Bell Journal of Economics & Management Science* 3:58-97 (1972).

[26] U.S. Supreme Court *Hope* Decision.

[27] U.S. Supreme Court *Bluefield* Decision.

[28] See Section II.A above.

A utility's ability to attract capital and maintain its financial integrity requires that the combined equity return and equity ratio be such that not only is the expected return commensurate with that of similar-risk enterprises, but it also addresses the capital recovery concerns of investors and meets the expectations of credit market participants.

Q14. Are there additional economic considerations that affect the relationship between the allowed return and the cost of capital?

A14. Yes, beyond the basic elements of the fair return standard discussed immediately above (and in II.A), utility regulators and customers must concern themselves with the broader economic consequences of providing an inadequate return to the company's investors. In the short run, deviations from the expected rate of return on the rate base from the cost of capital may seemingly create a "zero-sum game"—the perception investors gain if customers are overcharged, and customers gain if investors are shortchanged. This view is not valid. In the longer term, inadequate returns are likely to expose customers—and society generally—to risks that cost far more than may be saved in the short run. Inadequate returns lead to inadequate investment, whether for maintenance or for new plant and equipment. Without access to investor capital, the company may be forced to forgo opportunities to maintain, upgrade, and expand its systems and facilities in ways that decrease long run costs. Indeed, the cost to consumers of an undercapitalized industry can be far greater than any short-run gains from shortfalls in the cost of capital. This is especially true in capital-intensive industries (such as the electric and gas distribution utility business), which feature systems that take a long time to decay. Such long-lived infrastructure assets cannot be repaired or replaced overnight, because of the time necessary to plan and construct the facilities.

Thus, it is in customers' interest to make sure the expected return of the investors does not fall short of the cost of capital. For example, the Clean Water Council of New Jersey, which has members appointed by the governor and representatives from state agencies was concerned about the level of investment in infrastructure and stated:

> Utility rates absolutely must be set at a level sufficient to recover the cost of current operations and maintenance expenses AND the full cost of capital.

Full cost pricing ensures that utility rates are not artificially low, with too little invested in infrastructure renewal.[29]

2. The Impact of Risk on the Cost of Capital

Q15. Please summarize how you consider risk when estimating the cost of capital.

A15. First, I select my benchmark samples. Second, as the cost of equity depends on the leverage of the company to which it is applied, I consider the difference in leverage between the data from which I estimate the cost of equity and a benchmark equity percentage. To determine where in the estimated range the ROE reasonably falls, I consider the business risk of the Utilities relative to the samples and also the capital markets evidence.

Q16. Why is capital structure important for the determination of the cost of equity?

A16. As shown by Hamada (1969),[30] shareholders in a company with more debt face more equity risk and the return on equity needs to increase. There are several manners in which the impact of financial risk can be taken into account. The manner in which Professor Hamada took this into account as he unlevered the beta estimates in the CAPM to obtain a so-called all-equity or assets beta and then relevered the beta to determine the beta associated with the target company's capital structure. This requires an estimate of the systematic risk associated with debt (i.e., the debt beta), which is usually quite small. See Appendix B, Section IV for further technical details related to methods to account for financial risk when estimating the cost of capital. Another way to take the phenomena into account is to determine the average overall cost of capital for the sample companies and let that figure be constant between the estimate obtained for the sample and the entity to which it is applied. This assumes that the average overall cost of capital is constant for

[29] The Clean Water Council of New Jersey, "Recommendations for Water Infrastructure Management and Financing," 2010, pg. 4.

[30] Robert S. Hamada, "Portfolio Analysis, Market Equilibrium and Corporate Finance," *The Journal of Finance* 24: 13-31 (March 1969).

a range that spans the capital structures used to estimate the cost of equity and the regulatory capital structure – usually a range that avoids extreme levels of debt or equity.

Q17. Are there Alberta-specific risk factors?

A17. Yes. As discussed in Dr. Carpenter's Evidence,[31] the AUC's decision on the design of PBR 2 and rebasing increases regulatory lag and capital recovery risks. Dr. Carpenter further notes that he is not aware of any U.S. Gas LDC with similar exposure. In Dr. Carpenter's view

> "[q]uantitatively, the amounts at issue would represent material variances from the authorized ROE. Additionally, I am not aware of any LDCs in the US which are similarly exposed, so these regulatory risk factors significantly differentiate the Alberta utilities from the US companies in Dr. Villadsen's Gas LDC sample in terms of business risk."[32]

Dr. Carpenter also finds that the uncertainty associated with the UAD policy is higher today than during the 2016 GCOC Proceeding due to the intention to review (transmission) asset utilization.[33]

Based on the business risk analysis of Dr. Carpenter as well as my knowledge of the sample companies, I agree that the risks of the Utilities are higher than that of the U.S. Gas LDC sample.

Q18. Does your approach to estimating the cost of capital consider capital market evidence?

A18. Yes. The return that investors require to provide equity capital depends not only on the relative risk of the investment being considered but also on the return generally available in the market for investments with comparable risk. Therefore, it is essential to consider prevailing conditions and trends in financial markets when determining inputs to the

---

[31] Carpenter Evidence Section IV.B.

[32] Carpenter Evidence, Q/A 48.

[33] Carpenter Evidence Section IV.D.

models used to estimate the cost of equity and when evaluating the reasonableness of the estimates. The evidence of Mr. Bob Buttke provides details on prevailing conditions and trends in financial markets, whereas my evidence attempts to evaluate how such conditions and trends affect the ROE. The next section addresses this topic.

III. IMPACT OF THE ECONOMY AND MARKETS ON THE COST OF EQUITY

Q19. What do you cover in this section?

A19. This section focuses on how recent changes in capital markets conditions and ongoing volatility in equity and debt markets impact the cost of equity and its estimation. Specifically, this section addresses (i) interest rate developments and the impact on cost of equity, (ii) the development in utility credit spreads and research attempting to explain such developments, (iii) investor perceptions of the market risk premium, and (iv) the interaction of Canadian, U.S. and world markets, indicating that investors consider the risk-return tradeoff across jurisdictions.

Preliminarily, I agree with ATCO's and AUI's witness Mr. Robert A. Buttke[34] that the Canadian economy is in better shape than at the 2016 GCOC as indicated by, for example, a GDP growth of 4.5% in Q2, 2017 and two recent rate hikes by the Bank of Canada. However, as the Bank of Canada recently stated, "significant geopolitical risks and uncertainties around international trade and fiscal policies remain,"[35] so economic and market uncertainty continue to impact investors.[36] As market uncertainty regarding monetary, fiscal, tax, trade and geopolitical risks persist, investors will, all else equal, require a higher premium to invest in equity than historically. Similarly, an elevated spread between utility and government bond yields or between the yield on preferred

[34] Written Evidence of Robert Buttke for the Utilities (Buttke Evidence).

[35] Bank of Canada, "Bank of Canada increases overnight rate target to 1 per cent," Press Release September 6, 2017.

[36] Examples of such uncertainties are the U.S. tax and trade policy going forward. In Europe the impact of Brexit, the continuing debt in Greece and other countries along with political uncertainty about, for example, the relationship between Spain and Catalonia or the EU and its membership states create uncertainty.

issuances and government bonds indicate that investors require a higher premium for investing in securities that are not risk-free than they did when spreads were at the level prior to the financial crisis[37] Consequently, all indications are that the cost of debt will increase going forward, so that a forecasted bond rate is more indicative of the cost of equity going forward than the current rate.

A. DEVELOPMENTS IN INTEREST RATES

Q20. What are the relevant developments regarding interest rates?

A20. The Bank of Canada has raised the target overnight rate twice since mid-July; most recently on September 6, when the rate was increased to 1%. This is the highest level of the target overnight rate since January 2015.[38] At the time of the most recent increase in interest rates, the Bank of Canada stated that "[r]ecent economic data have been stronger than expected…" but cautioned that "significant geopolitical risks and uncertainties around international trade and fiscal policies remain …"[39] Consensus Forecasts expects this rate, which is "often referred to as the Bank's *policy interest rate*,"[40] to average 1.43% by the end of June 2018.[41]

The written evidence of Mr. Robert Buttke similarly notes faster than expected interest rate hikes in the U.S. and the expected increase in interest rates by the Bank of England as indications that interest rates are expected to increase. For the reasons provided above, I agree with Mr. Buttke that we are in a rising interest rate environment.

---

[37] The elevated spread between utility bond yield and government bond yields is shown in Figure A-1 in the technical appendix (Appendix B) to my written evidence. The elevated spread between preferred yields and government bond yields is discussed in the Buttke Evidence.

[38] Bank of Canada, V39079: Target for the overnight rate, October 1, 2010 through October 2, 2017.

[39] Bank of Canada, "Bank of Canada increases overnight rate target to 1 per cent," Press Release, September 6, 2017.

[40] Bank of Canada, "Policy Interest Rate," Assessed October 2, 2017 at http://www.bankofcanada.ca/core-functions/monetary-policy/key-interest-rate/

[41] Consensus Forecast, October 2017, p. 17. The median forecast is 1.50%.

Q21. What particular capital market developments have occurred since the 2016 GCOC?

A21. Based on the recent actions by Bank of Canada, the forecasted increase in government bond yields as well as the forecasted increase in economic growth – Consensus Forecasts indicate GDP growth rates in the range of 1.9% to 3.3% for Q3, 2017 through Q2, 2019 with an estimate of 3.7% for Q2, 2017.[42] The actual growth was higher at 4.5%.[43] In comparison, the forecasted growth as of December 2015 (when the 2016 GCOC evidence was developed) ranged from a low of 0.7% to a high of 2.5% for the forecasted period.[44] Looking to the long-term forecasts, U.S. interest rates are expected to continue to increase through the early through mid-2020s as are GDP growth rates.[45] Thus, both interest rates and growth rates are expected to increase during the 2018 GCOC period.

In addition, the continued suppression of the government bond yield due to accommodative monetary policy in Canada and globally means that the direct reliance on current yields is likely to lead to an underestimation of the cost of equity. Compared to the time period studied during the 2016 GCOC proceeding, the Consensus Forecasts' estimate for the 10-year Canadian Government bond yield has increased substantially. The December 2015 forecast one year ahead was 2.2%, whereas the one year ahead forecast as of October 2017 is 2.5%.[46] At the same time, actual 10-year Canadian government bond yields have increased from approximately 1.6% to 2.2%.[47]

As interest rates have increased, the spread between A rated utility bonds and government bonds has declined although it remains elevated compared to the period prior to the

---

[42] Consensus Forecast, October 2017, p. 16.

[43] Buttke Evidence, Q/A 37.

[44] Consensus Forecast, December 2015, p. 16.

[45] Blue Chip Economic Indicators, October 2017.

[46] Similarly, looking to U.S. data, interest rates and growth rates are expected to increase further for 2018 and 2019. Per the October 2017 edition of Consensus Forecasts (p. 3 and 5), 10-year U.S. Treasury Bond yields (currently at approximately 2.4%) are forecasted to reach 2.9% by October 2018 and 3.4% by the end of 2019. Around the time I filed initial evidence in the 2016 GCOC proceeding, U.S. 10-year Treasuries were yielding approximately 2.2%, and were forecast to increase to 2.8% by the end of 2016. *See* Consensus Forecasts, December 2015 edition, p. 5.

[47] Consensus Forecast, December 2015 (p. 17) and October 2017 (p. 17).

financial crisis.[48] An elevated yield spread suggests that either government bond yields remain artificially low, the premium investors require to hold risky securities has increased relative to its long-term average level, or some combination of the two.

Q22. Can you provide an illustration of the recent trends in government bond yields and utility bond yields?

A22. Yes. Figure 2 below shows the development in Canadian and U.S. long-term government bond yields as well as A rated utility bonds in those countries. Both utility and government bond yields have increased slightly since the close of the record in the 2016 GCOC proceeding,[49] but treasury yields have increased more such that the spread between A range utility and long-term government bond yields has declined somewhat. However, the spread remains elevated relative to the level prior to the financial crisis.

Importantly as noted above, both utility bond yields and government bond yields are expected to increase over the next several years. The fact that the 10-year Government of Canada bond yield is expected to increase by approximately 90 basis points from current levels to reach 3.1% by 2020 is significant because the ROE that is being determined in this case is expected to be in effect through at least 2020. [50] Thus, the fact that yields are forecasted to continue to increase for the next several years means that contemporaneous yields and even 12-month ahead forecasted yields are likely to under estimate the yields experienced over the period.

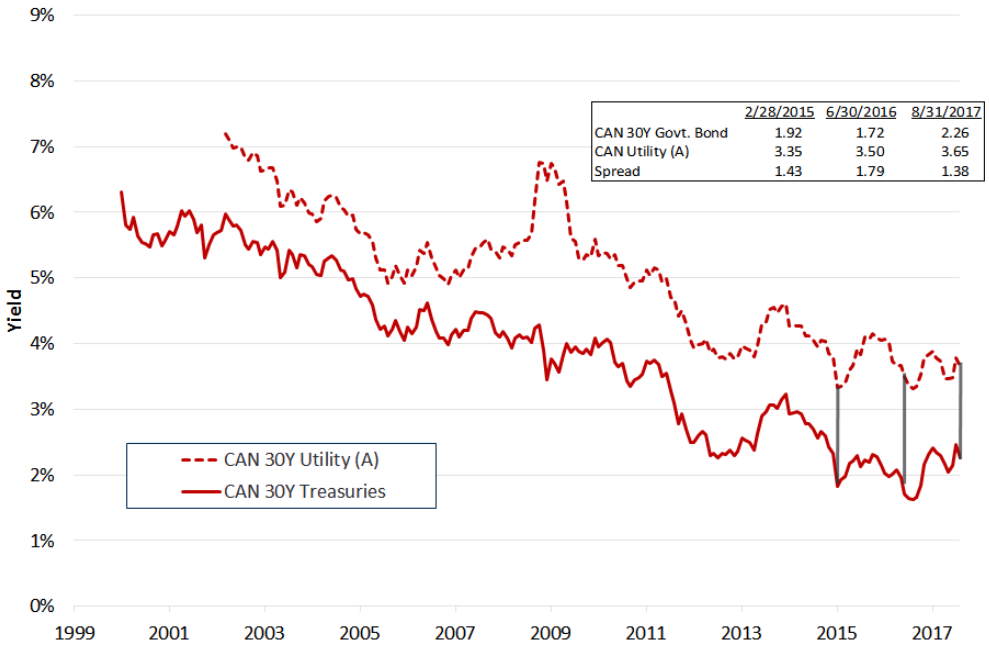
---

[48] *Ibid* and Figure 3 below.

[49] I note that prevailing government bond yields are actually lower now than they were at the time I prepared my initial evidence in the last GCOC proceeding (i.e., January 2016).

[50] Consensus Forecast, October 2017, pgs. 17, 28

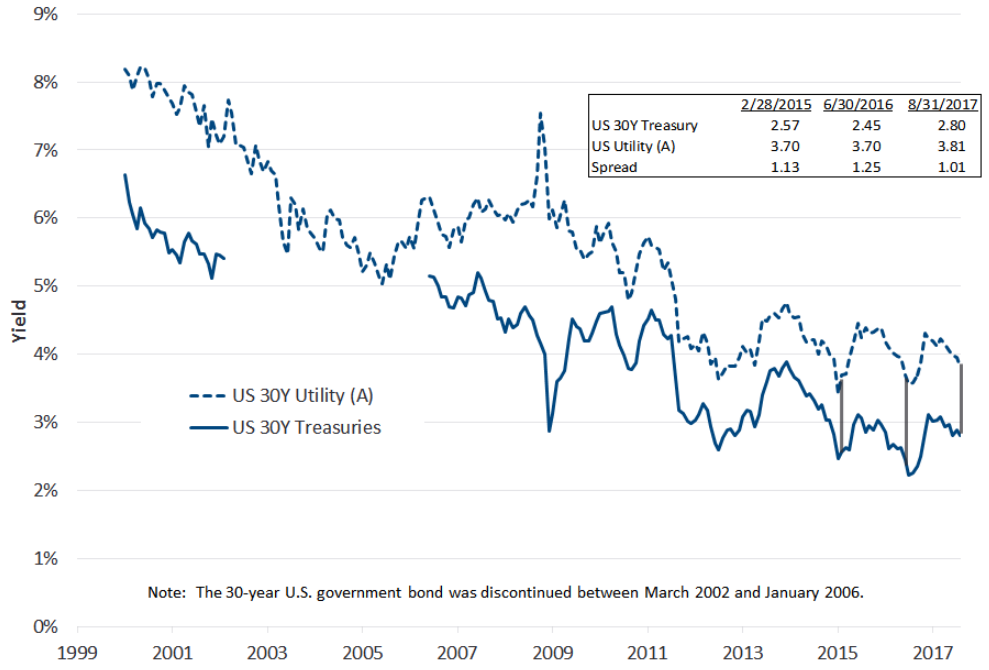
Figure 2
Canadian and U.S. Government Bond Yields 2000–2017
Panel A—Canadian Bonds



	2/28/2015	6/30/2016	8/31/2017
CAN 30Y Govt. Bond	1.92	1.72	2.26
CAN Utility (A)	3.35	3.50	3.65
Spread	1.43	1.79	1.38

Source: Bloomberg.

Panel B—U.S. Bonds



	2/28/2015	6/30/2016	8/31/2017
US 30Y Treasury	2.57	2.45	2.80
US Utility (A)	3.70	3.70	3.81
Spread	1.13	1.25	1.01

Note: The 30-year U.S. government bond was discontinued between March 2002 and January 2006.

Source: Bloomberg.

Q23. How do these developments affect the cost of equity estimation?

A23. There are several ways in which the current interest rate environment affects cost of equity estimation. Most directly, the Capital Asset Pricing Model (CAPM) takes as one of its inputs a measure of the risk-free rate (see Figure 1). The estimated cost of equity using the CAPM increases (decreases) by 1 percentage point when the risk free rate input increases (decreases) by 1 percentage point. Therefore, to the extent that the prevailing government yield is depressed due to monetary policy or other factors, using this yield as the risk free rate will depress the CAPM estimate below what is representative of the forward-looking cost of equity during the relevant period. Put another way, if the current government bond rate is a downwardly biased estimate of what risk free rates will be when rates are in effect, then the CAPM estimate will itself be downwardly biased. To avoid such bias in light of the present capital market conditions, it is necessary to normalize the relied upon government bond rate, so that the resulting CAPM estimate reflects a non-biased estimate of the risk-free rate.

Another consequence of the present rising interest rate environment is that as interest rates rise, the cost of equity can be expected to rise also.[51] This suggests that the fair allowed return on equity for the Utilities should perhaps be successively higher in 2019 and 2020 compared to 2018 rather than constant across all three years.

B. YIELD SPREADS AND THE COST OF EQUITY

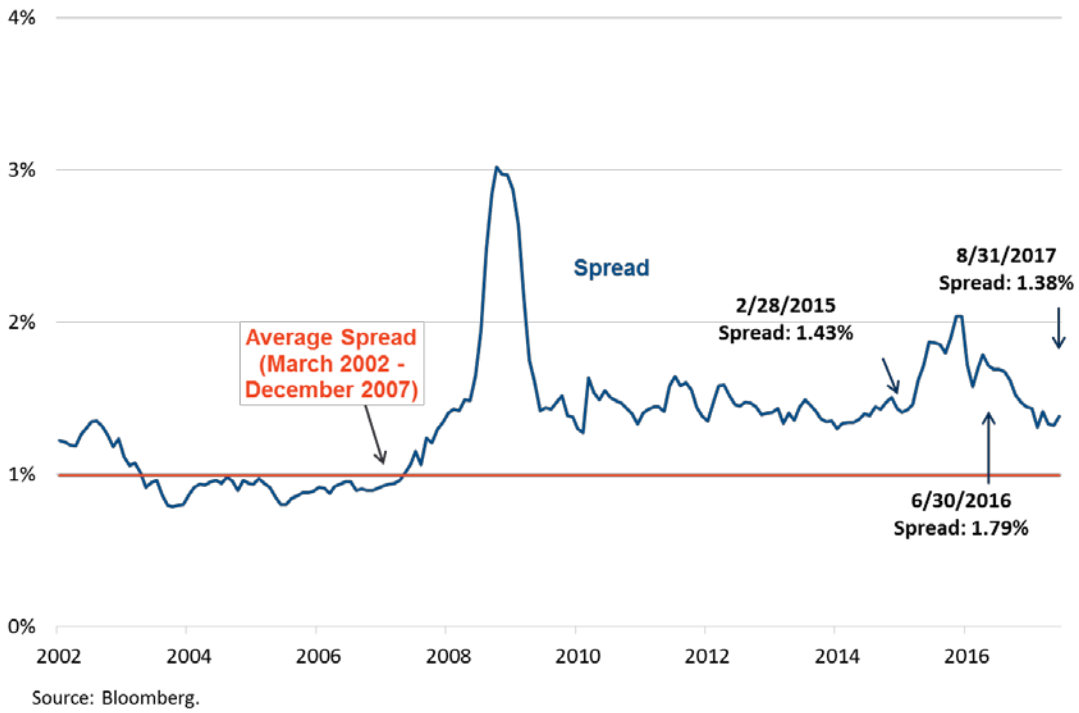
Q24. How does the current spread between utility and government bond yields compare to the historical spread?

A24. The spread between the yields on 30-year A rated utility bonds and the 30-year government bond at the end of August 2017 was 138 basis points, whereas the spread prior to the financial crisis (from 2002 through 2007) was 99 basis points, meaning the

[51] Note, however, that due to the tendency of risk premiums and risk-free returns to move inversely to one another, the change in the cost of equity should not be expected to be one for one with the change in bond yields. In other words, a one percentage point increase (decrease) in the risk-free rate will likely lead to an increase (decrease) of less than 1 percent in the cost of equity capital.

spread is elevated by 39 basis points relative to the pre-crisis years.[52] This phenomenon is illustrated in Figure 3 below. While we do not have the same detailed forecasts for the utility or corporate bond yields as for government bond yields, it is plausible that the yield spread will decline albeit not disappear over the next few years as the government bond yield increase.

Figure 3
Spread between Canadian A-Rated Utility and 30-Year Government Bond Yields



Source: Bloomberg.

One possible explanation of the elevated level of the yield spread is that current and near-term expected levels of government bond yields are artificially depressed due to global monetary policy.[53] The Buttke Evidence similarly observes that yield spreads are higher than in the past and notes that as spreads have declined, Canadian corporate spreads have

[52] See the workpaper BV WP01 for details.

[53] If investors believe the yield on government bonds will soon elevate, they may demand higher yields on corporate debt relative to the prevailing government bond yields, thus widening the yield spread.

been stickier than in the U.S. Mr. Buttke concludes that "[t]his perhaps suggests some resistance from Canadian investors to accept tighter spreads."[54]

I emphasize that both the Canadian and the U.S. government bond yields are expected to increase substantially over the next year. For example, Royal Bank of Canada forecasts that the interest on 30-year government bonds will increase by 116 basis points in Canada and by 91 basis points in the U.S between Q2, 2017 and Q4, 2018. [55]

In addition to the increase in the yield spread, which focuses on the difference between utility and government bond yields, I observe that Mr. Buttke presents evidence that preferred issuances (outside the financial sector) often are issued with a rate floor – indicating that there is a lower bound on the yield investors require for investing in any type of equity. Mr. Buttke concludes that even in a rising interest environment, investors continue to require a dividend floor.[56]

Q25. What are the implications of an elevated yield spread?

A25. The increase in the yield spread indicates that (i) the current long-term government bond yields are depressed relative to their normal levels and / or (ii) investors are demanding a premium higher than historical premium to hold securities that are not risk free. The latter is an indication that the market equity risk premium may be elevated relative to its historical level. Regardless of the interpretation, the consequence is that if cost of equity is estimated using the current risk-free rate and a market equity risk premium based on historical data, then it will be downward biased. Hence, it is necessary to "normalize" the risk-free rate by taking into account the elevated spread or alternatively relying on a market equity risk premium that is higher than its historical average. An alternative was

---

54 Buttke Evidence, Q/A 51.

55 RBC Economics, "Financial Market Forecasts," September 8, 2017. (http://www.rbc.com/economics/economic-reports/pdf/financial-markets/rates.pdf).

56 Buttke Evidence, Section IV.B.

to reflect a portion of the elevated yield spread in the risk-free rate and the remainder in the market risk premium.[57]

C. RISK PREMIUMS

Q26. What is the current evidence regarding market volatility?

A26. A measure of the market's expectations for volatility is the S&P/TSX 60 VIX (VIXC), which measures the 30-day implied volatility of the S&P/TSX 60 index. In the U.S. the VIX measures the 30-day implied volatility of the S&P 500 index. These indices are also referenced as the "investor fear gauge"[58] in that they provide a market indication how investors in stock index options perceive the likelihood of large swings in the stock market **within the next month**. At present, the VIXC and the VIX indices stand at about 10, which is below the long-term historical volatility of approximately 20 for both markets.[59]

While near-term expectations for market volatility are therefore lower today than at the time of the 2016 GCOC proceeding, examining the recent history of the VIX and VIXC indices (Figure 4) reveals that there can be considerable movements in short-term volatility expectations. For example, within the last two years, the VIXC has been as high as 32 and as low as 4.

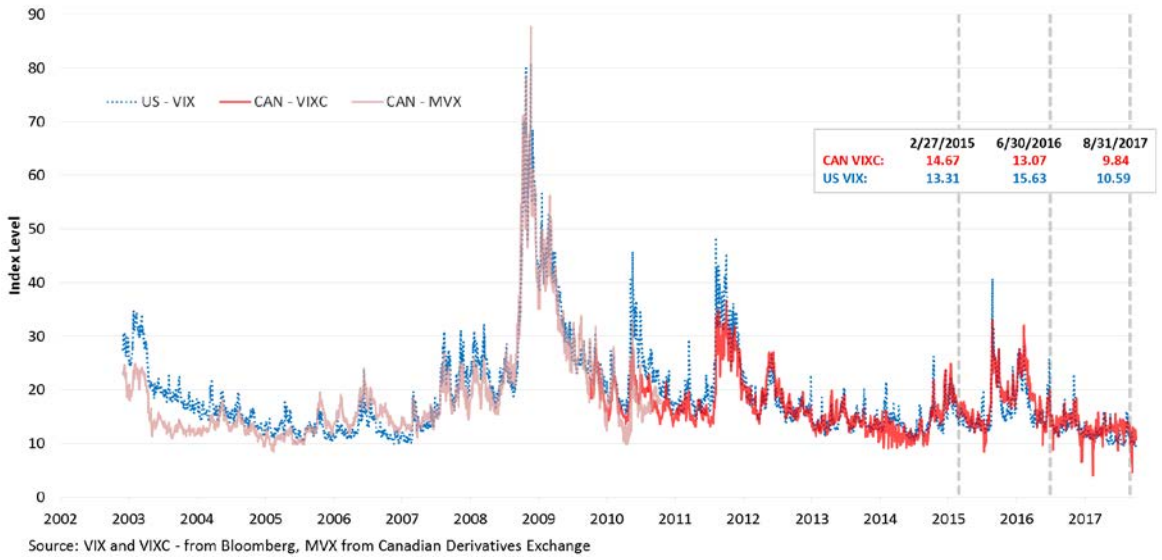
---

[57] I note that if a combination interpretation is used, it becomes important to make sure that the overall (total) "normalization" takes into account the elevated yield spread once and only once.

[58] Standard & Poor's Indices, "A VIX for Canada," October 14, 2010.

[59] Bloomberg as of October 2, 2017. See workpaper BV WP02. Note that the Canadian VIX until Dec. 2008 was the Montreal Exchange's MVX.

Figure 4
Canadian and US Volatility Index



Q27. What are the implications of the short-term volatility being lower?

A27. As a noted in my 2016 GCOC evidence, academic research has found that, all else equal, investors, demand higher risk premiums during more volatile periods. However, it is important to remember that the VIX and VIXC measure expectations for market volatility in the *near-term*—specifically over the coming 30 days. By contrast, the market equity risk premium (MERP) that is relevant in this proceeding represents the compensation investors require to take on risk over a long investment horizon. (Theoretically, an equity investment has a perpetual term, but it is typical to approximate this with a multi-decade investment horizon, for example by selecting a 30-year government bond as proxy for the risk free rate of interest.) Consequently, while the levels of the VIX and VIXC are useful indicators of current investor sentiment and uncertainty in equity markets, it is too simplistic to say that lower implied volatility necessarily corresponds to lower risk premiums required by investors.

As Mr. Buttke notes in his evidence, the decline in the VIX has occurred over a very short period of time, but the return on equity is being set over 3 years and investors have a much longer horizon.[60]

Q28. Are there reasons to be wary of interpreting a relatively low VIX Index level as an indicator of long-term market stability?

A28. Yes, in May the VIX index closed under 10 points, which has occurred on less than 1.0% of all trading days since its start in 1990. The prior two cases of a below-10 VIX index before May of 2017 were followed by the great recession beginning at the end of 2007 and by 1994's 4.0% annual advance by real GDP.[61] These examples serve as warnings not to assume that short-term implied volatility is a reliable indicator of sustained long-term stability.

Another reason to be cautious of interpreting the low VIX as an indicator of improved capital market certainty over the long term is highlighted in Mr. Buttke's discussion of the SKEW index, which measures the market's willingness to pay for protection against negative "black swan" stock market events (*i.e.*, sudden substantial downturns). Mr. Buttke presents evidence that the SKEW is historically high, indicating that while short-term volatility expectations may be low, investors are exhibiting signs of elevated risk aversion as concerns downside tail risk.[62]

It is also worth considering that global political and economic uncertainty is quite high at present. Tensions with North Korea and continued unrest in the Middle East (e.g. in Syria, Iraq, and on the Arabian Peninsula) have the potential cause turmoil that could

---

60 Buttke Evidence, Section III.E.

61 Moody's Analytics, "Much Doubt Surrounds the VIX Index's Optimism", Weekly Market Outlook, May 11, 2017, p. 2.

62 Buttke Evidence, Section III.E.

spill over into capital markets. Also oil prices are currently very low by historic standards – with a substantial impact on oil producing countries and regions, including Canada.[63]

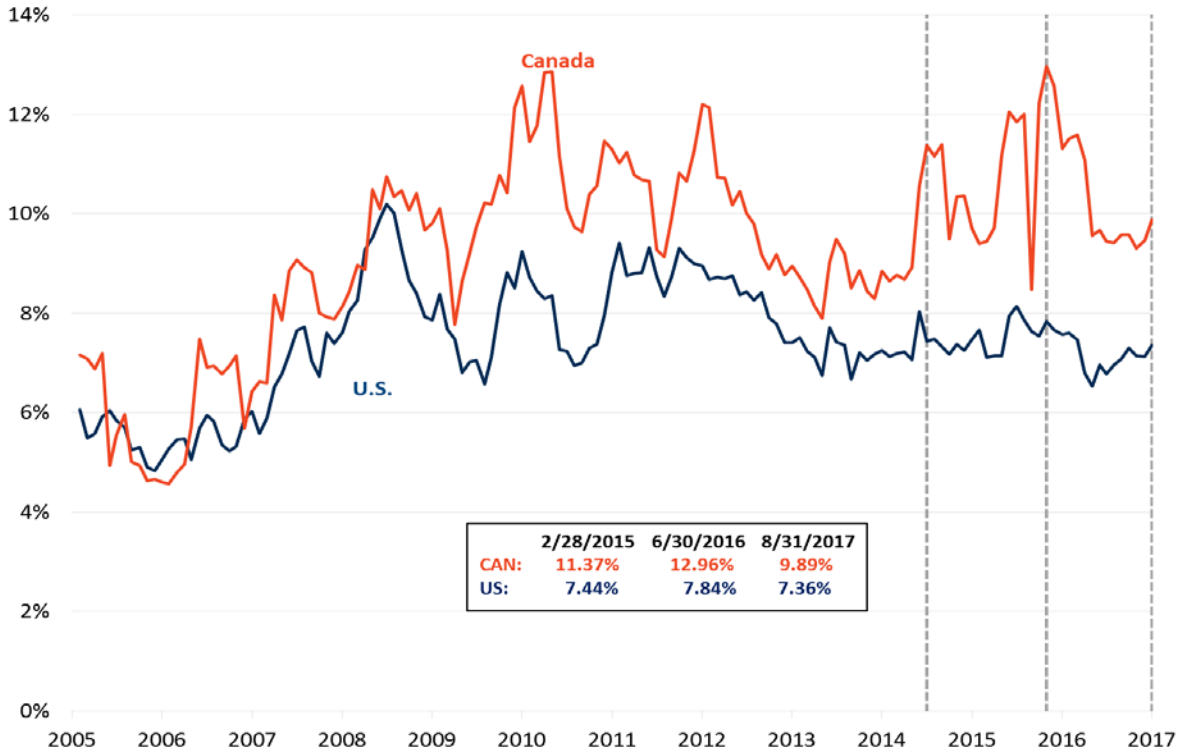
Q29. Is there any market evidence that the return premium demanded by investors for taking risk remains higher than it was prior to the financial crisis?

A29. Yes. Looking to forward-looking market-implied MERPs, both academic research and financial data services such as Bloomberg have found an increase in the expected MERP compared to prior to the financial crisis. Not only did the expected MERP increase, but it also remains above the historical level. This is especially true for Canada, where Bloomberg's expected MERP has exceeded the U.S. MERP consistently since 2007. Bloomberg measures the forecasted Canadian MERP at nearly 10% as of August 2017, which is a slight decrease from the forecasted MERP Bloomberg reported in December of 2015. The same service measured the U.S. MERP at about 7.3% in August 2017, which is a slight increase since the beginning of 2017 (and since the time of the 2016 GCOC proceeding). The Bloomberg MERP is measured as the market-implied forward-looking return premium of equities over the yield on a 10-year government bond, so the forecasted MERP would be about 9½ percent and 6¾ percent relative to the 30-year government bond in Canada and the U.S., respectively.[64] Figure 5 below shows Bloomberg's forecasted MERP for Canada and the U.S. from 2005 to today.

[63] For a discussion of the impact on the Bank of Canada's interest rate decisions, see Canada Business, "How oil prices are messing with the Bank of Canada's interest rate math," June 27, 2017. See http://www.canadianbusiness.com/economy/how-oil-prices-are-messing-with-the-bank-of-canadas-interest-rate-math/

[64] Estimates of the MERP over a 30-year bond is obtained by subtracting the maturity premium of the Canadian (U.S.) 30-year over the 10-year government bond from the figure reported by Bloomberg. This maturity premium is about 40 (60) basis points in Canada (the U.S). See workpaper BV WP01.

Figure 5
Forecasted Canadian and U.S. Market equity risk premium
(Over 10-Year Government Bonds)



Q30. Is there any other evidence that the MERP remains elevated relative to its long-term historical level?

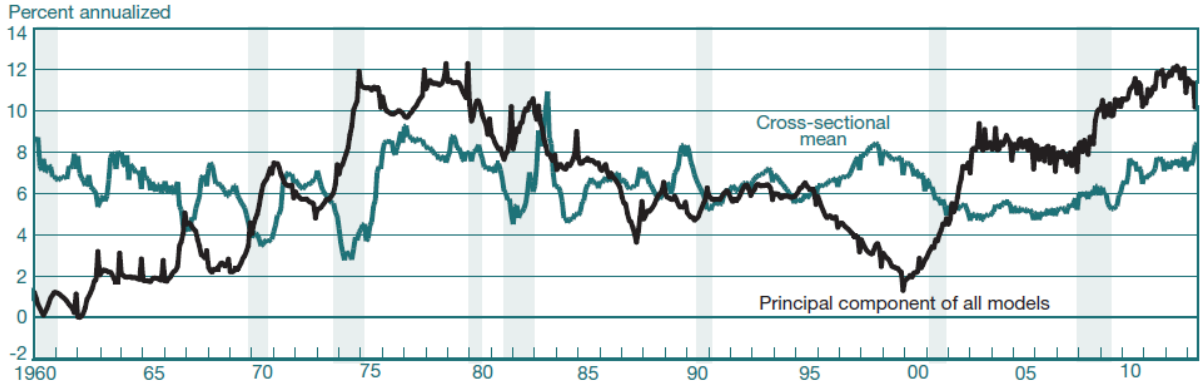
A30. Yes. In 2015, Duarte and Rosa of the Federal Reserve of New York performed a study that aggregates the results of many models of the required MERP in the U.S. and tracks them over time.[65] This analysis found a very high MERP in recent years, especially relative to time periods before the financial crisis.

The authors estimated the MERP that resulted from a range of models each year from 1960 through the time of their study. The authors then report the average as well as the

[65] Fernando Duarte and Carlo Rosa, "The Equity Risk Premium: A Review of Models," *Federal Reserve Bank of New York*, December 2015 (Duarte & Rosa 2015).

first principal component of results.[66] The authors found that the models used to determine the risk premium were converging to provide comparable estimates and that the average annual estimate of the MERP had reached an all-time high in 2012-2013. (Figure 6 below is a copy of the summary chart from Duarte and Rosa's 2015 paper.). These directional trends identified by Duarte and Rosa are reasonably consistent with those observed from Bloomberg, and they further support the proposition that the elevation of the MERP over its historical pre-crisis levels is a persistent feature of capital markets in the time since the great financial crisis.

Figure 6
Duarte and Rosa's Chart 3
One-Year Ahead MERP and Cross-Sectional Mean of Models



Q31. What do you conclude from the discussion above?

A31. The increase in the spread between the yield on utility and government bonds relative to the historical levels indicates that the premium investors require to hold assets that are not risk-free is elevated relative to its historical average and Bloomberg's forecasted MERP for Canada confirms this. Likewise, the presence of floors in preferred debt issuances

[66] Duarte & Rosa emphasize the "first principal component" of the 20 models. This means that the authors used statistics to compute the weighted average combination of the models that captures the most variability among the 20 models over time.

and rate increases by Bank of Canada and the U.S. Federal Reserve indicate that there is an expectation that interest rates and hence the cost of capital will increase.[67]

D. CANADIAN AND U.S. MARKET INTEGRATION

Q32. Please summarize the relationship between the Canadian and U.S. capital markets.

A32. While the Canadian and U.S. market have experienced aspects of the financial crisis and its aftermath differently, there are many similarities. For example, as illustrated in Figure 2 and Figure 5 above, interest rates and the forecasted MERP in the two countries tend to move in the same direction. Similarly, the S&P/TSX and S&P 500 are highly correlated with a correlation coefficient of 0.79 since 2000,[68] and the volatilities of these indices tend to track one another as shown in Figure 4. As Mr. Buttke notes, the Bank of Canada's Canadian effective exchange rate is a weighted average of bilateral exchange rates for the Canadian dollar against currencies of Canada's major trading partners. This rate weighs the U.S. the highest because of the large trading activity between the two countries.[69]

Q33. Do you have any evidence of the magnitude of investments from the U.S. into Canada or Canada into the U.S.?

A33. Yes. Figure 7 summarizes Canada's international investment position by region. It is clear from Figure 7 (Panel A) that the majority of Canada's international direct investments abroad are into North America (primarily the U.S). I also note that the magnitude of the investment into North America has been increasing. Further, the majority of the international investments are in to equity.[70] Figure 7 (Panel B) also

---

[67] Buttke Evidence, Sections III.B,D and IV.B-C.

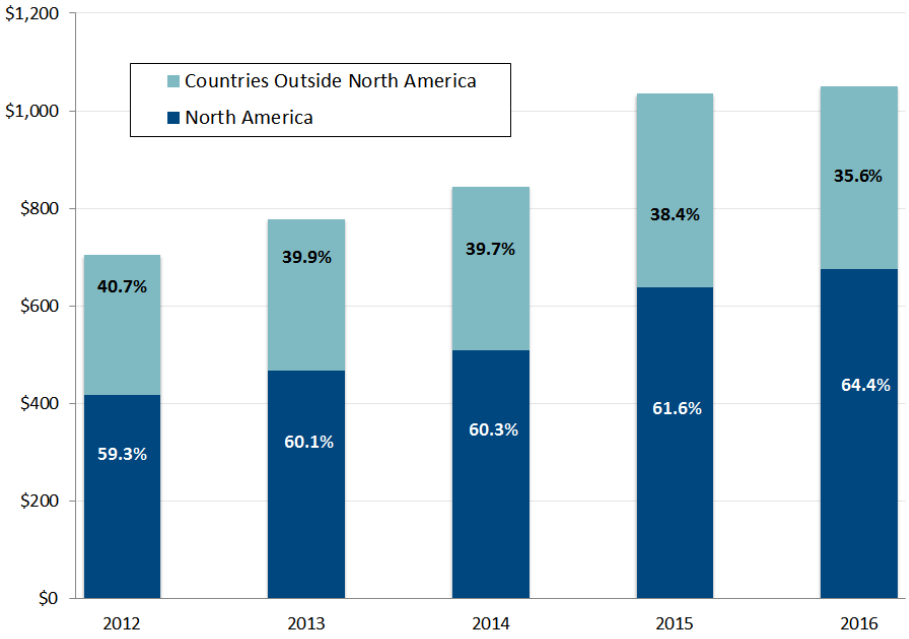
[68] Calculated from Bloomberg data.

[69] Buttke Evidence, Section III.D.

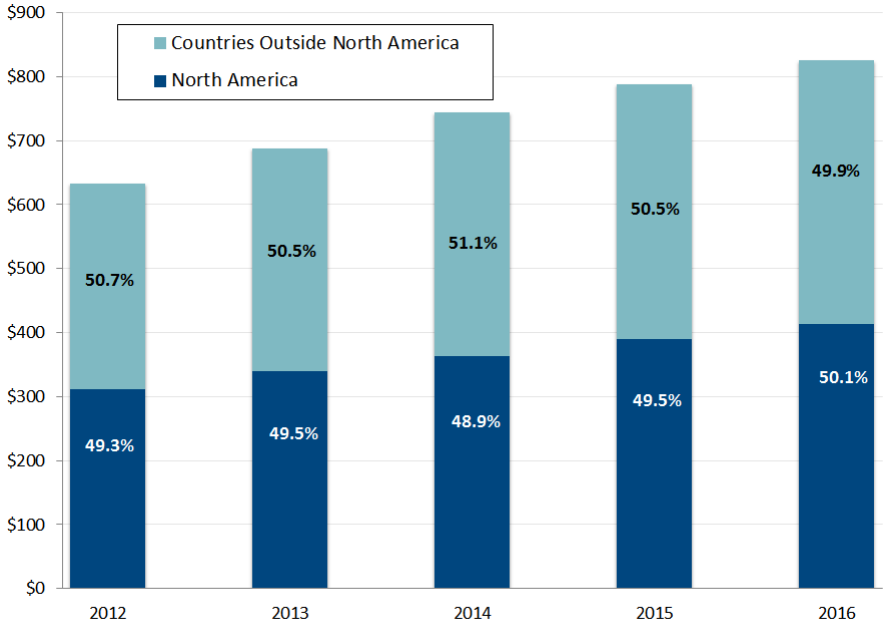
[70] See CANSIM Table 376-0141: International Investment Position, Book Value. Available at: http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=3760141&&pattern=&stByVal=1&p1=1&p2=-1&tabMode=dataTable&csid. See also workpaper BV WP03.

shows the origins of foreign direct investments into Canada are split roughly 50/50 between North America and elsewhere.

Figure 7
Summary of Direct Investments: Canada
Panel A: Canadian Direct Investment Abroad ($CAD billion)



Panel B: Foreign Direct Investment in Canada ($CAD billion)



Q34. Do Canadian direct investments in U.S. equity pertain to utilities?

A34. Yes. Canadian pension funds as well as Canadian utilities have invested in U.S.-based regulated assets. For example, three Canadian pension funds hold the majority of the equity in Puget Sound Energy in the state of Washington,[71] and the British Columbia Investment Management Corporation is part of a group that acquired CLECO in the state of Louisiana.[72] Similarly, Fortis Inc. acquired Arizona-based UNS Energy in 2014, CH Energy Group in 2013, and ITC Holdings in 2016; Emera Inc. acquired Florida-based TECO Energy Inc. as well as New Mexico Gas in 2015, TransCanada and Enbridge acquired U.S. pipeline companies Columbia Pipeline and Spectra Energy Corp respectively in 2016, while in 2017, AltaGas is in the process of acquiring WGL Holdings and Hydro One plans on acquiring Avista Corp.[73] Thus, there are plenty of Canadian investments in U.S. utilities. This shows the interconnectedness of investment decisions between the two countries particularly as it relates to utility assets.

Q35. Why is the relationship between Canadian and U.S. markets important for cost of equity estimation?

A35. Because of the interaction of financial markets and cross-border investments, there is a strong link between financial markets in Canada and the U.S. As a result (and as discussed in Mr. Buttke's evidence),[74] investors consider not only Alberta or Canadian utilities but also comparable U.S. investments. Since investors clearly consider investment opportunities regardless of jurisdiction, it becomes important to include both Canadian and U.S. companies as comparables in the cost of equity study. I also consider this fact when assessing, for example, what Market Equity Risk Premium (MERP) to employ in my CAPM analysis.

---

[71] Puget Energy and Puget Sound Energy 2017 Q2 Fixed Income Investor Call, September 20, 2017, p. 30.

[72] CLECO Press Release, "Cleco and investor group enhance commitments to create additional value for customers and obtain approval of the Louisiana Public Service Commission," January 4. 2016.

[73] Bloomberg as of August 31, 2017.

[74] Buttke Evidence, Q/A 18.

E. IMPACT ON COST OF EQUITY ESTIMATION

Q36. Please summarize how the economic developments discussed above have affected the return on equity and debt that investors require?

A36. Utilities rely on investors in capital markets to provide funding to support their capital expenditure program and efficient business operations, and investors consider the risk return tradeoff in choosing how to allocate their capital among different investment opportunities. It is therefore important to consider how investors view the current economic conditions; including the plausible development in the risk-free rate and the current MERP.

These investors have been dramatically affected by the credit crisis and ongoing market volatility, so there are reasons to believe that their risk aversion remains elevated relative to pre-crisis periods.

The effects of the Bank of Canada keeping a low short term interest rate likely contributed to an artificially lower risk-free rate – an effect, which is similar to that of other sovereign banks' quantitative easing programs and accommodative monetary policies.[75] As a result, yield spreads on utility debt, including top-rated instruments, have remained elevated. The evidence presented above demonstrates that the equity risk premium is higher today than it was prior to the crisis for all risky investments. This is true even for investments of lower-than-average risk, such as the equity of regulated utilities.

Q37. How does your analysis consider the current economic conditions?

A37. In implementing the CAPM, I consider the downward biased risk-free rate as well as the elevated MERP. Specifically, I rely on two sets of inputs for the CAPM: I consider the elevated spread between utility and government bond yields and either (i) normalize the risk-free rate to reflect the downward bias of the yields and combine that with the

[75] The Bank of Canada has not engaged in quantitative easing.

historical MERP or (ii) rely on Consensus Forecasts' government bond yield forecast for the middle of regulatory period to derive my risk-free rate input, and combine that with a MERP that reflects the strong evidence that risk premiums are elevated relative to their long-term historical average.

Regarding the risk-free rate, it is important to recognize that the Bank of Canada has increased the bank interest rate twice this year and that "most signs point to higher Canadian rates" going forward.[76] In the U.S., the Federal Reserve has indicated that further rate hikes are forthcoming.

To be conservative and consistent with the Commission's order in the 2013 GCOC, I do not simultaneously normalize the risk-free rate and adjust the MERP. Rather, I calculate the CAPM for two input scenarios: one that normalized the risk-free rate while using the historical average Canadian MERP, and another that uses a higher MERP informed by forecasts.[77] For the reasons discussed above, the current risk-free rate is too low to accurately be used to assess the cost of equity. The yield spread is elevated and the Canadian forecasted market equity risk premium is much higher than the historical market equity risk premium, so it is necessary to rely on a forecasted risk-free rate and either "normalize" the risk-free rate and / or rely on MERP that is higher than the historical average. Because the Bank of Canada has not engaged in formal quantitative easing, an argument could be made that the enhanced yield spread is primarily a reflection of a higher MERP, consistent with the forecasted MERP being higher than the historical MERP in Canada.

---

[76] Buttke Evidence, Q/A 40.

[77] I note that because Bank of Canada has not engaged in quantitative easing, I explicitly rely on the yield spread in Canada to assess the impact on the risk-free rate and simply adjust the forecasted MERP downward due to the interaction of markets in Canada and the U.S. (given that the U.S. forecasted MERP is presently lower than the Canadian one).

IV. ESTIMATING THE COST OF EQUITY FOR BENCHMARK SAMPLES

A. APPROACH

Q38. Please outline your approach for estimating the cost of equity for the Utilities.

A38. My estimation procedures and analysis in this case are consistent with my approach in the 2016 GCOC proceeding. As described above in Section II.A, the standard for establishing a fair rate of return on equity requires that the regulated entity be allowed to earn a return equivalent to what an investor could expect to earn on an alternative investment of equivalent risk. Therefore, my approach to estimating the cost of equity for the Utilities focuses on measuring the expected returns required by investors to invest in companies that face business and financial risks comparable to those faced by the Utilities. Because the models I rely upon require market data, my consideration of comparable companies is restricted to those that have publicly traded common equity shares.

To this end, I have selected five samples of publicly-traded companies with risk profiles that are comparable to the Utilities (albeit in various degrees and aspects): a sample of Canadian companies with substantial natural gas and electric distribution operations as well as regulated pipeline operations (Canadian Utility sample); a sample of U.S. based companies whose business is focused on the local distribution of natural gas (Gas LDC sample); a sample of U.S. based publicly traded partnerships predominantly engaged in the transmission of natural gas and/or crude oil and petroleum products by pipeline (Pipeline sample); a sample of U.S. water distribution utilities (Water sample); and a sample of U.S. companies operating in the electric sector whose operations are primarily concerned with the provision of regulated electric utility service (Electric sample).

For each sample, I derive estimates of the representative cost of equity according to standard financial models including two versions of the Capital Asset Pricing Model (CAPM) and two versions of Discounted Cash Flow (DCF). As a further reference point to check the reasonableness of my results and provide context for my allowed ROE recommendations, I perform a summary analysis of allowed ROEs from other

jurisdictions in Canada and from the U.S. As discussed in the Buttke Evidence at Q/A 15, equity analysts do consider the regulatory regime and allowed ROEs across jurisdictions.

Since the cost of equity for the CAPM and DCF based models are derived from market data that reflect the equity capital that investors hold in the sample companies, I consider the impact of any difference between the financial risk inherent in the cost of equity estimates and the deemed capital structure to which it is applied in determining rates for the Utilities. Modern finance theory and practice prescribe multiple standard techniques to adjust for differences in financial risk when the capital structures of the various samples differ from one another (and from the "target" company). However, all of these are based on the fundamental finance principle that—all else equal—greater financial leverage imposes greater financial risk on equity holders. Methods of adjustment include unlevering and relevering betas using so-called "Hamada" adjustment procedures, as well as unlevering and relevering the cost of equity estimates themselves. I employ both methods, as well as two subtly different formulas for unlevering and relevering betas so to minimize the possibility that any one formula or input assumption could bias the results. I emphasize that in all circumstances the adjusted cost of equity is ultimately applied to the book value rate base of the target company, consistent with original cost ratemaking practices. In acknowledgement of the Commission's historical practice, I present my results both before and after financial risk adjustment.

B. SAMPLE SELECTION

Q39. Why do you apply your cost of capital models to samples of comparable companies instead of estimating the cost of capital for the Utilities directly?

A39. It is a well-established point of finance theory (and practice) that the cost of capital depends on the *use*—not the source—of the invested capital. This means that if a diversified company has subsidiary parts engaged in distinct lines of business, the cost of capital for each part is specifically dependent on the risks inherent in its own line of business, not on the risks of the consolidated company as a whole.

Since the Utilities are subsidiaries of consolidated entities and do not themselves have publicly traded stock, it is not possible to directly estimate their cost of equity using the CAPM or DCF models. This is because these models rely on market information (such as stock prices, betas based on historical stock returns, and growth rate estimates) to estimate the expected returns required by equity investors.

Nor would it be appropriate to infer the appropriate cost of equity of the Utilities based solely on the measured cost of equity of their publicly traded corporate parents, since those corporations also contain other lines of business with different levels and sources of risk.[78] According to financial theory, the overall risk of a diversified company equals the market-value weighted average of the risks of its components, so cost of equity estimates derived for diversified publicly traded companies reflect a blend of risk-appropriate returns.

That is why I develop samples of publicly traded companies that are as analogous as possible to the Utilities in terms of business risk, and apply the models to those samples as proxies for the Utilities.

Q40. How do you identify sample companies of comparable business risk to the Utilities?

A40. The Utilities are primarily engaged in the regulated distribution and transmission of electricity and natural gas. As discussed by Dr. Carpenter, the business risk associated with these endeavors depends on many factors, including the specific characteristics of the service territory and regulatory environment in which the provider of these services operates. Additionally, there are variations in business risk characteristics and rate regulation schemes applicable to the individual utility entities operated by ATCO and AUI (i.e., AltaGas Utilities Inc., ATCO Electric Distribution, ATCO Electric Transmission, ATCO Gas, and ATCO Pipelines). Consequently, it is obviously not possible to identify publicly traded sample companies that replicate every aspect of the

[78] Additionally, applying the standard cost of capital models to one or two traded entities would likely lead to imprecise estimates due to the influence of idiosyncratic (random) error in the estimation process. I discuss this issue further with respect to ranges of beta values in Section VII.A below.

Utilities' risk profiles. However, ensuring that the sample companies have their business operations concentrated in similar lines of business and/or business environments is an appropriate starting point for selecting a proxy group of comparable risk to the target companies.

To this end I have selected five samples—namely a Canadian Utility sample, a Gas LDC sample, a Water Distribution sample, a Pipeline sample, and an Electric sample—each with different advantages when it comes to capturing relevant comparable business risk characteristics for estimating the Utilities' cost of capital.

Q41. Please describe the Canadian Utility Sample.

A41. The Canadian Utility sample contains companies that have utility operations in Canadian regulatory jurisdictions and therefore provides insights into the risk and return of Canadian-based utilities. These companies' common equity shares are publicly traded on the Toronto Stock Exchange, and in general the sample companies have long histories of paying periodic dividends to shareholders. The majority of the Canadian Utility sample companies are quite diversified and have some business segments engaged in unregulated operations (such as merchant power generation or the gathering and processing of natural gas) or regulated activities other than gas and electric distribution and transmission (such as common carrier oil pipelines). In addition to their Canadian business operations, many of these companies also have operations in the U.S., and other international jurisdictions.

Figure 8 reports the sample companies' annual revenues for the trailing twelve months ended June 2016 and a categorization as regulated, mostly regulated, or diversified based on the percentage of each company's assets devoted to regulated activities. The figure also displays each company's Market Capitalization and the S&P Credit Rating in 2017, as well as its 3-year adjusted historical beta from Bloomberg and long-term (3- to 5-year) earnings per share growth rate estimate for the company derived from individual estimates made and compiled (respectively) by Value Line and Thomson Reuters IBES.

Figure 8
Canadian Utility Sample Companies

Company	Annual Revenues (CAD million)	Regulated Assets	Market Cap. 2017 Q2 (CAD million)	Betas	S&P Credit Rating (2017)	Long Term Growth Est.
	[1]	[2]	[3]	[4]	[5]	[6]
Algonquin Power & Utilities C	$1,543	D	$5,390	0.85	BBB	15.0%
AltaGas Ltd.	$2,494	D	$5,114	1.25	BBB	15.8%
Canadian Utilities	$3,727	R	$11,093	0.92	A	4.5%
Emera Inc.	$6,226	R	$10,303	0.69	BBB+	6.8%
Enbridge Inc.	$40,088	M	$84,528	1.04	BBB+	7.5%
Fortis Inc.	$7,893	R	$19,177	0.77	A-	5.3%
Hydro One Ltd.	$6,349	R	$13,852	0.59	BBB+	3.3%
TransCanada Corp.	$13,859	M	$54,654	0.97	A-	14.4%
Valener	$83	M	$882	0.57	BBB+	2.6%
Average	$9,140		$22,777	0.85	BBB+	8.3%
Portfolio				0.95		

Sources and Notes:
[1]: Bloomberg as of August 31, 2017. Most recent four quarters.
[2]: See Table No. BV-CAN-2. Key:
R - Regulated (More than 80% of assets regulated).
M - Mostly Regulated (50%-80% of assets regulated).
D - Diversified (Less than 50% of assets regulated).
[3]: See Table No. BV-CAN-3 Panels A through I.
[4]: See Supporting Schedule # 1 to Table No. BV-CAN-10.
[5]: S&P Credit Ratings from Research Insight as of 2017 Q2.
[6]: See Table No. BV-CAN-5.

Q42. Why do you consider U.S. based samples in addition to the Canadian Utility Sample?

A42. The Canadian Utility sample is limited because it is composed of a relatively small number of companies whose business operations are diversified relative to the Utilities and engaged in higher proportions of unregulated activities. As discussed by Dr. Carpenter, U.S. and Canadian utility business and regulatory models are increasingly similar, and thus the business risk and regulatory environment are comparable. For example, Dr. Carpenter points out that many of the Gas LDC Sample companies have deferral accounts related to, for example, capital expenditures and revenue decoupling.[79]

[79] Carpenter Evidence, Section IV.

In addition, investors in Canada consider investment alternatives in both the U.S. and Canada, as described by Mr. Buttke,[80] which makes the U.S.-based samples relevant investment alternatives to Canadian utility companies such as the Utilities. As such, they would be expected to have similar returns given their levels of business and financial risk.

Q43. Why did you select separate U.S. samples for Water, Pipelines, Gas LDCs, and Electric companies?

A43. The various U.S. based samples have different advantages (and disadvantages) in estimating the cost of capital for the Utilities. The U.S. **Electric sample** is a large sample—which allows for greater statistical precision in the results. Additionally, the companies in the Electric sample have utility operations in a variety of jurisdictions, so they are broadly representative of utility regulation in the U.S. However, due to the majority of companies in the U.S. Electric sample being vertically integrated, it is not possible to isolate transmission and distribution from generation functions. Because some of these companies have higher proportions of unregulated activities, I create a subsample that consists of companies with at least 80% of their assets subject to regulation. However, due to the inclusion of many companies that operate rate based generation assets, even this "regulated subsample" does not closely mirror the business operations of the distribution utilities operated by ATCO and AUI.

The **Gas LDC sample** is essentially a pure play local distribution group, with the majority of business activities centered on rate regulated distribution activities, which makes it a close analog for the Utilities' distribution businesses. However, the sample is relatively small due to the smaller number of publicly traded natural gas utility

[80] Buttke Evidence, Q/A 15.

companies (compared to integrated electric companies and combined electric and gas companies) in the U.S.[81]

Similar to the Gas LDC sample, the **Water sample** consists of pure play distribution companies. To an even greater extent than the Gas LDC companies, the publicly traded U.S. water companies are more or less exclusively dedicated to providing a utility distribution service under rate regulation. In the U.S., rate regulation of investor-owned water utilities is quite similar to regulation of natural gas and electric distribution utilities. Also as with U.S. gas and electric utility regulation, the cost of service regimes for water utilities increasingly incorporate mechanisms for decoupling revenue from sales and capital trackers to allow recovery of major infrastructure expenditures outside the context of a general rate case.[82]

Finally, the **Pipeline sample** contains U.S. based companies—more accurately Master Limited Partnerships (MLPs) with publicly traded limited partnership units—that focus primarily on regulated transmission of natural gas and/or crude oil and petroleum products ("liquids"). As explained by Dr. Carpenter, U.S. pipeline companies generally do not have monopoly franchises, which subject them to somewhat higher business risk relative to pure-play distribution utilities. Dr. Carpenter also notes that there is a greater degree of regulatory lag inherent in the regulation regimes governing pipelines in the U.S. These features make the Pipeline sample a useful indicator of the cost of capital for enterprises at the high end of the range that applies based on the Utilities' business risk characteristics.

---

[81] I note that owing to recent merger and acquisition ("M&A") activity that has resulted in the imminent combination or elimination of certain publicly traded natural gas LDC companies, the composition of the Gas LDC sample has shifted relative to the one I presented and studied in the AUC's last (2016) GCOC proceeding. However the same selection criteria were applied in selecting both samples, and the business risk characteristics of the current sample are substantially the same as those of the Gas LDC sample Dr. Carpenter and I analyzed in the 2016 GCOC.

[82] RRA Regulatory Focus – Adjustment Clauses: A state-by-state overview, SNL Financial, September 12, 2017 and RRA Financial Focus – Water Capital Expenditures: Accelerated CapEx spending at water utilities expected to continue, SNL Financial, August 24, 2017.

In light of the relative advantages and limitations of these various groups of sample companies, I believe each one provides a useful point of comparison when estimating the cost of equity for the Utilities. In making my recommendation, I consider the model results for each sample individually and use my judgement—informed by Dr. Carpenter's business risk analysis—in deciding which results are most helpful in determining a reasonable range for the Utilities' cost of equity.

Q44. Will you please summarize how you selected the Electric, Gas LDC, Water, and Pipeline samples?

A44. My procedures for identifying the members of the U.S. based samples is entirely consistent with the approach I took in the 2016 GCOC proceeding. I started with the universes of publicly traded companies classified in the corresponding industry groups by *Value Line*. I reviewed the business descriptions and annual financial reports of these companies and eliminated any that are not primarily focused on the business activity in question. (Specifically, I eliminated any companies with less than 50%[83] of their assets dedicated to regulated utility service.)

I then applied a set of screening criteria to identify companies that cut their dividends or engaged in substantial merger and acquisition (M&A) activities over the past 3-years. My general practice is to eliminate companies that were either the target or acquirer in a major M&A transaction, since such circumstances typically impact a company's stock prices (and thus potentially influence the estimation of its equity beta) in ways that aren't necessarily representative of how investors perceive its business and financial risk characteristics.[84] Similarly, I generally screen out companies that engage in dividend cuts, since the announcement of a cut may create sharp disturbances in stock prices and

[83] I relax this criteria for a couple companies in the Pipeline Sample, namely Buckeye Partners L.P. and EQT Midstream Partners, whose business segments are on the borderline of this 50% cutoff, either above or below depending on how the calculation is performed.

[84] See pages 49 - 51 below for more detail on the treatment of recent M&A in the Gas LDC sample.

growth rate expectations, and the execution of the cut may also directly affect the dividend data relied on for the DCF calculations.

Further, I generally require that the companies have an investment grade credit rating,[85] and more than $300 million in revenues to ensure liquidity. A final (and fundamental) requirement is that the sample companies have the necessary data available for estimation.

Q45. Did you apply similar screening criteria to the Canadian Utility sample?

A45. I did check the Canadian Utility sample companies for the same criteria. However, I did not eliminate any of the companies based on these criteria. This is because nearly all of the companies in this group have recently engaged in substantial merger or acquisition activity, such that strictly following my standard elimination criteria would have left only one company (namely, Canadian Utilities Ltd.). Therefore, rather than foregoing any consideration of Canadian utility companies in my analysis, I elected to retain in the sample all TSX-traded utility companies for which my business segmentation analysis suggested at least some degree of business risk comparability to that of the Utilities.

Q46. What are the characteristics of the Electric sample?

A46. The Electric sample comprises electric companies whose primary source of revenues and majority of assets are in the regulated portion of the U.S. electric industry. The final sample consists of the 30 electric utilities listed in Figure 9 below. These companies own regulated electric utility subsidiaries in many U.S. states, and some also provide electric transmission service regulated by the U.S. Federal Energy Regulatory Commission

[85] There are some cases where a sample company does not have a credit rating from any of the major rating agencies. However, if they were to be rated, they would receive an investment grade rating. In these cases, for instance Chesapeake Utilities, I assign the company the average credit rating of the rest of the sample. I note in the case of Chesapeake Utilities that SNL Financial's Sept. 21, 2017 RRA Financial Focus "Quality Measures: Holding Companies," ranked the company 1st among gas utility holding companies in overall fixed charge coverage ratio over the 12-months ending 6/30/2017 and 2nd in the same metric over the 2014-2016 period.

(FERC).[86] Therefore, the Electric sample is broadly representative of the regulated electric utility industry from a business risk perspective. However, unlike the Utilities, the companies in the Electric sample are generally not pure transmission and distribution utilities. Many own regulated electric generation plants and some have unregulated wholesale power generation operations. Nevertheless, the Electric sample companies are dividend paying utility companies whose business risk is predominantly defined by the regulatory environments in which their utility subsidiaries operate.

Figure 9 reports the sample companies' annual revenues for the trailing twelve months ended June 2017 and the percentage of their assets devoted to regulated electric operations according to Edison Electric Institute's (EEI) classifications of electric utilities as being either regulated (R), having greater than 80% regulated electric assets or mostly regulated (M), having 50-80% regulated electric assets. It also displays each company's Market Capitalization and the S&P Credit Rating in 2017, as well as its 3-year adjusted historical beta from Bloomberg and the weighted average long-term (3 to 5-year) earnings growth rate estimate for the company from Thomson Reuters IBES and *Value Line*.

[86] None of the included entities are primarily electric transmission entities.

Figure 9
U.S. Electric Utility Sample Companies

Company	CAPM Subsample	DCF Subsample	Annual Revenues (USD million)	Regulated Assets	Market Cap. 2017 Q2 (USD million)	Betas	S&P Credit Rating (2017)	Long Term Growth Est.
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Alliant Energy	*	*	$3,341	R	$9,561	0.59	A-	6.3%
Amer. Elec. Power	*	*	$15,952	R	$35,142	0.56	A-	4.3%
Ameren Corp.	*	*	$6,267	R	$13,617	0.59	BBB+	6.2%
CMS Energy Corp.	*	*	$6,505	R	$13,343	0.53	BBB+	7.3%
Consol. Edison	*	*	$11,985	R	$25,530	0.43	A-	3.6%
Duke Energy	*	*	$22,921	R	$60,180	0.48	A-	2.8%
Edison Int'l	*	*	$12,079	R	$26,191	0.55	BBB+	4.4%
El Paso Electric	*	*	$934	R	$2,136	0.77	BBB	5.2%
Entergy Corp.	*	*	$10,980	R	$14,172	0.62	BBB+	-4.7%
Eversource Energy	*	*	$7,684	R	$19,706	0.58	A	6.0%
FirstEnergy Corp.	*	*	$14,153	R	$13,102	0.66	BBB-	-2.0%
IDACORP Inc.	*	*	$1,301	R	$4,436	0.71	BBB	4.1%
OGE Energy	*	*	$2,317	R	$7,092	0.71	A-	6.3%
Otter Tail Corp.	*	*	$820	R	$1,618	0.79	BBB	7.5%
PG&E Corp.	*	*	$18,041	R	$34,809	0.60	A-	3.5%
Pinnacle West Capital	*	*	$3,528	R	$9,786	0.61	A-	5.8%
PNM Resources	*	*	$1,429	R	$3,138	0.66	BBB+	7.5%
Portland General	*	*	$1,987	R	$4,185	0.61	BBB	5.8%
PPL Corp.	*	*	$7,397	R	$26,812	0.67	A-	1.7%
Unitil Corp.	*	*	$390	R	$690	0.57	BBB+	4.6%
Xcel Energy Inc.	*	*	$11,426	R	$23,932	0.48	A-	5.1%
ALLETE			$1,410	M	$3,723	0.68	BBB+	4.9%
AVANGRID Inc.			$5,998	M	$13,998	0.55	BBB+	7.7%
CenterPoint Energy			$8,848	M	$12,142	0.73	A-	6.6%
Dominion Energy			$12,411	M	$49,730	0.59	BBB+	4.4%
DTE Energy			$11,893	M	$19,568	0.59	BBB+	4.5%
MGE Energy			$559	M	$2,309	0.66	AA-	7.9%
NextEra Energy			$16,880	M	$66,379	0.58	A-	7.2%
Public Serv. Enterprise			$9,265	M	$22,157	0.66	BBB+	1.5%
SCANA Corp.			$4,324	M	$9,920	0.59	BBB+	4.8%
Average			$7,768		$18,303	0.61	BBB+	4.7%
Subsample Average			$7,688		$16,627	0.61	BBB+	4.4%
Portfolio						0.58		
Subsample Portfolio						0.56		

Sources and Notes:
[1]-[2]: Denotes companies used in the CAPM and DCF subsamples.
[3]: Bloomberg as of August 31, 2017. Most recent four quarters.
[4]: See Table No. BV-ELEC-2. Key:
R - Regulated (More than 80% of assets regulated).
M - Mostly Regulated (50%-80% of assets regulated).
[5]: See Table No. BV-ELEC-3 Panels A through AD.
[6]: See Supporting Schedule # 1 to Table No. BV-ELEC-10.
[7]: S&P Credit Ratings from Research Insight as of 2017 Q2.
[8]: See Table No. BV-ELEC-5.

Q47. What are the characteristics of the Gas LDC sample?

A47. The Gas LDC sample consists of nine companies that have the majority of their revenue generating assets dedicated to the regulated distribution of natural gas in the U.S.

Figure 10 reports the sample companies' annual revenues for the trailing twelve months ended June 2017 and the percentage of their assets devoted to regulated activities. It also displays each company's Market Capitalization and S&P Credit Rating in 2017, as well as its 3-year adjusted historical beta from Bloomberg and the weighted average long-term (3- to 5-year) earnings growth rate estimate for the company from Thomson Reuters IBES and *Value Line*.

Figure 10
U.S. Gas LDC Utility Sample Companies

Company	CAPM Subsample	DCF Subsample	Annual Revenues (USD million)	Regulated Assets	Market Cap. 2017 Q2 (USD million)	Betas	S&P Credit Rating (2017)	Long Term Growth Est.
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Atmos Energy	*	*	$2,973	95%	$8,918	0 64	A	6 8%
Chesapeake Utilities	*	*	$560	77%	$1,225	0 67	A-	10 7%
Northwest Natural Gas	*	*	$755	89%	$1,766	0 61	A+	6 4%
ONE Gas Inc	*	*	$1,503	100%	$3,719	0 73	A-	6 3%
Southwest Gas	*	*	$2,397	100%	$3,576	0 62	BBB+	6 4%
Spire Inc	*	*	$1,761	85%	$3,427	0 66	A-	4 8%
New Jersey Resources			$2,201	74%	$3,610	0 75	A	5 6%
South Jersey Inds			$1,219	74%	$2,815	0 65	BBB+	12 2%
WGL Holdings Inc			$2,386	89%	$4,286	0 68	A	5 1%
Average			$1,751	87%	$3,705	0 67	A	7 1%
Subsample Average			$1,658	91%	$3,772	0 66	A	6 9%
Portfolio*						0 66		
Subsample Portfolio						0 66		

Sources and Notes:
* The Portfolio beta dynamically excludes New Jersey Resources, South Jersey Industries, and WGL Holdings from the portfolio once the respective M&A is announced
[1]-[2]: Denotes companies used in the CAPM and DCF subsamples
[3]: Bloomberg as of August 31, 2017 Most recent four quarters
[4]: Company 10-Ks See Table No BV-GAS-2 Key:
[5]: See Table No BV-GAS-3 Panels A through I
[6]: See Supporting Schedule # 1 to Table No BV-GAS-10
[7]: S&P Credit Ratings from Research Insight as of 2017 Q2
[8]: See Table No BV-GAS-5

The average Gas LDC sample company devotes over 80% of its assets to regulated activities, which are primarily related to the local distribution of natural gas.[87] Therefore,

[87] While some of the companies in the Gas LDC sample own gas transmission assets, the majority of those assets are state and not FERC regulated, indicating they are not long-haul transmission lines.

these sample companies are nearly pure-plays in the natural gas distribution industry.[88] Moreover, as discussed by Dr. Carpenter, the regulatory frameworks in the jurisdictions in which the Gas LDC subsample companies operate are substantially similar to those prevailing in Alberta and other Canadian jurisdictions.[89] Therefore, I believe that although they do not engage in electric distribution or transmission operations, the Gas LDC sample companies are among the most directly comparable to the Utilities in terms of business risk as they tend to be primarily distribution entities subject to state regulation.

I include New Jersey Resources, South Jersey Industries, and WGL Holdings in the full sample to maintain continuity with the Gas LDC sample I studied in the 2016 GCOC proceeding, which included these three companies alongside Atmos, Northwest Natural Gas, and Southwest Gas. However, New Jersey Resources and South Jersey Industries announced a merger on April 4th, 2017, and therefore would be excluded from this year's sample following my standard screening criteria. Similarly, AltaGas Ltd. announced in January 2017 that it would be acquiring WGL Holdings. Given the size of this pending transaction, my standard sample selection criteria would lead me to eliminate WGL from the current sample.

While recent major M&A activity has affected 3 of the 6 companies included in my 2016 GCOC Gas LDC sample, another recent development in the U.S. natural gas distribution utility space industry is that three other investor-owned natural gas utilities have now existed long enough to meet the sample selection criteria. Specifically, Chesapeake Utilities, One Gas, and Spire all now have a long enough trading history to provide the necessary data for my model estimation. As demonstrated in Figure 10, these companies are also similar to companies in my 2016 GCOC sample in relevant characteristics.

[88] I note that these companies are primarily subject to state regulation.

[89] Carpenter Evidence, Table 1 and Section IV.

Given the recent "turnover" in the group of companies that meets the sample selection criteria, I have constructed my full sample to include all companies that met the criteria either currently (i.e., as of August 31, 2017) or at the time I performed my 2016 GCOC analysis (i.e., January 2016). To determine whether the inclusion of the three companies that are the subject of major M&A introduces any bias to the results, I have also constructed a subsample that excludes New Jersey Resources, South Jersey Industries, and WGL Holdings. As demonstrated below, the results for the subsample and full sample do not differ substantially.

Q48. What are the characteristics of the Water sample?

A48. The water sample consists of eight companies whose primary source of revenues and majority of assets are subject to regulation. These companies own regulated water utilities or subsidiaries that may operate in multiple states in the U.S. The water utility sample is broadly representative of the regulated water distribution industry from a business risk perspective. Additionally, it is worth noting that, like natural gas distribution companies, water utilities are highly capital intensive and face the need to maintain and upgrade aging infrastructure networks designed to deliver commodities to end users. As such, the business risk characteristics of the Water and Gas LDC samples are broadly similar.

Figure 11 reports the sample companies' annual revenues for the trailing twelve months ended June 2017 and the percentage of their assets devoted to regulated activities. It also displays each company's Market Capitalization and the S&P Credit Rating in 2017, as well as its 3-year adjusted historical beta from Bloomberg and the weighted average long-term (3- to 5-year) earnings growth rate estimate for the company from Thomson Reuters IBES and *Value Line*.

Figure 11
U.S. Water Utility Sample Companies

Company	Annual Revenues (USD million)	Regulated Assets	Market Cap. 2017 Q2 (USD million)	Betas	S&P Credit Rating (2017)	Long Term Growth Est.
	[1]	[2]	[3]	[4]	[5]	[6]
Amer. States Water	$443	84%	$1,779	0.71	A+	5.8%
Amer. Water Works	$3,332	89%	$14,362	0.57	A	7.3%
Aqua America	$815	97%	$5,981	0.64	A-	7.6%
California Water	$628	92%	$1,760	0.76	A+	6.7%
Conn. Water Services	$101	100%	$674	0.71	A	5.4%
Middlesex Water	$133	100%	$652	0.83	A	8.1%
SJW Corp.	$363	95%	$1,048	0.85	BBB+	5.7%
York Water Co. (The)	$48	95%	$474	0.93	A-	8.0%
Average	$733	94%	$3,341	0.75	A	6.8%
Portfolio				0.64		

Sources and Notes:
[1]: Bloomberg as of August 31, 2017. Most recent four quarters.
[2]: Company 10-Ks. See Table No. BV-WATER-2.
[3]: See Table No. BV-WATER-3 Panels A through H.
[4]: See Supporting Schedule # 1 to Table No. BV-WATER-10.
[5]: S&P Credit Ratings from Research Insight as of 2017 Q2.
[6]: See Table No. BV-WATER-5.

The average water sample company devotes over 90% of its assets to regulated activities related primarily to the distribution of water and has an average credit rating of A. Given the proven long-term financial stability of these companies, I relax my $300 million annual revenue screening criteria to include three more companies—Connecticut Water Services, Middlesex Water, and York Water Company.

Q49. What are the characteristics of the Pipeline sample?

A49. The Pipeline sample consists of six U.S. based partnerships that operate primarily in the regulated transportation of natural gas, crude oil or petroleum products in the United States. The pipeline subsample reflects the companies within the sample that have a higher proportion of regulated assets dedicated to pipeline transportation operations.

Figure 12 demonstrates the financial information on each of the companies included in the Pipeline sample, including each sample company's most recent fiscal year revenue

and market capitalization, S&P and Moody's credit rating, the estimated weighted growth rate for the DCF model, and the proportion of their assets that are regulated.

Figure 12
U.S. Pipeline Sample Companies

Company	CAPM Subsample	DCF Subsample	Annual Revenues (USD million)	Regulated Assets	Market Cap. 2017 Q2 (USD million)	Betas	S&P Credit Rating (2017)	Long Term Growth Est.
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Boardwalk Pipeline	*	*	$1,341	R	$4,352	1.14	BBB-	9.5%
Spectra Energy Part.	*	*	$2,686	R	$13,095	0.98	BBB+	8.0%
TC PipeLines LP	*	*	$372	R	$3,678	1.11	BBB-	5.4%
Buckeye Partners L.P.			$3,470	D	$8,756	1.16	BBB-	3.4%
EQT Midstream Part.			$768	D	$5,933	0.93	BBB-	11.0%
Magellan Midstream			$2,428	M	$15,922	0.90	BBB+	8.6%
Average			$1,844		$8,623	1.04	BBB	7.6%
Subsample Average			$1,466		$7,042	1.07	BBB	7.6%
Portfolio						1.00		
Subsample Portfolio						1.02		

Sources and Notes:
[1]-[2]: Denotes companies used in the CAPM and DCF subsamples.
[3]: Bloomberg as of August 31, 2017. Most recent four quarters.
[4]: See Table No. BV-PIPE-2. Key:
R - Regulated (More than 80% of assets regulated).
M - Mostly Regulated (50%-80% of assets regulated).
D - Diversified (Less than 50% of assets regulated).
[5]: See Table No. BV-PIPE-3 Panels A through F.
[6]: See Supporting Schedule # 1 to Table No. BV-PIPE-10.
[7]: S&P Credit Ratings from Research Insight as of 2017 Q2.
[8]: See Table No. BV-PIPE-5.

Similar to natural gas distribution companies, the pipeline industry has recently experienced substantial M&A activity. The partnerships included in this sample are largely unaffected by major M&A transactions and generally pass my standard screening criteria. However, given the tendency of pipeline MLPs to engage in ancillary business activities—such as processing, terminalling, unregulated storage, or even marketing of commodities—that are generally considered riskier than regulated pipeline transportation, I also include a subsample of companies that are closer to "pure-play" operators of regulated (mostly natural gas) transmission pipelines.

Q50. Are there any risks specific to the Utilities that are not captured when measuring the cost of capital for samples of comparable companies?

A50. Yes. As discussed at length in the evidence of Dr. Carpenter and Mr. Buttke, recent developments in the Alberta regulatory environment—notably the Alberta Utilities Commission's Utilities Asset Disposition Decision (UAD Decision)—have introduced substantial uncertainty regarding the ability of the Utilities to recover their costs. To the extent that such uncertainty is particular to Alberta, and that the proxy companies contained in my samples are not substantially affected by similar regulatory provisions and associated uncertainty, the cost of capital estimates obtained for the samples will not fully reflect the business risk profiles of the Utilities.[90]

Therefore, it is essential that the Commission take Alberta-specific risk factors into account when determining the appropriate risk-adjusted cost of equity and capital structure that the Utilities should be allowed. As discussed in Section VII below, I consider these factors when making my capital structure recommendations.

C. FINANCIAL RISK ADJUSTMENT

Q51. Please explain the difference between the data relied upon to estimate the cost of equity and the regulatory rate base to which the cost of equity is applied.

A51. Both the CAPM and the DCF models rely on market data to estimate the cost of equity for the sample companies, so the results reflect the value of the capital that investors hold during the estimation period (market values). The allowed return on equity is applied to the rate base, which is determined using historical cost and hence reflect the book values of assets.

Q52. Why is this difference important to the estimation of the cost of equity?

A52. The strict application of a cost of equity that is estimated from market value and hence is based on market value capital structures to a book value capital structure leads to a

[90] Carpenter Evidence, Section V.

mismatch between the two. To my knowledge there is no dispute that the rate base is and should be determined using book values. However, the Commission in its 2013 GCOC Decision cited its 2011 GCOC Decision that "[a]rguments that a market return should be applied to a market value based rate base, rather than a book value rate base, are circular since the market value is clearly dependent on the awarded return."[91] I therefore make clear that the rate base is measured using book values, and that nothing about my analysis of financial risk involves the application of the allowed return to a market value rate base.

Taking differences in financial leverage into consideration does not change the value of the rate base and consequently does not depart from original cost ratemaking principles. Adjusting for differences in leverage *does* consider the fact that the more debt a company has, the higher is the financial risk associated with an equity investment in that company.[92] To see this I construct a simple example below, where only the financial leverage of a company varies. I assume the return on equity is 10% at a 50% equity capital structure and determine the return on equity that would result in the same overall return if the percentage of equity in the capital structure were reduced to 40%.

Figure 13
Illustration of Impact of Financial Risk on Allowed ROE

	Company A (50% Equity)	Company B (40% Equity)
Rate Base	$1,000	$1,000
Equity	$500	$400
Debt	$500	$600
Cost of Debt (5%)	$25	$30
Return on Equity	$50	$45
Total Cost of Capital (7.5%)	**$75**	**$75**
ROE / Implied ROE	10%	11.25%

[91] 2013 GCOC Decision, paragraph 141.

[92] See Appendix B, Section IV for a description of common practice and underlying finance principles related to the impact of financial risk on the cost of equity.

The table above illustrates how financial risk affects returns and also the allowed ROE: the overall return does not change, but the allowed ROE required to produce the same return goes up in recognition of the increased risk to equity investors caused by the higher degree of financial leverage.

The principle illustrated in Figure 13 is exemplary of the adjustments I perform to account for differences in financial risk when conducting estimates of the cost of equity applicable to the Utilities. However, I recognize that the Commission in past decisions has expressed a disinclination to rely on the results of financial leverage adjustments, so I report my results both without and with the adjustments for financial risk. Further, I perform these adjustments using several commonly used methods to avoid undue influence from any one set of assumptions.[93] The details of these methods are included in Appendix B, Section IV.

D. THE CAPM BASED COST OF EQUITY ESTIMATES

Q53. Please briefly explain the CAPM.

A53. The Capital Asset Pricing Model (CAPM) is a theoretical model stating that the collective investment decisions of investors in capital markets will result in equilibrium prices for all risky assets such that the returns investors expect to receive on their investments are commensurate with the risk of those assets relative to the market as a whole. The CAPM posits a risk-return relationship known as the Security Market Line (see Figure 1 in Section II), in which the required expected return on an asset is proportional to that asset's relative risk as measured by that asset's so-called "beta".

More precisely, the CAPM states that the cost of capital for an investment, S (e.g., a particular common stock), is given by the following equation:

$$\boldsymbol{r_s = r_f + \beta_s \times MERP} \qquad (1)$$

[93] These methods include calculating the ROE implied by the overall cost of capital as illustrated in Figure 13, as well as two versions of the so-called Hamada Adjustment for levering and unlevering betas in the CAPM and ECAPM. See Appendix B, Section IV for further discussion and detail.

where r_S is the cost of capital for investment S;

r_f is the risk-free interest rate;

β_S is the beta risk measure for the investment S; and

$MERP$ is the market equity risk premium.

The CAPM is a "risk-positioning model" that relies on the empirical fact that investors price risky securities to offer a higher expected rate of return than safe securities. It says that an investment whose returns do not vary relative to market returns should receive the risk-free interest rate (that is the return on a zero-risk security, the y-axis intercept in Figure 1). Further, it says that the risk premium of a security over the risk-free rate equals the product of the beta of that security and the Market Equity Risk Premium: the risk premium on a value-weighted portfolio of all investments, which by definition has average risk.

1. Inputs to the CAPM

Q54. What inputs does your implementation of the CAPM require?

A54. As demonstrated by equation (1), estimating the cost of equity for a given company requires a measure of the risk-free rate of interest and the market equity risk premium (MERP), as well as a measurement of the stock's beta. There are many methodological choices and sources of data that inform the selection of these inputs. I discuss these issues, along with the finer points of finance theory underlying the CAPM, in Appendix B, Section B to my written evidence. In recognition that estimating the appropriate values of these inputs is inherently imprecise and requires judgment on the part of the analyst, I perform multiple CAPM calculations corresponding to distinct "scenarios" reflecting different values of the inputs. This allows me to derive a range of reasonable estimates for the cost of equity capital implied by each of my samples.

Q55. What values do you use for the risk-free rate of interest?

A55. I use the yield on a 30-year Canadian Government Bond as the risk-free asset for purposes of my analysis. Recognizing the fact that the cost of capital set in this proceeding will prevail for the Utilities over the next several years, I rely on a forecast of what Canadian Government bond yields will be in the middle year of the relevant period for this proceeding (2018-2020). Specifically, Consensus Forecasts® predicts that the yield on a 10-year Government Bond will be 2.9% by 2019.[94] I adjust this value upward by 40 basis points, which is my estimate of the representative maturity premium for the 30-year over the 10-year Government Bond.[95] This gives me a lower bound on the risk-free rate of 3.3%.

I also consider a scenario in which the appropriate risk-free rate of interest is 3.45%. Thus, I consider a scenario where 15 basis points reflect downward pressure on the government bond yield or an increase in the MERP.[96] It also reflects the fact that (as discussed above in Section III) economic forecasts are for 10-year government bond yields to increase over the next several years to about 3.1% by 2020.[97]

Q56. What values do you use for the market equity risk premium (MERP)?

A56. Like the cost of capital itself, the market equity risk premium is a forward-looking concept. It is by definition the premium above the risk-free interest rate that investors can *expect* to earn by investing in a value-weighted portfolio of all risky investments in the market. The premium is not directly observable, and must be inferred or forecasted based on known market information. One commonly used method for estimating the MERP is to measure the historical average premium of market returns over the income returns on

---

94 Consensus Forecasts October 2017 survey. p. 28

95 This maturity premium is estimated by comparing the average excess yield on 30-year versus 10-year Canadian Government Bonds over the period 1990 - 2017, using data from Bloomberg.

96 As of August 31, 2017, the spread between utility and government bond yields was elevated by approximately 30-40 basis points relative to the historical norm, so the application of only 15 basis points as an upward adjustment to the risk-free interest rate is conservative.

97 Consensus Forecasts, October 2017, p. 28.

government bonds over some long historical period. *Duff and Phelps* performs such a calculation of the Canadian MERP using data from several sources.[98] The average market equity risk premium from 1935 to the present is 5.7% with slightly shorter or longer periods resulting in slightly higher or lower MERPs.[99] I use this value of the MERP in one input scenario to my CAPM analyses.

However, investors may require a higher or lower risk premium, reflecting the investment alternatives and aggregate level of risk aversion at any given time. As explained in Section III, there is substantial evidence that investors' level of risk aversion remains elevated relative to the time before the global financial crisis and ensuing recession that commenced in 2008. In recognition of this evidence, together with forward-looking measurements of the expected market equity risk premium that are higher than the long-term historical average, I also perform CAPM calculations using 8% for the Canadian market equity risk premium. The 8% forecasted MERP is in between Bloomberg's forecasted Canadian and U.S. MERP.[100] I use a forecasted MERP between the Canadian forecast and the U.S. forecast because of the substantial interaction of the two markets.

Q57. What is the evidence that the current MERP is higher than its historical average?

A57. As discussed in Section III and in the technical appendix to this evidence, lingering elevation in credit spreads relative to their pre-financial crisis levels is broadly consistent with the forward-looking MERP's calculated by Bloomberg and shown in Figure 5, which demonstrates that the forward-looking MERP for Canada is particularly high at nearly 10 percent. Even after reducing this estimate to account for the maturity premium between 10-year government bonds used in their model and 30-year Government bonds that form the risk-free rate in this proceeding, this suggests that a figure well above 9% could be representative of the MERP in Canada. Because the forecasted U.S. MERP is

---

98 See *Duff and Phelps International Cost of Capital Handbook, 2017,* pp. 3-9 for details.

99 See *Duff and Phelps International Cost of Capital Handbook*, 2017, Exhibit 1-9

100 Over a 30-year government bond, the Canadian MERP is 9.49% which is high relative to the forecasted U.S. MERP of 6.76%. (*See* BV WP01.)

lower—closer to its long-term historical average of approximately 7% when considered relative to a 30-year Treasury bond, I rely on an estimate of 8% for the forward-looking MERP in consideration of the evidence in both (Canadian and U.S.) markets. Thus, I conservatively rely on the historical average Canadian MERP of 5.7% as well as a forward-looking MERP of 8% in my CAPM analysis.[101] A plausible explanation as to why the MERP differs across countries is that historically the return data relied upon came from a different composition of traded entities and going forward the differences in the composition of the local index will lead to differences in realized and expected returns.

Q58. What betas did you use for the companies in your sample?

A58. I used adjusted historical betas obtained from Bloomberg, using weekly returns over a three-year historical estimation period.[102] As acknowledged by the Commission "adjusted betas are widely disseminated to investors by investment research firms."[103] For the Canadian Utility Sample, I used the S&P/TSX as the measure of overall market returns, but for the U.S. samples, I relied on the S&P 500 as the market proxy.

Additionally, I estimated a portfolio beta for each sample, reflecting the market risk of each sample on an aggregate basis. For example, I took the market-value weighted average of the weekly returns to the stocks of the eight Water sample companies and measured how this series of composite returns varied relative to the market over a 3-year period. The use of value-weighted portfolio betas is advantageous from a statistical standpoint, since idiosyncratic fluctuations in the returns on individual stocks may cancel

[101] I use 8% because it recognized that the forward-looking U.S. MERP is lower than the Canadian forward-looking MERP and also is justified by the elevation in the spread between Canadian utility and government bond yields. See Appendix B, Section II for details.

[102] Bloomberg reports betas using "Blume Adjustment" to improve predictive accuracy relative to the use of raw historical betas. Betas adjusted in this manner are also reported by *Value Line* and other investment services, are routinely relied upon in practical applications of the CAPM, including in many regulatory jurisdictions See Appendix B, section IV for more detail on the estimation of betas.

[103] 2016 GCOC Decision, paragraph 178.

each other out as part of the portfolio, leading to a more precise estimate of beta compared to betas measured for individual securities.

The portfolio betas for the five samples (and subsamples where relevant), along with the individual company betas and the simple average betas for each sample are reported above in Figure 8, Figure 9, Figure 10, Figure 11, and Figure 12.

2. The Empirical CAPM

Q59. What other equity risk premium model do you use?

A59. Empirical research has long shown that the CAPM tends to overstate the actual sensitivity of the cost of capital to beta: low-beta stocks tend to have higher risk premiums than predicted by the CAPM and high-beta stocks tend to have lower risk premiums than predicted.[104] A number of variations on the original CAPM theory have been proposed to explain this finding, but the observation itself can also be used to estimate the cost of capital directly, using beta to measure relative risk by making a direct empirical adjustment to the CAPM.

The second variation on the CAPM that I employ makes use of these empirical findings. It estimates the cost of capital with the equation,

$$\boldsymbol{r_S = r_f + \alpha + \beta_S \times (MRP - \alpha)} \qquad (2)$$

where $\boldsymbol{\alpha}$ is the "alpha" adjustment of the risk-return line, a constant, and the other symbols are defined as for the CAPM (see equation (2) above).

I label this model the Empirical Capital Asset Pricing Model, or "ECAPM." The alpha adjustment has the effect of increasing the intercept but reducing the slope of the Security Market Line in Figure 1, which results in a Security Market Line that more closely matches the results of empirical tests. In other words, the ECAPM produces more accurate predictions of eventual realized risk premiums than does the CAPM.

[104] See Figure A-3 in Appendix B for references to relevant academic articles.

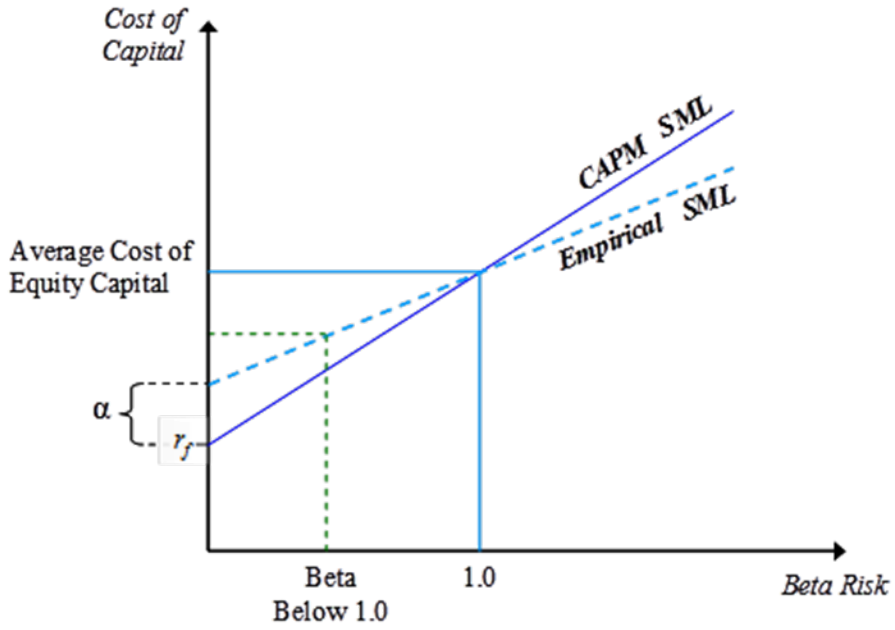
Q60. Why do you use the ECAPM?

A60. Academic research finds that the CAPM has not generally performed well as an empirical model. One of its short-comings is directly addressed by the ECAPM, which recognizes the consistent empirical observation that the CAPM underestimates the cost of capital for low beta stocks. In other words, the ECAPM is based on recognizing that the actual observed risk-return line is flatter and has a higher intercept than that predicted by the CAPM. The alpha parameter (α) in the ECAPM adjusts for this fact, which has been established by repeated empirical tests of the CAPM. Appendix B, Section II discusses the empirical findings that have tested the CAPM and also provides documentation for the magnitude of the adjustment, α.

The 2016 GCOC Decision recognized the ECAPM as a valid and academically supported model that can "improve upon CAPM results" by addressing the established empirical observation that the risk-return relationship in equities is steeper than the security-market line (SML) assumed by the traditional CAPM.[105] I concur.

[105] 2016 GCOC Decision, paragraphs 194-199.

Figure 14
The Empirical Security Market Line



3. Results from the CAPM Based Models

Q61. Please summarize the parameters of the scenarios and variations you considered in your CAPM and ECAPM analyses.

A61. The parameters for the two scenarios are displayed in Figure 15 below. The motivation for the scenarios is the empirical observation that the yield spread is higher than normal as is the forecasted MERP for Canada. The increased yield spread could reflect the increase in the MERP or downward pressure on the yield of government bonds due to a flight to quality or other factors. Therefore, I use the unadjusted forecast risk-free rate with a higher estimate of the MERP, and the unadjusted historical average MERP with the increased estimate of the risk-free interest rate as illustrated in Figure 15. Consistent with the Commission's expressed concern in past GCOC Decisions, I do not simultaneously normalize the risk-free rate and elevate the MERP. This is a conservative approach as it is plausible that both downward pressure on the risk-free rate and upward pressure on the MERP could simultaneously occur. Scenario 1 normalizes the risk-free rate and uses a historical MERP while Scenario 2 uses an unadjusted forecast of the risk-free rate and a forecasted MERP. Because I do not simultaneously normalize both the

government bond rate and the MERP, my estimates are lower bounds. I also note that I rely on less than one half of the current spread to ensure conservatism given that interest rates are expected to increase and given that the Bank of Canada has not engaged in quantitative easing.

Figure 15
Risk Positioning Scenario Parameters

	Scenario 1	Scenario 2
Risk-Free Interest Rate	3.45%	3.30%
Market Equity Risk Premium	5.70%	8.00%

Q62. Can you summarize the results from applying the CAPM-based methodologies?

A62. Yes. The results for the five samples are presented in Figure 16, Figure 17, Figure 18, Figure 19, and Figure 20 below.[106] Consistent with Commission precedent, I have included a 50 basis point flotation cost allowance as an adder to all of my estimates. In the interest of displaying the results more compactly, the tables report ranges reflecting differences due to (i) estimation using the portfolio beta approach vs. taking the sample average of results estimated using individual company betas, and (ii) employing subtly different formulas in the financial risk adjustment calculations.

Note that I report estimates derived using both the full samples and the subsamples. In the case of the Gas LDC results, this allows me to compare results for the Gas LDC sample I presented in the 2016 GCOC to those for an "updated" sample that replaces three companies that have since been involved in major M&A with three "new" companies that recently became eligible for inclusion in the sample. For the Electric and Pipeline samples, the subsamples reflect a stricter standard in terms of comparability criteria (i.e., higher proportion of assets and operations dedicated to rate-regulated utility service), for estimating the Utilities' cost of equity.

[106] Tables and supporting schedules detailing my cost of capital calculations for the Canadian Utility sample, the Electric sample, the Gas LDC sample, the Water sample, and the Pipeline sample are contained in workpapers BV WP05, 06, 07, 08, and 09, respectively.

Figure 16
Canadian Utility Sample CAPM Results using Individual Company and Portfolio Betas[107]

	Scenario 1		Scenario 2	
	Without Leverage Adjustment [1]	With Leverage Adjustments [2]	Without Leverage Adjustment [3]	With Leverage Adjustments [4]
Full Sample				
CAPM	8.8% - 9.4%	9.9% - 11.0%	10.6% - 11.4%	12.1% - 13.7%
ECAPM (α = 1.5%)	9.0% - 9.4%	9.8% - 11.0%	10.8% - 11.5%	12.0% - 13.3%

Sources and Notes:
Scenario 1: Long-Term Risk Free Rate of 3.45%, Long-Term Market Risk Premium of 5.70%.
Scenario 2: Long-Term Risk Free Rate of 3.30%, Long-Term Market Risk Premium of 8.00%.
Includes flotation costs of 0.5%.

Figure 17
U.S. Gas LDC Sample CAPM Results using Individual Company and Portfolio Betas

	Scenario 1		Scenario 2	
	Without Leverage Adjustment [1]	With Leverage Adjustments [2]	Without Leverage Adjustment [3]	With Leverage Adjustments [4]
Full Sample				
CAPM	7.7% - 7.8%	9.6% - 11.0%	9.1% - 9.2%	11.7% - 13.3%
ECAPM (α = 1.5%)	8.2% - 8.3%	9.6% - 11.8%	9.6% - 9.6%	11.8% - 14.2%
Current Criteria Subsample				
CAPM	7.7% - 7.7%	9.5% - 10.7%	9.0% - 9.1%	11.6% - 12.9%
ECAPM (α = 1.5%)	8.2% - 8.2%	9.6% - 11.5%	9.6% - 9.6%	11.7% - 13.8%

Sources and Notes:
Scenario 1: Long-Term Risk Free Rate of 3.45%, Long-Term Market Risk Premium of 5.70%.
Scenario 2: Long-Term Risk Free Rate of 3.30%, Long-Term Market Risk Premium of 8.00%.
Includes flotation costs of 0.5%.

[107] Note that setting alpha (a) equal to 1.5% is a conservative estimate according to the academic research listed in the technical appendix, Figure A-3.

Figure 18
U.S. Electric Sample CAPM Results Individual Company and Portfolio Betas

	Scenario 1		Scenario 2	
	Without Leverage Adjustment [1]	With Leverage Adjustments [2]	Without Leverage Adjustment [3]	With Leverage Adjustments [4]
Full Sample				
CAPM	7.2% - 7.4%	8.5% - 9.7%	8.4% - 8.7%	10.2% - 11.6%
ECAPM (α = 1.5%)	7.9% - 8.0%	8.8% - 10.6%	9.1% - 9.3%	10.5% - 12.4%
Regulated Subsample				
CAPM	7.2% - 7.4%	8.3% - 9.5%	8.3% - 8.7%	9.9% - 11.3%
ECAPM (α = 1.5%)	7.8% - 8.0%	8.7% - 10.3%	9.0% - 9.3%	10.3% - 12.1%

Sources and Notes:
Scenario 1: Long-Term Risk Free Rate of 3.45%, Long-Term Market Risk Premium of 5.70%.
Scenario 2: Long-Term Risk Free Rate of 3.30%, Long-Term Market Risk Premium of 8.00%.
Includes flotation costs of 0.5%.

Figure 19
U.S. Water Utility Sample CAPM Results using Individual Company and Portfolio Betas

	Scenario 1		Scenario 2	
	Without Leverage Adjustment [1]	With Leverage Adjustments [2]	Without Leverage Adjustment [3]	With Leverage Adjustments [4]
Full Sample				
CAPM	7.6% - 8.2%	9.4% - 12.1%	9.0% - 9.8%	11.4% - 14.9%
ECAPM (α = 1.5%)	8.2% - 8.6%	9.4% - 12.8%	9.5% - 10.2%	11.5% - 15.5%

Sources and Notes:
Scenario 1: Long-Term Risk Free Rate of 3.45%, Long-Term Market Risk Premium of 5.70%.
Scenario 2: Long-Term Risk Free Rate of 3.30%, Long-Term Market Risk Premium of 8.00%.
Includes flotation costs of 0.5%.

Figure 20
U.S. Pipeline Sample CAPM Results using Individual Company and Portfolio Betas

	Scenario 1		Scenario 2	
	Without Leverage Adjustment [1]	With Leverage Adjustments [2]	Without Leverage Adjustment [3]	With Leverage Adjustments [4]
Full Sample				
CAPM	9.7% - 9.9%	13.3% - 15.3%	11.8% - 12.1%	16.9% - 19.2%
ECAPM (α = 1.5%)	9.7% - 9.8%	12.3% - 15.2%	11.8% - 12.0%	16.0% - 19.1%
Regulated Subsample				
CAPM	9.7% - 10.1%	12.7% - 14.2%	11.9% - 12.4%	16.0% - 17.8%
ECAPM (α = 1.5%)	9.7% - 10.0%	11.9% - 14.0%	11.9% - 12.3%	15.2% - 17.6%

Sources and Notes:
Scenario 1: Long-Term Risk Free Rate of 3.45%, Long-Term Market Risk Premium of 5.70%.
Scenario 2: Long-Term Risk Free Rate of 3.30%, Long-Term Market Risk Premium of 8.00%.
Includes flotation costs of 0.5%.

Q63. How do you interpret the results of your CAPM and ECAPM analyses?

A63. Looking at the various sample and subsamples, the model results vary over a wide range. However, as discussed in the evidence of Dr. Carpenter, the business risk of the Utilities is likely to be higher than that of the Gas LDC sample albeit lower than that of the U.S. Pipeline sample. Therefore, I focus my discussion of the recommendation on these two samples, while continuing to evaluate how the other samples inform the recommendation. In addition, I discuss my recommendation for 2018-2020 relative to my recommendation in the 2016 GCOC and the 2016 GCOC Decision.

Relative to the 2016 GCOC proceeding, the business risk of the Utilities has increased (as reflected in my consideration and Dr. Carpenter's discussion of the U.S. Pipeline sample) and the forecasted risk-free rate has increased, so it is not surprising that the CAPM results are slightly higher for the Gas LDC sample compared to my analysis for the 2016 GCOC. The CAPM results for the Gas LDC sample are broadly consistent with a range of 9.5% to 11.7% (using the current criteria subsample and disregarding the highest observations). If financial leverage is not considered, the range is approximately 8.2% to 9.6% (disregarding the lowest observations). Looking next to the U.S. Pipelines sample, I find a range of 11.9% to over 18%, but given Dr. Carpenter's observation that the Utilities' business risk is not as high as that of the U.S. Pipeline sample in general, I focus

on the subsample of purer play regulated gas pipeline companies, where the lower end results are 11.9% (ECAPM) and 12.7% (CAPM). [108] If financial leverage is ignored, the full range of Pipeline regulated subsample results is 9.7% to 12.3%. The Water sample generally corroborates the results of the Gas LDC sample, while the Canadian Utility sample is closer to the U.S. Pipeline sample. For both the Water and Canadian Utility sample, I disregarded the highest and lowest results in identifying ranges.[109] As discussed previously, I do not focus on the Electric Sample.

Figure 21
Ranges of CAPM Based Cost of Equity Estimates (%)

Sample	Reasonable Range	Ignoring Financial Risk
Gas LDC (Current Subsample)	9.5% - 11.7%	8.2% - 9.6%
Pipeline (Regulated Subsample)	11.9% -12.7%	9.7% - 12.3%
Water	9.4% - 12.8%	8.2% - 10.2%
Canadian Utility	9.8 – 12.1%	9.0% - 11.5%

The high end of the Gas LDC range is close to the low end of the Pipeline range with the Water sample generally supporting the Gas LDC sample. The Canadian Utility sample results are also in line with those of the Gas LDC sample when adjusting for financial risk, but are closer to the U.S. Pipeline sample when differences in financial leverage are ignored. Based on the ranges above, I find that a range 9.5% to 11.5% includes results from all samples when financial risk is considered. Looking to results that ignore financial risk, there is no strictly overlapping range, but the Gas LDC and Pipeline

[108] I note that the 2016 GCOC Decision recognized that the ECAPM was a valid and academically supported model that can "improve upon CAPM results" and therefore include those results in the ranges. Source: 2016 GCOC Decision, paragraphs 194-199.

[109] In general, my reasonable ranges go from the lowest result produced using leverage adjustments to the low end of the highest range produced for any combination of the CAPM of ECAPM and Scenario 1 or 2. For example, in the Canadian Utility sample, the lowest Scenario 1 ECAPM result is 9.8%, while the highest values are in the 12.1% – 13.7% are produced by the Scenario 2 CAPM. Hence my reasonable range for the Canadian Utility sample is 9.8% - 12.1%. When ignoring financial risk, I generally disregard the combination of CAPM vs. ECAPM and Scenario 1 vs. Scenario 2 that produces the lowest results. Hence, for example, I generally disregard the Scenario 1 CAPM results in all samples when producing ranges of results that ignore financial risk. The aim is to identify the central tendency of the results.

samples have high and low (respectively) results of 9.6 and 9.7%, which are well within the ranges from the Canadian Utility and Water samples.

In consideration of the results as discussed above and informed by Dr. Carpenter's business risk analysis, I believe a reasonable range for the CAPM-based results is 9½ to 11½ percent. This range is supported primarily by the Gas LDC sample and the lower end of the Canadian Utility and U.S. Pipeline samples.

E. THE DCF BASED ESTIMATES

1. Single- and Multi-Stage DCF Models

Q64. Can you describe the discounted cash flow approach to estimating the cost of equity?

A64. The DCF model attempts to estimate the cost of capital for a given company directly, rather than based on its risk relative to the market as the CAPM does. The DCF method simply assumes that the market price of a stock is equal to the present value of the dividends that its owners expect to receive. The method also assumes that this present value can be calculated by the standard formula for the present value of a cash flow—literally a stream of expected "cash flows" discounted at a risk-appropriate discount rate. When the cash flows are dividends, that discount rate is the cost of equity capital:

$$\boldsymbol{P_0} = \frac{\boldsymbol{D_1}}{\boldsymbol{1+r}} + \frac{\boldsymbol{D_2}}{\boldsymbol{(1+r)^2}} + \frac{\boldsymbol{D_3}}{\boldsymbol{(1+r)^3}} + \cdots + \frac{\boldsymbol{D_T}}{\boldsymbol{(1+r)^T}} \qquad (3)$$

where $\boldsymbol{P_0}$ is the current market price of the stock;

$\boldsymbol{D_t}$ is the dividend cash flow expected at the end of period $\boldsymbol{t}$;

$\boldsymbol{T}$ is the last period in which a dividend cash flow is to be received; and

$\boldsymbol{r}$ is the cost of equity capital

Importantly, this formula implies that if the current market price and the pattern of expected dividends are known, it is possible to "solve for" the discount rate r that makes

the equation true. In this sense, a DCF analysis can be used to estimate the cost of equity capital implied by the market price of a stock and market expectations for its future dividends.

Many DCF applications make the assumption the growth rate lasts into perpetuity, so the formula can be rearranged algebraically to directly estimate the cost of capital. Specifically, the implied DCF cost of equity can then be calculated using the well-known "DCF formula" for the cost of capital:

$$\boldsymbol{r = \frac{D_1}{P_0} + g = \frac{D_0}{P_0} \times (1 + g) + g} \qquad (4)$$

where $\boldsymbol{D_0}$ is the current dividend, which investors expect to increase at rate $\boldsymbol{g}$ by the end of the next period, and over all subsequent periods into perpetuity.

Equation (4) says that if equation (3) holds, the cost of capital equals the expected dividend yield plus the (perpetual) expected future growth rate of dividends. I refer to this as the single-stage DCF model; it is also known as the Gordon Growth model, in honor of its originator Professor Myron J Gordon of the University of Toronto.

Q65. Are there other versions of the DCF model?

A65. Yes. There are many alternative versions, notably (i) multi-stage models, (ii) models that use cash flow rather than dividends, or versions that combine aspects of (i) and (ii).[110] One such alternative expands the Gordon Growth model to three stages. In the multistage model, earnings and dividends can grow at different rates, but must grow at the same rate in the final, constant growth rate period. [111]

In my implementation of the multi-stage DCF, I assume that companies grow their dividend for 5-years at the forecasted company-specific rate of earnings growth, with that

[110] The Surface Transportation Board uses a cash flow based model with three stages. See, for example, Surface Transportation Board Decision, "STB Ex Parte No. 664 (Sub-No. 1)," Decided January 23, 2009.

[111] See Appendix B, Section III for further discussion of the various versions of the DCF model, as well as the details of the specific versions I implement in this proceeding.

growth then tapering over the next 5-years toward the growth rate of the overall economy (i.e., the long-term GDP growth rate forecasted to be in effect 10 years or more into the future).

Q66. Are there advantages to the multistage DCF relative to the single-stage DCF?

A66. Potentially, the multi-stage DCF allows the near-term growth rate to differ from the long-term growth rate with the latter commonly being set at GDP growth, so that in the long-run the growth rate follows GDP growth.[112]

Q67. What are the relative strengths and weaknesses of the DCF versus CAPM based methodologies for estimating the cost of equity capital?

A67. Current market conditions affect all cost of capital estimation models to some degree, but the DCF model has at least one advantage over the CAPM-based models as it includes contemporaneous stock prices and forward-looking growth, whereas the CAPM relies on historical data to estimate systematic risk and (in some cases) the market risk premium.

2. DCF Inputs and Results

Q68. What growth rate information do you use?

A68. The first step in my DCF analysis (either constant growth or multi-stage formulations) is to examine a sample of investment analysts' forecasted earnings growth rates for companies in my samples. For the single-stage DCF and for the first stage of the multi-stage DCF, I use investment analyst forecasts of company-specific growth rates sourced from *Value Line* and Thomson Reuters IBES.[113]

---

[112] The multi-stage DCF model is therefore consistent with the Commission's 2013 GCOC Decision, which stated that it "will not accept the use of long-term or terminal growth rates that exceed estimates of the nominal long-term GDP growth rate in single-stage DCF model." (p. 40)

[113] Since *Value Line* does not cover all Canadian companies in my sample, for those companies not followed by *Value Line*, I used only the consensus mean EPS growth rate estimates from Thomson Reuters IBES.

For the long-term growth rate for the final, constant-growth stage of the multistage DCF estimates, I use the long-term Canadian GDP growth forecast of 3.85% from Consensus Forecasts.[114] (Importantly, this is lower than the realized growth for Q2, 2017 at 4.5%.) I use the most recent long-run U.S. GDP growth forecast of 4.35% from Consensus Forecasts for the U.S. samples.[115] Thus, the long-run (or terminal) growth rate in the multi-stage model is nominal GDP growth.

Q69. What are the pros and cons of the input data?

A69. Both the Gordon Growth and single-stage DCF models require forecast growth rates that reflect investor expectations about the pattern of dividend growth for the companies over a sufficiently long horizon, but estimates are typically only available for 3-5 years. In the multi-stage version, I taper these growth rates toward a stable growth rate corresponding to a forecast of long-term GDP growth for all companies.[116]

One issue with the data is that it includes solely dividend payments as cash distributions to shareholders, while some companies also use share repurchases to distribute cash to shareholders. To the extent that companies in my samples use share repurchases, the DCF model using dividend yields will underestimate the cost of equity for these companies.

Q70. What are the DCF based cost of equity estimates for the samples?

A70. The results are presented in Figure 22, Figure 23, Figure 24, Figure 25, and Figure 26 below.[117] Consistent with the Commission's precedent, I have included 50 basis points

[114] Calculated using a forecasted 1.8% real GDP growth and 2.0% consumer price inflation for 2023-2027 [(1.018) * (1.020) - 1 = 3.84%], Consensus Forecasts, October 2017, p. 28.

[115] Calculated using a forecasted 2.1% real GDP growth and 2.2% consumer price inflation for 2023-2027 [(1.021) * (1.022) - 1 = 4.35%], Consensus Forecasts, October 2017, p. 3.

[116] In the case of the Consensus Forecasts estimates of GDP growth, the horizon of the forecasts is 2023-2027.

[117] Tables and supporting schedules detailing my cost of capital calculations for the Canadian Utility sample, the Electric sample, the Gas LDC sample, the Water sample, and the Pipeline sample are contained in my workpapers labeled BV WP05, 06, 07, 08, and 09 respectively.

for flotation costs in my estimates. As with the CAPM based estimates, I have presented both cost of equity estimates that adjust for financial risk and simple averages of the individual market-implied cost of equity estimates for the sample companies without adjustment for differences in financial leverage. As with the CAPM based estimates, I present both full sample and subsample results where applicable.

Figure 22
Canadian Utility Sample DCF Results

	Without Leverage Adjustment	With Leverage Adjustments
Full Sample		
Simple	13.1%	15.7%
Multi-Stage	9.8%	11.5%

Sources and Notes: Includes flotation costs of 0.5%.

Figure 23
U.S. Gas LDC Utility Sample DCF Results

	Without Leverage Adjustment	With Leverage Adjustments
Full Sample		
Simple	10.3%	15.8%
Multi-Stage	7.9%	11.6%
Current Criteria Subsample		
Simple	9.9%	15.3%
Multi-Stage	7.7%	11.2%

Sources and Notes: Includes flotation costs of 0.5%.

Figure 24
U.S. Electric Utility Sample DCF Results

	Without Leverage Adjustment	With Leverage Adjustments
Full Sample		
Simple	9.1%	12.7%
Multi-Stage	8.3%	11.2%
Regulated Subsample		
Simple	8.9%	12.2%
Multi-Stage	8.1%	10.9%

Sources and Notes: Includes flotation costs of 0.5%.

Figure 25
U.S. Water Utility Sample DCF Results

	Without Leverage Adjustment	With Leverage Adjustments
Full Sample		
Simple	9.5%	15.0%
Multi-Stage	7.4%	11.0%

Sources and Notes: Includes flotation costs of 0.5%.

Figure 26
U.S. Pipeline Sample DCF Results

	Without Leverage Adjustment	With Leverage Adjustments
Full Sample		
Simple	14.8%	23.1%
Multi-Stage	12.5%	19.0%
Regulated Subsample		
Simple	14.3%	19.7%
Multi-Stage	12.0%	16.4%

Sources and Notes: Includes flotation costs of 0.5%.

Q71. How do you interpret the results of your DCF analyses?

A71. The range of results is even wider than for the CAPM-based analysis. Relative to the 2016 GCOC, the results from the Canadian Utility sample and the Gas LDC sample have declined slightly. For both samples, the change is largely due to changes in growth rates for the utilities and to a lesser degree a change in sample composition.

However, for the same reasons as discussed above, I focus on the Current Gas LDC and Regulated Pipeline samples. Looking at the Gas LDC subsample, the data shows a range of 11.2% to 15.3%, with a much lower range of 7.7% to 9.9% if financial risk is ignored. My best point estimate for the sample is 11.2%, which is based on the multi-stage DCF for the gas LDC companies that currently meet the selection criteria. This estimate takes the long-term GDP growth rate for the economy into account. In the 2016 GCOC Decision, the Commission considered a growth rate that combined utility-specific and GDP growth biased.[118] However, I respectfully submit that utilities (or other companies) may have growth rates that are higher or lower than that of the economy in the near to mid-term[119] although I agree that long-term it must converge to that of the economy.

Looking to the multi-stage DCF results for other samples, the Water Sample results are slightly lower than the Gas LDC results and the Canadian Utility Sample results are slightly higher than the Gas LDC results. However, the Pipelines results are non-trivially higher, but unlikely to be representative for the Utilities. This is because many of the Pipeline Sample companies experienced poor performance in recent years and therefore the growth rate reflects growth from a low Earnings per Share figure. Therefore, I do not focus on the Pipeline Sample's DCF results. In summary, I find the following ranges to be representative for the DCF models.

[118] 2016 GCOC Decision paragraph 288.

[119] I rely on company specific growth rates for 5 years and a combination of company-specific and GDP growth for years 6 through 10 after which all growth rates are based on GDP.

Figure 27
Ranges of DCF Based Cost of Equity Estimates (%)

Sample	Reasonable Range	Ignoring Financial Risk
Gas LDC	11.2% - 11.6%	7.7% - 7.9%
Water	11.0%	7.4%
Canadian Utility	11.5%	9.8%
Pipeline Sample	n/a	12.0% - 12.5%

As I did when interpreting the CAPM-based results, I focus on the tendency of the estimates rather than the full range of DCF results. Further, following the Commission's has expressed preference for growth rates that do not exceed GDP growth.[120] For this reason, I focus on the multi-stage DCF and consider the very low or very high estimates outside the reasonable range.

The Gas LDC sample's results and those of the Canadian Utility sample as well as those of the Water sample are generally in line and provide a reasonable range of 11 to 11½ percent, but the Pipeline results indicate a much higher range. Looking to the right-hand suggests a range of 8 to 9¾ percent (disregarding the highest and lowest figures) when differences in financial risk are ignored.

F. OTHER EVIDENCE RELEVANT TO THE ALLOWED ROE

Q72. Do you have any other pertinent evidence regarding the cost of equity for the Utilities?

A72. Yes. For the reasons explained above, I believe that since investors compare returns across jurisdictions, it is important to recognize what return utilities have recently been granted in other jurisdictions. Figure 28 below summarizes the allowed ROE and capital structure for Canadian and U.S. utilities regulated by the province / state.[121]

[120] 2016 GCOC Decision, paragraph 287. I acknowledge that my multi-stage DCF will have growth rates above and below GDP growth in early years, but converge to GDP growth.

[121] Sources: SNL Financial for the U.S. and Concentric Energy Advisors, "Authorized Return on Equity for Canadian and U.S. Gas and Electric Utilities," Volume V. See workpaper BV WP04.

Figure 28
Allowed ROEs and Capital Structures in Canada and the U.S.

Service	2016		2017	
	Allowed ROE (%)	Common Equity Ratio (%)	Allowed ROE (%)	Common Equity Ratio (%)
U.S.				
Natural Gas	9.54	50.06	9.74	48.69
Electric	9.77	48.91	9.73	48.55
Electric T&D	9.31	49.12	9.53	48.00
All	9.68	49.36	9.74	48.60
All - Settled	9.65	48.04	9.63	48.43
All - Fully Litigated	9.70	50.50	9.87	48.77
Canada				
Natural Gas	9.30	40.08	9.30	40.08
Electric	8.71	39.04	8.75	38.94
All	9.05	39.65	9.07	39.61
All (excluding Alberta)	9.35	40.40	9.29	40.34

Sources:
For U.S. data: Averages calculated using SNL Financial data accessed as of October 27, 2017.
For Canadian data: Concentric Energy Advisors Authorized Return on Equity for Canadian and U.S. Gas and Electric Utilities, Volume V, May 25, 2017. Averages exclude crown corporations.

It is clear from the table above that allowed ROEs in both Canada and the U.S. have been substantially higher than the most recently allowed ROE in Alberta and the average capital structure includes an average of 40% to 50% equity. I note that allowed ROEs elsewhere in Canada (excluding crown corporations) are approximately 9.3% on average across jurisdictions and that deemed equity ratios have averaged approximately 40%.[122] In summary, the return available to investors is higher both because of a higher ROE and because of a higher equity ratio.

It is interesting to note that in both 2016 and 2017, U.S. allowed ROE's and deemed equity ratios were higher in fully litigated rate cases than in cases that reached negotiated settlements. The ability to distinguish between "settlements" and "fully litigated" cases addresses one of the Commission's concerns that some of the ROE decisions that have been presented in the past were settlements.

[122] See Figure 28 and workpaper BV WP04.

Q73. Do you include evidence based on price-to-book ratios?

A73. Consistent with my position in the 2016 GCOC, I find such information problematic. As the Commission acknowledged in the 2009 GCOC Decision, it was "unable to derive any useful information about the price-to-book ratios of stand-alone utilities from the price-to-book ratios of utility holding companies"[123] and did not "[give] any material weight to P/B evidence" in the 2016 GCOC Decision.[124] In the 2009 GCOC Decision, the Commission also found that there may be business reasons for a specific purchase that are not well understood and henceforth, the Commission found it difficult to draw any conclusions from this evidence.[125] Put differently, the market-to-book ratio is influenced by many factors other than allowed ROEs. Additionally, as Professors Brealey, Myers and Allen point out,

> Most of the tests of market efficiency are concerned with *relative* prices and focus on whether there are easy profits to be made. It is almost impossible to test whether stocks are *correctly valued* because no one can measure true value with any precision.[126]

This means that it is difficult to assess the absolute price of a stock and therefore the price-to-book value.

Q74. What do you conclude regarding the required ROE?

A74. Having considered two versions of both the CAPM-based and DCF models applied to five samples as well as the economic conditions, allowed return in other jurisdictions and the Utilities' unique risks, I conclude that at 40% equity a reasonable range for the required return is in the range of 9½ to 11½ percent using the benchmark and financial risk adjusted figures.[127] As the Commission in the past has preferred to look to figures

---

123 2009 GCOC Decision paragraph 295.

124 2016 GCOC Decision, paragraph 305.

125 2011 GCOC Decision, paragraph 122.

126 Richard A. Brealey, Stewart C. Myers, and Franklin Allen, "Principles of Corporate Finance," 12th Edition, 2017, p. 339.

127 See the discussion below Figure 21 and Figure 26 and focusing the range on overlapping estimates from the CAPM-based and DCF figures.

that do not consider financial risk, this range is lower at 8¼ percent to a bit below 10 percent.[128] Further, the allowed ROE in recent Canadian proceedings outside Alberta has averaged 9.3-9.4% at a little over 40% equity.[129] Based on these figures and in recognition of the Commission's preference for results that do not take leverage into account, I conservatively find a range of 9.5% to 10.5% to be appropriate[130] and recommend 10.0% as the allowed ROE for 2018-2020.

V. CAPITAL STRUCTURE ANALYSIS

A. CAPITAL STRUCTURE AND THE FAIR RETURN STANDARD

Q75. What is your understanding of the Commission's approach to determining the capital structure for the Alberta Utilities in recent GCOC proceedings?

A75. In the 2016 Decision, the Commission maintained its position from the 2013 GCOC Decision of focusing primarily—if not exclusively—on credit metrics when determining capital structures for the utilities in Alberta. Specifically, the Commission has sought to set capital structures such that the implied credit metrics were consistent with an A range rating.[131] However, in my assessment, the Commission's analysis in recent GCOC Decisions has taken the narrow view that an appropriate capital structure is one that allows the Alberta Utilities to meet the bare minimum credit quality standards necessary to obtain such a rating. In my opinion, by narrowly focusing on minimal thresholds for maintaining financial integrity, the Commission has neglected to consider the other components of the fair return standard, namely comparability and capital attraction. When setting an equity ratio consistent with the fair return standard, ensuring financial integrity and adequate access to *debt* capital through maintenance of an A range credit

---

[128] *Ibid*.

[129] See Figure 28.

[130] The low-end of this range was determined as the lowest overlapping figure from the financial risk adjusted and unadjusted figures and the high-end was conservatively determined as close to the midpoint of the upper bounds of the financial risk adjusted and non-financial risk adjusted upper bound.

[131] 2016 GCOC Decision, paragraph 345.

rating is a *necessary* condition, but it is not *sufficient* to ensure that the utility can attract *equity* capital and offer a return equal to that of an alternative investment of comparable risk.

Q76. How has the Commission described its approach to determining capital structures?

A76. In the 2016 Decision, the Commission described its capital structure analysis as follows.

> [The Commission] will review the evidence in respect of the credit metrics currently observed in the bond market as noted by credit rating agencies and market analysts in Canada, required by a typical pure-play regulated utility in order to maintain an A-range credit rating. The Commission will then evaluate the credit metrics of the transmission utilities included in the affected utilities and the credit metrics of the distribution utilities included in the affected utilities […]. If required, the Commission will adjust the deemed equity ratios for all the affected utilities based on this generic business risk analysis. Finally, the Commission will consider the evidence in respect of the unique business risk of individual utilities and consider whether a further adjustment to the deemed equity ratios of any of these individual utilities is required to reflect a change in business risk since the 2013 GCOC proceeding.[132]

Leaving aside considerations of company specific risk factors, the Commission's generic determination of an appropriate benchmark capital structure thus focuses on "credit metrics as an indication of the financial risk of the affected utilities" as well as a consideration of generic business risk.[133]

With regard to the referenced credit metrics, the Commission has traditionally focused on the following three metrics.

- Earnings before interest and taxes (EBIT) coverage
- Funds from Operations (FFO) interest coverage
- Funds from Operations (FFO) to debt

[132] 2016 GCOC Decision, paragraph 346.

[133] 2016 GCOC Decision, paragraph 613.

The Commission has historically based its capital structure determinations on the principle that a deemed equity thickness exceeding certain minimum thresholds for these credit metrics will achieve the Commission's goal of allowing the Alberta Utilities to achieve A range credit ratings.[134]

Q77. What was the Commission's determination regarding deemed equity ratios in the 2016 GCOC Decision?

A77. Figure 29 below summarizes the deemed equity ratios approved by the Commission for AUI and the ATCO Utilities in both the 2013 and 2016 GCOC Decisions. As shown in the table, relative to the 2013 ratios, the Commission raised equity thicknesses by 1 percentage point for transmission utilities, and lowered them 1 percentage point for distribution utilities, leading to a representative benchmark deemed equity ratio of 37 percent (before company specific adjustments) for both types of utilities.[135]

Figure 29
2016 GCOC Deemed Equity Ratios

	2016-2017 approved (%)	Last approved (%)	Change in approved common equity ratio (%)
ATCO Electric Transmission	37	36	+1
ATCO Pipelines	37	37	0
ATCO Electric Distribution	37	38	-1
ATCO Gas	37	38	-1
AltaGas	41	42	-1

Source: Excerpt of Table 26. Commission-approved deemed equity ratios, 2016 GCOC Decision

Notably, the 37 percent benchmark equity thickness for 2016-2017 was set 1 percentage point *lower* than the 38 percent ratio deemed for the "average risk utility" in the 2013 Decision, despite the Commission's finding that its "review of generic business risk, including risks associated with the UAD decision, demonstrated a directional increase in

[134] 2016 GCOC Decision, paragraph 431-433.

[135] 2016 GCOC Decision, paragraphs 619 to 622.

generic business risk for all utilities, supporting an across-the-board increase to the deemed equity ratios."[136] This was also despite the fact that other Canadian regulatory entities had not broadly reduced the equity thickness for utilities in their jurisdiction.[137]

Similarly, in discontinuing the application of a specific difference in awarded equity thicknesses for average risk distribution versus transmission utilities, the Commission mentioned a need to "balance the financial risks, as examined in the credit metric calculations, and the different business risks of the distribution and transmission utility sectors."[138]

Q78. How do you interpret the Commission's statements in the 2016 Decision in regard to its standard for determining the allowed equity ratios for the Utilities?

A78. It appears that the Commission's assessment of credit metrics relative to minimum thresholds is the primary focus of its capital structure analysis, and the primary driver of its deemed equity ratio determinations.

For example, the increase in allowed equity thickness for transmission utilities is consistent with the Commission calculation of a lower FFO-based pro forma credit metrics for transmission utilities than for distribution utilities as presented in Table 20 and Table 22 of the 2016 Decision.[139] Therefore it appears that the calculation of the FFO metrics received more weight than the Commission's finding that "there continued to be differences in business risks between transmission and distribution utilities."[140]

The final determination of lower equity ratios for distribution entities is also consistent with a greater emphasis on FFO based credit metrics for distribution utilities in the 2016

[136] 2016 GCOC Decision, paragraphs 612 and 616.

[137] See workpaper BV WP04. It appears that the only non-Alberta entity for which the equity thickness was reduced since 2015 was Maritime Electric Company, which had its equity thickness reduced to 40 percent.

[138] 2016 GCOC Decision, paragraph 617.

[139] 2016 GCOC Decision, paragraph 430 (Table 20 and Table 22).

[140] 2016 GCOC Decision, paragraph 617.

GCOC Decision compared to the 2013 Decision—perhaps coupled with its revision of previously established credit metric guidelines—as the Commission found that business risk factors favored an across-the-board *increase* in deemed equity ratios.[141]

Q79. What is your reaction to the exclusive or primary focus on credit quality when evaluating the impact of capital structure on financial risk, and thus on the fair return standard?

A79. While I agree with the Commission that ensuring credit quality (in the form of A-range credit ratings) is an important and *necessary* objective when setting an equity ratio consistent with the fair return standard, it is not *sufficient* to ensure a fair return.

As the Commission acknowledges, its determination of deemed equity ratios is a requisite component of its obligation to set a cost of capital for the Alberta Utilities that satisfies the fair return standard.[142] In past GCOC Decisions, the Commission has discussed that the fair return standard has three components—"comparable investments," "capital attraction," and "financial integrity"; it acknowledged that these distinct but interrelated criteria are analogous to a "three legged stool," each of which must be applied by the Commission (subject to the exercise of its judgement) when determining "what constitutes a fair return (including capital structure)."[143]

However, the Commission's focus on meeting minimum credit metric standards to determine the capital structure (including in the 2016 GCOC Decision) focus on the "financial integrity" component of the fair return (and perhaps on debt "capital attraction"), while there is no consideration of the "comparable investments" standard. The Commission acknowledges as much when it states

> The objective of [the Commission's capital structure] analysis, consistent with past decisions, is to ensure that **a deemed equity ratio is established for each affected utility […], when combined with the allowed ROE established in**

[141] 2016 GCOC Decision, paragraphs 430 (Table 20 and Table 22), 615-616, and 619.

[142] 2016 GCOC Decision, paragraph 340.

[143] AUC Decision 2009-216 ("2009 GCOC Decision") paragraphs 94, 106-108.

> **this decision, will achieve target credit ratings in the A-range when assessed on a stand-alone basis.** In previous GCOC decisions, the Commission has recognized the importance of maintaining a credit rating in the A category for the affected utilities, which facilitates debt financing at optimal rates.[144]

Certainly, maintaining an A range credit rating is paramount to ensuring the Utilities have access to reasonably priced debt capital. However, an allowed equity ratio sufficient to "facilitate debt financing at optimal rates" will **not** necessarily ensure that *equity* investors can expect to earn a return commensurate with returns available for alternative investments of comparable risk.[145] Therefore, the focus on ensuring financial integrity through the maintenance of A range credit quality does not consider the effect of capital structure on the risk-comparability of equity investments. The focus on a minimum equity ratio that likely will result in an A range rating further has the unintended consequence that there is no cushion should economic conditions or the market in which utilities operate change in a negative direction.

B. CAPITAL STRUCTURE AND THE COMPARABILITY OF EQUITY RETURNS

Q80. Why is focusing on credit quality insufficient to promote comparability of returns?

A80. It is because capital structure affects the risk of equity holders in multiple ways. The Commission acknowledged one aspect of the relationship in the 2016 GCOC Decision:

> [A]s the proportion of debt in the capital structure rises, everything else equal, both debt and equity investors will perceive an increase in risk. This is because **if debt levels increase**, debt holders will be more concerned that the debt obligations of the firm may not be met, and **equity investors will be more concerned that there will be insufficient earnings from operations to cover both the debt obligations of the firm and to provide them with their expected return**.[146]

This is effectively saying that both debt and equity investors are concerned with the risk of default, a circumstance in which debt holders may not receive their full interest and

---

144 2016 GCOC Decision, paragraph 345 (emphasis added).

145 2016 GCOC Decision, paragraph 345.

146 2016 GCOC Decision, paragraph 342 (emphasis added).

principal payments and equity holders may be wiped out. Obviously, when the level of debt increases, the risk of default and hence the inability to meet debt obligations is increased. However, as the level of debt increases, the risk to equity holders also increases, and importantly, this effect is felt long before there is any risk of default. The reason is the tendency of financial leverage to amplify variability (and thus risk) of equity returns. Simply put, as the level of debt increases, the variability in equity returns increases as illustrated in the example below.

Consequently, a given return on equity when coupled with one capital structure is not, all else equal, comparable to the same ROE applied to another capital structure with a higher or lower proportion of debt. Importantly, this non-comparability can persist even if combining the ROE with *either* capital structure allows for sufficient level of credit quality.

Q81. Can you provide an example to illustrate this point?

A81. Yes. Consider two hypothetical cost of service regulated utility companies: utilities A and B. Assume both utilities have the same business risk, and that they are awarded the same 10 percent allowed return on equity, but different deemed equity thicknesses—35 percent and 45 percent, respectively. Further suppose that the deemed equity thicknesses were determined consistent with a policy of maintaining FFO-to-debt credit metrics above an assumed target threshold of 9.0%, and assume that this is sufficient to provide both utilities access to credit on similar terms.[147] Figure 30 summarizes the assumed inputs for this example, along with the calculated FFO-to-debt metric and overall allowed return on rate base for each hypothetical utility.

[147] While utility B will have a higher FFO-to-debt as a result of the higher equity thickness, this analysis assumes that the forecast metrics of both utilities earn the same credit rating and thus both utilities are able to issue debt at the same cost. See workpaper BV WP10.

Figure 30
Capital Recovery Parameters for Hypothetical Utilities A and B

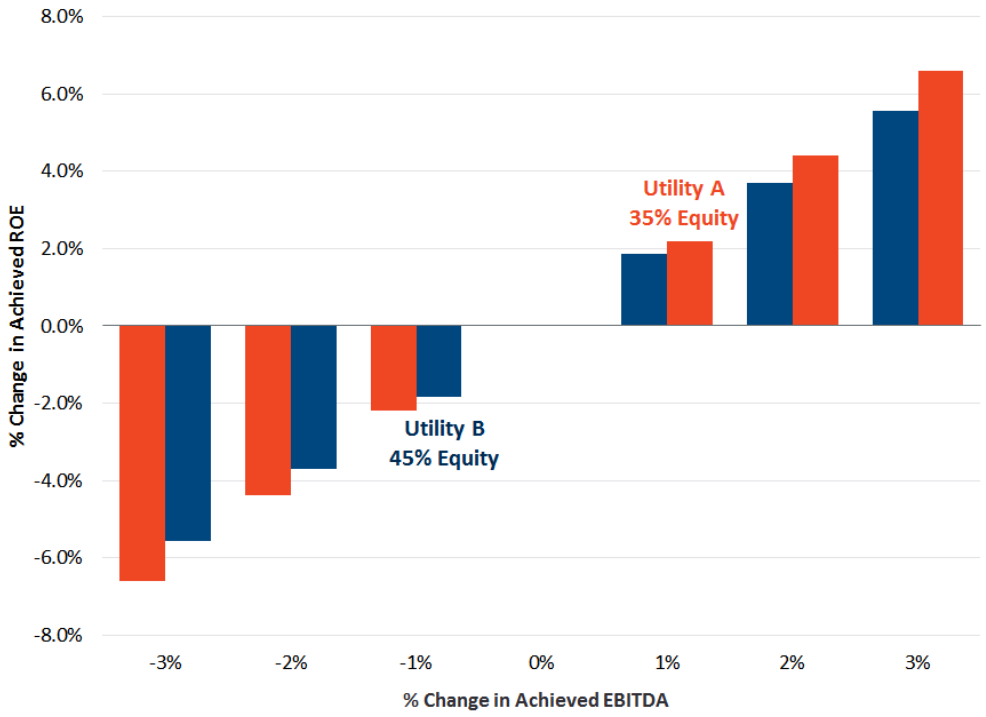
		Utility A	Utility B
Equity Ratio	[1]	35%	45%
Debt Ratio	[2]	65%	55%
Return on Equity	[3]	10.0%	10.0%
Return on Debt	[4]	5.0%	5.0%
Tax Rate	[5]	27.0%	27.0%
Depreciation Rate	[6]	2.5%	2.5%
Return on Rate Base	[7]	6.75%	7.25%
Assumed Rate Base	[8]	1,000	1,000
FFO	[9]	$60	$70
FFO-to-Debt	[10]	9.2%	12.7%

Notes:
[1] through [6], [8] are assumptions.
[7] = [1]*[3] + [2]*[4]
[9] = ([1]*[3]+[6])*[8]
[10] = [9]/([8]*[2])

In the illustrative example set out above, the three utilities have different overall allowed returns on rate base and their rates will contain provision for recovery of different levels of EBITDA,[148] but they all expect to achieve the same return on equity—10 percent—if actual revenues turn out to match the revenue requirement. Importantly however, if capital recovery cash flows *vary* from the expected levels on which rates are based, the variation will impact the equity holders of the two utilities differently. Specifically, shareholders in utility A face greater variability in realized return on equity than do utility B's shareholders. Figure 31 below illustrates this effect, showing the percent change in realized return on equity (relative to the allowed ROE of 10 percent) for a given change in the expected level of EBITDA.

[148] I focus on EBITDA in this example because in this simplified setup it represents the level of revenue allowed—or actually earned—net of operating expenses, which do not factor into capital recovery calculations or credit metrics.

Figure 31
Percent Change in Realized Return on Equity
For a Given % Change in Realized Cash Flow



As the example illustrates, capital structure affects the risk of an equity investment separate and apart from its influence on credit quality and default risk. It is clear from Figure 31 the expected equity return of 10 percent does not constitute a "comparable return" for both utilities, because there is *more equity risk* inherent in the lower equity ratio for utility A. The more leveraged returns are simply more sensitive to variability due to business risk factors (which are common to both utilities in the example), even though both meet similar credit standards.

Consequently, meeting the requirements for financial integrity is not sufficient to ensure that returns are comparable on a risk adjusted basis. To address the comparability component of the fair return standard when setting the allowed equity ratio, it is necessary to additionally consider how the financial risk inherent in a given capital structure—when combined with an allowed return on equity—compares to the returns

equity investors can earn on alternative investments of comparable business and financial risk.[149]

In addition, satisfaction of the capital attraction of the fair return standard may require an evaluation of whether investors perceive a substantial risk of non-recovery of capital or if additional asymmetric risk factors affect the utility's ability to attract equity capital.

Q82. What evidence on comparability do you consider in evaluating an appropriate capital structure for the Utilities?

A82. One measurable comparability metric is that the 37 percent benchmark equity thickness allowed by the Commission is several percentage points lower than the average deemed equity ratio for regulated distribution and transmission utilities elsewhere in Canada and generally is much lower than the equity thickness allowed for distribution and transmission entities in the U.S. At the same time, Dr. Carpenter finds that the Utilities have higher business risk than do U.S. gas distribution utilities. Ultimately, comparability is about obtaining a comparable return for a given risk profile, so the dollar amounts that accrue to equity holders in the Utilities need to be comparable to what they could obtain on similarly risky entities. This is a challenging standard to measure objectively, but as shown in Figure 28 above, the average deemed capital structures for Canadian utility operating companies contains approximately 40% equity and slightly higher outside Alberta. Considering that the average awarded ROE for the same group of utilities is 80 bps higher than the 8.5 percent approved by the AUC for 2017 (and was 100 basis points higher than the 8.3 percent allowed in 2016), utilities in Alberta do not receive a comparable dollar return on their investment. Put differently, not only have the Utilities

[149] I note that in my ROE analysis, I account for comparability of business risk by selecting samples of companies with identifiable business risk characteristics and, as informed by Dr. Carpenter's business risk analysis, placing my ROE recommendation within the ranges of cost of equity estimates for those samples. To ensure comparability of financial risk, I employ standard techniques for unlevering and relevering betas and returns to account for differences in capital structure among the sample companies and compared to 40 percent equity I recommend for the Utilities. My ROE estimates are conducted in such a manner that if the deemed equity ratio changes, the cost of equity estimates will continue to reflect the change in financial risk. This section considers how to establish the capital structure for the utilities that is consistent with comparability of both business and financial risk in the fair return standard.

received a lower ROE but they have done so on a smaller fraction of their investment. As a matter of finance principle, such a situation can only be consistent with a standard that returns should be comparable for comparable-risk investments if the Alberta Utilities are of non-trivially lower business risk than their Canadian peers.

Additionally, Dr. Carpenter's Evidence finds that utility regulatory regimes are not substantially different for pure-play distribution utilities in the U.S. compared to transmission and distribution utilities in Canada—and that regulatory and business risk is actually higher for the Utilities compared to U.S. distribution utilities such as those in my Gas LDC and Water samples—yet, the allowed equity ratios for the Alberta Utilities are more than 10 percentage points lower than those recently allowed for regulated utility operating companies in the U.S. (See Figure 28.) Coupled with the fact that allowed ROEs are also higher for U.S. distribution and transmission utilities, this suggests that U.S. utilities are permitted to earn higher returns despite having lower financial risk inherent in their regulatory capital structures.

Finally, I note that while my DCF and CAPM model estimates are based on the market returns of the sample companies' publicly-traded common equity shares, the book value capital structures of those companies also contain higher equity ratios compared to those deemed for the Alberta Utilities.[150]

Q83. What do you conclude based on this evidence?

A83. I conclude that in addition to considering whether a deemed equity ratio is sufficient to meet credit quality requirements to obtain an A range rating, the fair return standard requires that the overall return that is available to investors needs to be comparable to what investors can obtain in other investments of comparable risk. To meet the comparability criteria, the allowed equity ratio needs to be such that investors find that

[150] See workpapers BV WP05 - 09 on the tabs labeled "Cap_Struct_Book." The samples all have average book value equity ratios around 50%, except for the Canadian sample, which has an average common equity ratio of approximately 40% on a book value basis, but also features substantial (~7% on average) preferred equity financing.

investments in the Utilities are as attractive as other alternatives of equivalent risk. Because the dollar return that accrues to investors is determined as the product of the equity ratio and the allowed rate of return, both components are important. In addition, it is important to not rely on the Utilities "just" meeting the credit metric benchmark as even a relatively small variability in their actual return then would risk the Utilities being unable to meet the credit metric benchmark.

Moreover, as illustrated in the example above, a lower equity ratio imposes greater risk on equity returns *independent* of any effect on credit quality. Consequently to meet the comparability standard on a risk-adjusted basis, lower equity ratios must be compensated by higher equity returns.

As the evidence on allowed equity ratios and ROEs from elsewhere in Canada and the U.S. shows, the equity ratio for the Utilities are below what is awarded comparable utilities. Therefore, I find that a benchmark deemed equity ratio of at least 40% (before any company-specific adjustments) would be necessary to place the allowed equity returns in the range of comparability relative to similarly situated regulated distribution and transmission utilities.

C. CREDIT METRIC AND FINANCIAL INTEGRITY CONSIDERATIONS

Q84. What are the metrics that the Commission has used to evaluate whether the deemed equity thicknesses is sufficient to obtain an A range credit rating?

A84. In the 2009 and 2013 GCOC Decisions the Commission used realized DBRS and S&P credit ratings and calculated or reported credit metrics for a handful of specific utilities to derive the following minimum thresholds for an A range rating.[151]

- EBIT coverage of 2.0
- FFO coverage of 3.0
- FFO/debt ratio of 11.1 to 14.3 percent

[151] 2009 Decision, paragraphs 348, 354, and 356.

The Commission relied on these "minimum credit metrics to maintain an A-range credit rating" in both the 2011 and 2013 GCOC proceedings.[152] However, in the 2016 Decision, the Commission departed from its traditionally relied-upon thresholds, stating that it had "revised its previously established credit metric guidelines, in light of changes in the applicable financial parameters and changes in credit metrics required for a credit rating in the A category."[153] This "revision" refers to the Commission's statement that it would "place greater weight on S&P's credit metric benchmarks for FFO/debt and FFO coverage in evaluating the financial parameters necessary for an A credit rating," and its reference to S&P's published "low volatility scale" target metrics for an A range.[154] Even S&P has acknowledged that the number of firms that effectively fall in this category is extremely limited. Given that the Commission stated it would "take guidance from the EBIT coverage ratio range used in the 2013 GCOC proceeding," I infer that the Commission's "revised guidelines" in the 2016 proceeding were as follows.[155]

- EBIT coverage of at least 2.0
- FFO coverage of 2.0 to 3.0
- FFO/debt of 9.0 to 13.0 percent
- (EBITDA coverage of 2.5 to 4.0)[156]

In making its capital structure determinations in the 2016 GCOC Decision, the Commission noted that its pro forma credit metrics calculated for an "average distribution utility and an average transmission utility would meet all the credit metric guidelines of the Commission, with an ROE of 8.3 per cent, at a deemed equity ratio of 31 percent."[157] In making this determination, the Commission implies its determination that a utility with

---

[152] 2016 GCOC Decision, paragraphs 357-358.

[153] 2016 GCOC Decision, paragraph 614.

[154] 2016 GCOC Decision, paragraphs 393 and 399.

[155] 2016 GCOC Decision, Table 24..

[156] The Commission did not explicitly model EBITDA coverage but did mention it as a metric considered by S&P.

[157] 2016 GCOC Decision, paragraph 615.

EBIT coverage of 2.0, FFO coverage of 2.8, and an FFO/debt ratio of 9.0% would satisfy its criteria for ensuring an A range rating.[158]

Q85. Do you believe the Commission's minimum metrics cited above are an appropriate target to employ when determining whether an equity thickness satisfies the financial integrity component of the fair return standard?

A85. No. As I discussed in my 2016 GCOC evidence, I believe adopting thresholds at the low end of the rating agency's published criteria for A rating potentially places the Utilities in a tenuous position, as having metrics *at* the threshold leaves a company vulnerable to downgrades if its financial position unexpectedly deteriorates even slightly. Additionally, and even absent an official downgrade, operating with baseline low-end credit metrics could place the Utilities at risk of decreased access to credit or increased debt costs in the event of an unexpected economy-wide financial downturn. My concern with the relatively low equity thickness is shared by DBRS, which following the 2016 GCOC Decision noted

> DBRS notes that under its Rating Companies in the Regulated Electric, Natural Gas and Water Utilities Industry methodology, deemed equity of 37% continues to place the Alberta Utilities in the Below Average category. Additionally, some of the distribution utilities will also see their deemed equity score fall from Satisfactory to Below Average.[159]

As I did in the 2016 GCOC proceeding, for credit metric analyses, I recommend that the Commission target metrics that are comfortably within the published guidelines of the credit rating agencies[160] and are also consistent with actual realized credit metrics for A range rated utility companies.

---

[158] 2016 GCOC Decision, paragraph 430 (Table 20 and Table 22).

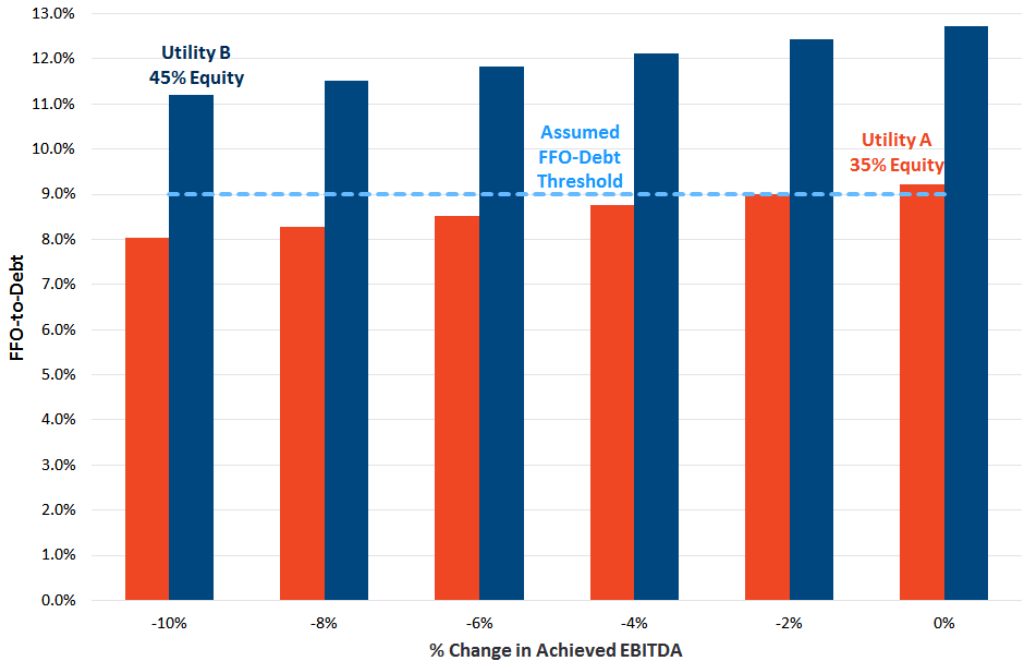
[159] DBRS Press Release, "DBRS Comments on the Impact of the Generic Cost of Capital Decision on Alberta Utilities," October 14, 2016.

[160] I continue to find that it is important to include assessments from all major credit rating agencies; including DBRS, Fitch Ratings, Moody's and Standard & Poor's.

Q86. Can you illustrate with an example the risks of setting the equity ratio to target metrics at the very low end of guideline ratios?

A86. Yes. Consider the same example discussed in Section V.B above. While both utility A and utility B will meet the assumed minimum FFO-to-debt threshold of 9.0% if their actual achieved capital recovery cash flows match their respective allowed levels of EBITDA, even a slight drop of 2% from this level would put Utility A (which has the lower 35% equity thickness) below this threshold. Meanwhile Utility B (with the higher 45% equity ratio) is able to maintain credit quality comfortably above the minimum threshold even for more substantial negative variances to its achieved capital recovery cash flow (as measured by EBITDA).

Figure 32
FFO-to-Debt for Hypothetical Utilities A and B
In Response to Changes in Realized Cash Flow



Q87. Do you have any particular concerns with the S&P guidelines cited by the Commission in its 2016 GCOC Decision?

A87. Yes. I have two key concerns with this set of guidelines. First, S&P is only one of multiple rating agencies and does not generally issue stand-alone ratings for operating entities that are part of a holding company. Instead S&P relies on a group approach, which is problematic because it is difficult to know exactly how the operating company versus other parts of the holding company impacts the rating. Second, the guidelines come from S&P's "low volatility table." The credit metric guidelines S&P applies are different (less strict) based on the low volatility table compared to the so-called "medial volatility" table. Under the latter set of criteria, S&P's methodologies suggest that the following ranges are consistent with an A range rating:[161]

- FFO/debt of 13.0 to 23.0 percent
- Debt/EBITDA of 3.5 to 4.5
- FFO coverage of 3.0 to 5.0
- EBITDA coverage of 2.75 to 5.0

Q88. How does S&P determine which credit metric guidelines are consistent with an A rating?

A88. As described in its methodology publications, S&P establishes ratings "anchors" with reference to a company's Business Risk Profile and its Financial Risk Profile. For companies designated as having an "Excellent" Business Risk Profile, it is possible to achieve an "a-" anchor with a Financial Risk Profile designated as "Significant" (or as having lower financial risk), but not with an "Aggressive" designation.[162] S&P's financial risk assessments depend in part on analysis of credit metrics relative to guidelines, which are established in one of three tables called "low volatility," "medial volatility," or "standard volatility."[163] According to S&P's regulated utility rating

[161] S&P Ratings Services, General Corporate Methodology, November 19, 2013, p. 36.

[162] S&P Ratings Services, General Corporate Methodology, November 19, 2013, p. 9.

[163] S&P Ratings Services, General Corporate Methodology, November 19, 2013, p. 36.

guidelines, which table is applied depends in turn on the utility's "Regulatory Advantage Score"—with the low volatility credit metric guidelines accessible only when a "Strong" regulatory advantage assessment is in place.[164] As established in the last GCOC proceeding, S&P's Regulatory Advantage designation for Alberta is "Strong," but with a negative trend.[165]

According to these criteria, the Utilities currently qualify to be assessed under S&P's low volatility table, such that the credit metric guideline relied on by the Commission are consistent with an "a-" anchor. However, there are reasons to be cautious about sole reliance on the low volatility table ranges.

Q89. What are the concerns about adopting the credit metric thresholds based on the low end of the ranges published in S&P's least strict "low volatility" financial risk guidelines table?

A89. The Commission's policy is to set equity ratios such that the Utilities could obtain an A range credit rating *on a stand-alone basis.*[166] I agree with this principle, but have two concerns as to whether this goal can be achieved if the credit metric thresholds are set at the lowest levels of the published targets.

First, Dr. Carpenter evidence shows that the Utilities business risk and especially regulatory risk is increasing, such that so that their ability to fit into S&P's low volatility category is reduced. As discussed above, credit rating agencies have already expressed concern about the quality of regulatory support in Alberta as reflected in the relatively low allowed return and deemed equity ratios. Therefore, it is risky to assume that S&P and the other rating agencies will continue to evaluate metrics under the assumption of a "strong" regulatory environment.

---

[164] S&P Key Credit Factors for the Regulated Utility Industry, November 19, 2013, pp. 18-19.

[165] 2016 GCOC Decision paragraph 400. . *See also* S&P, "Assessing the Regulatory Advantage in Canada," April 21, 2015, pp. 9 and 13. I am not aware of any explicit statements by S&P indicating that this has changed since the last GCOC proceeding.

[166] 2016 GCOC Decision, paragraph 345.

Second, the approach ignores other credit ratings agencies such as DBRS, Moody's, and Fitch, focusing instead on S&P, whose ratings methodology considers affiliated companies in a "group" framework, and applies the credit ratings of the corporate parent to any and all "core" subsidiaries. This is relevant because AUI's and ATCO's ultimate corporate parents—AltaGas Ltd. and ATCO Ltd., respectively—are evaluated by S&P according to the medial volatility table.[167] This is a reason to not focus solely on S&P's low volatility metrics..

To illustrate this point, S&P's July 2017 downgrade of ATCO Ltd. and its subsidiaries, the ratings agency noted that they continue to forecast credit metrics at the mid-to-lower end of the **significant financial risk category**, with FFO-to-debt of 13%-14% for both 2017 and 2018, and additionally stated it could contemplate a *further* downgrade of ATCO "if FFO-to-debt were to remain below 15%, with no prospect for improvement."[168] It is noteworthy that S&P stated it might downgrade ATCO Ltd. and its subsidiaries to a below A range rating if its credit metrics do not return to a level *above* the minimum thresholds for a "significant financial risk" rating on the medial volatility table and well above the minimum thresholds based on the medial volatility table. This once again emphasizes the inadvisability of targeting credit metrics at or below the low end of a single rating agency's published guideline ranges.

Q90. What target credit metrics do you recommend when assessing the financial integrity implications of potential allowed equity ratios?

A90. For the reasons discussed above, I believe it is important to select a capital structure sufficient to meet credit metric thresholds toward the middle—rather than at the low end—of the guideline ranges that is established by multiple credit rating agencies.

---

[167] *See* S&P Global Ratings "Research Update: ATCO Ltd. And Subsidiaries Ratings Lowered to 'A-' from 'A' On Lower Forecast Credit Metrics; Outlook Stable," July 25, 2017 (S&P July 2017 ATCO Downgrade); *See also* S&P Global Ratings "Research Update: AltaGas Ltd. 'BBB' Ratings Affirmed Following WGL Holdings Inc. Acquisition Announcement; Outlook Negative, "January 26, 2017.

[168] S&P July 2017 ATCO Downgrade, pp. 2 and 4.

In light of the Commission's decision to put greater weight on S&P's stated credit metric guidelines, and in consideration of the concerns articulated above with respect to depending entirely on guidelines taken from that agency's "low volatility" table, I find that the FFO based thresholds based on the point of "overlap" between the low and medial volatility ranges associated with a "Significant" Financial Risk Profile (and thus with an "a-" anchor for the Utilities) are more appropriate for the Commission to target than the very low ends of S&P's published low volatility benchmark ranges. However, I note that even such an approach would result in FFO interest coverage of 3.0 and an FFO to debt of about 13, which fall below the level S&P considered important for ATCO to maintain an A range rating.[169]

VI. RECOMMENDED ROE AND CAPITAL STRUCTURES

Q91. What do you conclude regarding the required ROE?

A91. My recommendation considers results from the CAPM-based and the DCF models as well as recently allowed ROEs in Canada along with the business risk analysis of Dr. Carpenter and the economic conditions study of Mr. Buttke. Based on my analyses, I find a range of estimated ROEs, but am able to focus my recommendation on the Gas LDC and the Pipelines sample based on Dr. Carpenter's business risk analysis. The Canadian Utility and the Water samples in turn support the recommendation.[170] I find that at 40% equity a reasonable range for the required return is in the range of 9½ to 11½ percent using the financial risk adjusted figures.[171] As the Commission in the past has preferred to look to figures that do not consider financial risk, I provided results for this scenario, too. This range is lower at 8¼ to 9¾ percent.[172] Further, the allowed ROE in

[169] See Q89 above.

[170] As noted previously, I do not rely on the Electric Utility sample but include it to be consistent with my evidence in the 2016 GCOC proceeding.

[171] See the discussion below Figure 21 and Figure 26.

[172] *Ibid*.

Canadian jurisdictions outside Alberta has averaged 9.3-9.4% at a little over 40% equity.[173]

I note that Dr. Carpenter views the Utilities as having more business risk than the Gas LDC sample but less than the Pipelines Sample. My recommendation is below that of the Pipelines Sample and within that of the Gas LDC sample, so I view it as conservative. This is also true in the light of my recommendation in the 2016 GCOC, where I recommended 10¼ percent. Relative to the time of the 2016 GCOC proceeding, several factors impacting the ROE have changed. The forecasted yield on the 10-year Canadian government bond has increased but the spread between utility and government bond yields has decreased. [174] The forecasted long-term GDP growth in Canada has declined, but Q2, 2017 realized GDP growth was actually quite high at 4.5%.[175] Mr. Buttke observes that while a traditional measure of market volatility, the VIX is currently low, there are many uncertainties in global markets that need to be resolved.[176] At the same time, Dr. Carpenter concludes that the business risk of the Utilities has increased.[177]

Based on these figures and in recognitions of the Commission's preference for results that do not take leverage into account, I find that a conservative range is 9.5% to 10.5%[178] and recommend 10.0% as the allowed ROE for 2018-2020. This recommendation is lower than what is supported by the Pipeline Sample and well below most of the figures derived for the sample, but broadly supported by the figures derived for the Gas LDC, Water, and Canadian Utility sample.

---

[173] *See* Figure 28 above. I exclude Alberta to avoid circularity in determining the ROE.

[174] Consensus Forecast, December 2015 and Consensus Forecast, October 2017.

[175] Buttke Evidence, Exhibit 4.

[176] Buttke Evidence, Section III.E.

[177] Carpenter Evidence, Section V.

[178] The low-end of this range was determined as the lowest overlapping figure from the financial risk adjusted and unadjusted figures and the high-end was conservatively determined as close to the midpoint of the upper bounds of the financial risk adjusted and non-financial risk adjusted upper bound.

Q92. What do you recommend regarding capital structures?

A92. I recommend that the equity thickness be set so as to meet all components of the fair return standard, including consideration of comparable returns and capital attraction as well as financial integrity. I note that 40% is at the low end of allowed equity ratios for comparable Canadian utility companies and far below what is typical for U.S. companies. I further note that my ROE recommendations above are based on CAPM and DCF model estimates derived so as to apply to a 40% equity capital structure. Consequently the comparability standard is met by applying those recommendations at that equity ratio. Finally, in targeting an A range credit ratio for the Utilities, the Commission should target credit metrics toward the middle of the range of what is observed for A range rated Canadian utility companies, rather than the bottom of the benchmark ranges published by S&P in its less stringent "low volatility" table. Therefore, to apply all components of the "three-legged stool" fair return standard I recommend the benchmark equity ratio be set at 40% for the average risk utility.

Having recommended an equity ratio of 40% for the average risk utility, I recommend that the Commission's relative equity percentages stay in place. Nothing in my analysis suggests that the criteria the Commission used to determine the relative equity ratio placements of distribution versus transmission utilities has changed since the last GCOC. Similarly, I am aware of no evidence that should change the Commission's reasoning in regards to the 4 percentage point equity ratio adder it has applied to AUI in the past, and Dr. Carpenter's evidence supports this view. Therefore, to determine my recommended equity ratios for the Utilities individually, I have increased the deemed equity ratios from the 2016 GCOC Decision uniformly so that the benchmark ratio is 40%.

Figure 33
Recommended Capital Structures for ATCO and AUI

	Recommended for 2018-2020 (%)	Allowed in 2016-2017 (%)	Recommended Increase (%)
ATCO Electric Transmission	40	37	+3
ATCO Pipelines	40	37	+3
ATCO Electric Distribution	40	37	+3
ATCO Gas	40	37	+3
AltaGas	44	41	+3

VII. SPECIFIC QUESTIONS RAISED IN THE COMMISSION'S ISSUES LIST

Q93. What is the purpose of this section of your testimony?

A93. In this section I address two specific questions laid out in the Commission's final issues list for this proceeding. Specifically, the Commission asked

> How should the Commission consider the traditional approaches and models used in previous GCOC proceedings for determining an approved ROE and equity ratios?
>
> (i) If there is a wide range of beta values provided by the experts, will the Commission be able to identify, with any reasonable degree of confidence, a method that allows the Commission to narrow the range of these betas?
>
> (ii) Will there be a clear and objective measure on the record by which the Commission can determine which factor or factors explain any changes in utility credit spreads?[179]

As to the overarching question about how the "traditional approaches and models" should be considered, I address this at length above in Sections II and I of this evidence. Here, I only reemphasize that regulatory precedents and finance best-practices both support the consideration of all available relevant information, including the results of multiple cost of capital estimation methodologies to inform the exercise of judgement in determining a fair return for the Utilities. In addition, I emphasize the importance of considering all three aspects of a fair return: comparability, capital attraction, and financial integrity.

[179] Exhibit 22570-X0114 (AUC July 5, 2017 letter), paragraph 28, citing Exhibit 22570-X0078, paragraph 3.

Regarding the Commission's specific "sub-questions" about betas and credit spreads, I address these in turn below.

A. RANGES OF BETA VALUES

Q94. What should the Commission consider in evaluating the "range of beta values" presented in your evidence?

A94. As discussed above, a company's beta is a measurement of its systematic market risk, *i.e.*, how its returns move relative to movements in returns on the overall market. The betas presented in my evidence and workpapers are estimated using historical returns for the individual sample company stocks compared to those of the relevant market index.[180] The range of estimated beta values for individual sample companies thus reflects variations due to two factors: (i) differences in systematic market risk among the individual companies, and (ii) idiosyncratic measurement error.

The latter factor is an unavoidable aspect of any exercise in statistical estimation. While the goal is to discern the "true beta" that describes the company's (forward-looking) market risk, this quantity cannot be directly observed, and must instead be inferred from observations of actual historical data series, which may include random idiosyncratic fluctuations or anomalous data points that are not representative of the actual relationship being measured. The best way to minimize the effect of randomness on beta estimates is to use more observations when making the measurement.[181] This is why I use a relatively longer window (i.e., three years versus one or two) in my estimation and employ weekly versus monthly returns.[182]

---

[180] I additionally estimate betas on a portfolio basis, wherein the market-weighted average returns for all the companies in a given sample are treated as a group, and these portfolio returns are then compared to the returns on the market index.

[181] In some circumstances, the exclusion of outlying data points may be needed.

[182] A three-year weekly beta is estimated based on 156 data points, whereas even a monthly beta estimated over a longer five-year period uses only 60 data points in the statistical estimation.

As to variation in betas due to differences in systematic market risk, this is actually a desired feature of the estimation process. A stock's measured beta is an estimate (with some degree of statistical precision) of how its returns move in correlation with the market. To the extent two different stocks have two measurably different beta estimates,[183] the difference reflects any combination of particular factors that make one stock riskier than the other as part of a well-diversified portfolio. Such risk factors fall broadly into two categories: business risk and financial risk.

Q95. How do differences in business risk contribute to variation in beta values?

A95. When I estimate betas to inform my (CAPM-based) cost of capital analysis, my goal is to identify betas that measure the degree of systematic risk associated with specific business and financial risk characteristics—namely those characteristic of the Utilities. This is why I consider samples of publicly-traded companies (whose stock returns I can use to calculate betas) that have business risk characteristics that are informative relative to the Utilities' circumstances.

To the extent that individual companies have business risk characteristics that are particular to their circumstances and influence their market risk in ways that are not broadly representative of the systematic risk inherent in their broader industry category (e.g., regulated gas distribution service for the Gas LDC sample), taking an average across the sample is a helpful and appropriate way to "narrow the range" of measured betas. In the same manner that using more data points reduces the impact of randomness on beta estimates, taking averages of individual company betas reduces the impact of

[183] Here I use the phrase "measurably different" to mean that the two estimates are different enough that, when taking account for the statistical imprecision in both estimates, it is still possible to infer with a high degree of confidence that the difference in estimates is a "real" difference in the "true betas" being estimated, rather than a result of idiosyncratic measurement error.

company-specific business risk differences and provides a clearer reflection of the business risk characteristics of the enterprise being sampled.[184]

As Dr. Carpenter discusses in his evidence, when betas are viewed on the basis of sample averages (or sample portfolios), differences among the betas estimated for different samples are appropriately interpreted in terms of how differences in business risk characteristics manifest as quantifiable differences in systematic market risk.[185] As discussed above, the ranges of cost of equity estimates from the various samples, together with Dr. Carpenter's evidence on business risk, informed my placement of a recommended ROE for the Utilities relative to the model results.

Q96. How do differences in financial risk contribute to the variation in beta values?

A96. As discussed above, financial leverage increases risk to equity holders. As the proportion of debt in a publicly-traded company's capital structure increases, variability in the company's cash flows is amplified from the perspective of stockholders, since the equity returns (after deducting fixed debt payments) are distributed over a smaller equity base. This means that when betas are estimated based on movements in a company's market-traded common equity shares, the systematic risk being measured reflects not only business risk factors—which contribute to variability in cash flows to the business as a whole—but also the financial risk imposed by the level of debt in the company's capital structure. While sample companies are specifically chosen to have well-defined and comparable business risk characteristics, no such requirement is imposed with respect to the companies having a uniform and comparable capital structure. Therefore, to the extent different companies within a sample have different degrees of financial leverage,

[184] Similarly, my portfolio beta estimates for the samples (and subsamples) not only minimize idiosyncratic estimation error but also "average out" the impact of company-specific business risk variations such that the resulting beta is representative of the systematic business risk characteristics of the sample as a whole. Because the sample portfolios aggregate the individual company returns on the basis of market value, however, the portfolio betas are more heavily influenced by the stock movements of larger (i.e., higher market capitalization) members of the sample, whereas simple averages of the individual sample betas weight all companies equally.

[185] Carpenter Evidence, Section IV.C.

their estimated betas will differ from one another in part due to these differences in financial risk. Similarly, to the extent the sample average (or portfolio) betas from different samples reflect different average (or aggregate) degrees of financial leverage, these financial risk differences may drive some of the variation in beta at the sample level also.

As discussed in the technical appendix to my evidence, standard finance techniques provide a means of isolating the impact of business risk on beta from the influence of financial risk. These techniques (which I refer to broadly as the Hamada adjustment) allow the analyst to adjust a measured so-called "levered equity beta" that is measured directly based on market stock returns to remove the effects of financial leverage. The resulting "unlevered" or "assets" beta thus reflects the systematic risk associated with the company's assets.[186]

Figure 34 below shows the sample average estimated betas for the five samples I analyzed. The left most column reports the simple average of the levered equity betas measured directly based on the sample company's stock returns. The right two columns report the simple averages of the assets betas computed for each sample company.[187] As can be seen from the figure, the ranges based on the highest and lowest sample average assets betas are tighter than those of the sample average levered equity betas, demonstrating that a substantial portion of the variability in equity betas is due to differences in financial risk. It is also instructive to observe that while the average levered equity beta estimate for the Canadian Utility sample is nearly 20 bps higher than that of the Gas LDC sample, the average *unlevered* (assets) betas for the two samples are identical. This is because the Canadian Utility sample has substantially higher financial

[186] The terminology of "unlevered" beta refers to the fact that this is the beta that would be observed if the same firm was hypothetically financed with 100% equity.

[187] The two alternative formulas for unlevering beta (which differ in that they make subtly different assumptions about the value of debt tax shields) are discussed in the technical appendix to this evidence.

leverage than the Gas LDC sample,[188] meaning that its equity beta reflects higher financial risk even though the assets betas indicate similar levels of systematic business risk for the two samples.

Figure 34
Sample Average Levered vs. Unlevered Betas

Sample		As Measured: Levered Equity Beta	As Measured: % Debt	As Measured: % Preferred Equity	Unlevered Betas: (without tax)	Unlevered Betas: Assets Beta (with tax)
		[1]	[2]	[3]	[4]	[5]
Pipeline Subsample	[a]	1.07	38%	0.0%	0.70	0.77
Water	[b]	0.75	30%	0.1%	0.55	0.59
Gas LDC	[c]	0.67	33%	0.1%	0.47	0.51
Canadian Utility	[d]	0.85	44%	5.7%	0.47	0.52
Electric	[e]	0.61	41%	0.3%	0.40	0.43
Min		0.61			0.40	0.43
Max		1.07			0.70	0.77
Range		0.46			0.31	0.34

Sources:
[a]: Table No. BV-PIPE-13
[b]: Table No. BV-WATER-13
[c]: Table No. BV-GAS-13
[d]: Table No. BV-CAN-13
[e]: Table No. BV-ELEC-13

B. FACTORS EXPLAINING UTILITY CREDIT SPREADS

Q97. Are there objective measures that can determine which factor or factors explain any changes in utility credit spreads?

A97. There is academic research into credit spreads and factors that may explain—or at least correlate with—such spreads, but there is, to my knowledge, no academic research that is specific to utility credit spreads. The research investigates factors that may impact credit spreads, including default risk, liquidity, tax effects, the market risk premium, and the general correlation between equity returns and the return on debt. Different studies reach

[188] Note that the Canadian sample also features a nontrivial amount of preferred equity financing, which has many of the fixed obligation components of debt and thus also acts to increase financial leverage from the perspective of common equity holders.

different conclusions, but the consensus finding is that increases (decreases) in default risk, liquidity constraints, and general systematic risk premiums all contribute directionally to an increase (decrease) in credit spreads. Importantly, while some of the studies attempt to quantify the effects of these factors, this quantification is not uniformly agreed upon. Thus academic finance does not support a single precise formula that can explain changes in credit spreads generally, much less utility credit spreads specifically.

However, this does not mean that credit spreads are incapable of providing useful information related to the cost of equity. Indeed, the academic research generally supports the concept that changes in credit spreads serve as a meaningful directional indicator of relative changes in the prevailing market equity risk premium.

Q98. Please summarize the academic findings of a relationship between credit spreads and equity risk premiums.

A98. Yes. Perhaps the seminal paper on this topic was published in 1993 by Professors Eugene Fama and Kenneth French. The stated goal of their study was to "to examine whether variables that are important in bond returns help to explain stock returns, and vice versa," under the "notion […] that if markets are integrated, there is probably some overlap between the return processes for bonds and stocks." [189] Their findings in fact did support the notion that common factors—specifically related to the term structure of interest rates—do indeed contribute to changes in both equity and bond returns:

> In a nutshell, our results suggest that there are at least three stock-market factors and two term-structure factors in returns. Stock returns have shared variation due to the three stock-market factors, and they are linked to bond returns through shared variation in the two term-structure factors.

Fama and French's finding indicates that movements in credit spreads and equity risk premiums are correlated, and suggests this because they are linked by common drivers. A 2001 paper by Elton, Gruber, Agrawal, and Mann ("Elton et. al.") takes a more direct

[189] Eugene F. Fama and Kenneth R. French (1993), "Common Risk Factors in the Returns on Stocks and Bonds," *Journal of Financial Economics* 33, pp. 3-56.

approach to "Explaining the rate spread on corporate bonds." Their conclusion is that the rate spread can be split into three main components: (i) compensation for default expectations, (ii) compensation for local taxes, and (iii) compensation for systematic risk (i.e., a risk premium). They find that "the risk premium is a large part of the [corporate rate] spread," and "show that corporate bonds require a risk premium because spreads and returns vary systematically with the same factors as common stock returns."[190] Elton et. al.'s results suggest that changes in credit spreads result in large degree from changes in the amount of compensation investors demand to take on systematic market risk. This conclusion is intuitive because, as the authors put it, "[i]f corporate bond returns move systematically with other assets in the market whereas government bonds do not, then corporate bond expected returns would require a risk premium to compensate for the non-diversifiability of corporate bond risk, just like any other asset." In other words, because corporate bonds have systematic risk—albeit to a lesser degree than equity securities—investors demand a risk premium to invest in them. Since (as shown by Fama and French) the same risk factors drive both corporate bond returns and equity returns, this risk premium should naturally be expected to move in a correlated fashion.

Q99. Have you examined any data on how credit spreads and the MERP have moved over time?

A99. Yes. Looking to monthly data from Bloomberg on the U.S. forecasted MERP from 2000 to today as well as U.S. 10-year BBB utility bond spreads, I find the two series are correlated with a correlation coefficient of about 0.25.[191] Although the correlation is far from perfect, the trend in the credit spread and implied MERP are related. Both data series are broadly consistent with the observation that return premiums for systematic risk remain elevated relative to their pre-crisis level.[192]

---

[190] Edwin J. Elton et al. (2001), "Explaining the rate spread on corporate bonds," *The Journal of Finance* 56, pp. 247-277.

[191] A parallel calculation of monthly data on the Canadian forecasted MERP from September 2005 to August 2017 against the Canadian 10-year BBB utility bond spread yields a correlation of 0.69.

[192] Data are provided in my workpaper BV WP01.

Q100. Does this conclude your evidence?

A100. Yes.