BEFORE THE

STATE OF NEW YORK PUBLIC SERVICE COMMISSION

CASE 21-E-XXXX	)	**Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Orange and Rockland Utilities, Inc. for Electric Service.**
CASE 21-G-XXXX	)	**Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Orange and Rockland Utilities, Inc. for Gas Service.**

DIRECT TESTIMONY OF DR. BENTE VILLADSEN

RETURN ON EQUITY

January 29, 2021

Brattle

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	)	Orange and Rockland Utilities, Inc. for Gas
	)	Service.

1. INTRODUCTION

Q1: Please state your name, occupation, and business address for the record.

A1: My name is Bente Villadsen and I am a Principal of The Brattle Group, whose business address is One Beacon Street, Suite 2600, Boston, Massachusetts, 02108.

Q2: Briefly describe your education and professional qualifications.

A2: I have more than 20 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 am the co-author of the text, "Risk and Return for Regulated Industries", and a frequent speaker on regulated finance at conferences and webinars. I have testified or filed expert reports on cost of capital in Alaska, Arizona, California, Illinois, Michigan, New Mexico, New York, Oregon, and Washington, as well as before the Bonneville Power Administration, Federal Energy Regulatory Commission ("FERC"), the Surface Transportation Board, the Alberta Utilities Commission, the Ontario Energy Board, and

Mexico's Comisión Reguladora de Energía. I have provided white papers on cost of capital to the regulators in Australia, Canada, and Europe. I have testified or filed testimony on regulatory accounting issues before FERC the Regulatory Commission of Alaska, the Michigan Public Service Commission, the Texas Public Utility Commission, as well as in international and U.S. arbitrations, and have regularly provided advice to utilities on regulatory matters and risk management.

I hold a Ph.D. from Yale University and a BS/MS from University of Aarhus, Denmark. Exhibit BV-1 contains more information on my professional qualifications as well as a list of my prior testimonies and publications.

Q3: What is the purpose of your testimony in this proceeding?

A3: Orange and Rockland Utilities, Inc. ("Orange and Rockland" or the "Company") has asked me to estimate the cost of equity that the New York State Public Service Commission ("Commission") should allow Orange and Rockland an opportunity to earn on the equity financed portion of its regulated electric and gas utility rate base in New York. Specifically, I perform cost of equity analysis and provide return on equity ("ROE") estimates derived from market data for a proxy group of regulated electric utilities. In addition, I provide additional estimates based on a proxy groups of natural gas distribution utilities. I also provide additional estimates based on an analysis of allowed utility risk premiums. Lastly, I consider the relative risk of Orange and Rockland and its proposed regulatory capital structure ratio to arrive at my recommendation for the allowed Return on Equity ("ROE").

2. SUMMARY OF CONCLUSIONS

Q4: Do you have any preliminary comments regarding the appropriate ROE?

A4: The current determination of Orange and Rockland's allowed ROE takes place during uncertain economic and financial conditions due to the ongoing impacts of the COVID-19 pandemic, which has led to unprecedentedly low U.S. Treasury bond yields and substantial stock and commodity price declines. At the same time, measures of volatility have spiked to all-time highs and remain elevated compared to long-term averages. Measures of the premium that investors require over and above the risk-free rate to invest in equities and bonds have increased as well. The length and extent of the impacts of the pandemic are not known and will depend on how measures impacting commerce stay in place and when a vaccine becomes widely available. In light of this uncertainty, it is important to assure investors that the allowed ROE and capital structure is such that Orange and Rockland can continue to raise the needed capital to continue to provide safe, adequate and reliable service to its customers, while also providing a return that is comparable to those that investors expect.

On March 14, 2019, the Commission approved a joint proposal, which awarded Orange and Rockland a 9.0% ROE at a 48% equity capital structure.[1] Since that time, measures of market uncertainty and premiums required by investors to hold risky assets have increased substantially. For example, in March 2019, the Chicago Board of Options Exchange's CBOE Volatility Index ("VIX") was 13.5. Almost exactly one year later, on March 16, 2020, the VIX reached an all-time high of 82.69 and has remained at an elevated level since then. The

[1] Case 18-E-0067, *Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Orange and Rockland Utilities, Inc. for Electric Service*; Case 18-G-0068, *Proceeding on Motion of the Commission as to the Rates, Charges, Rules and Regulations of Orange and Rockland Utilities, Inc. for Gas Service* ("2018 O&R Rate Cases"), Order Adopting Terms of Joint Proposal and Establishing Electric and Gas Rate Plans (issued March 14, 2019) ("2019 O&R Rate Order")

VIX is currently at 22.01 and has averaged approximately 29.75 in 2020, compared to its long term average of 19.43.[2] Similarly, Bloomberg's estimation of the market risk premium ("MRP") was at 7.24% in March 2019, reached a high of 9.8% in March 2020, and is currently at 7.85%.[3] Lastly, flight-to-quality and monetary policy has put downward pressure on U.S. Treasury bond yields – 10-Year U.S. Treasury yields were at 2.57% in March 2019 before reaching record lows in March 2020 and are currently approximately 0.96%.[4] Simply put, the financial markets are in extreme turmoil, which has had negative impacts on investors, not just in terms of returns but also with regard to volatility and risk. However, it is important to look to stability in investors' allowed returns and recognize that the currently low Treasury yields are not reflective of a low cost of equity. I provide more discussion of the current capital market conditions and their impact on the ROE for Orange and Rockland in New York in Section 4 below.

When evaluating the cost of equity, it is also important to consider business risks to long-term development for electric and natural gas distribution utilities, such as Orange and Rockland. Compared to other sample companies, Orange and Rockland is smaller, is facing significant energy and climate policy changes in the New York State, and has certain risks related to cost optimization programs. I further discuss how these and other business risk factors affect the cost of equity in Section 6 below.

Q5: Please summarize your recommendations for Orange and Rockland's ROE.

A5: I recommend that Orange and Rockland be allowed to earn a return on equity of no less than 9.75 percent on its regulated rate base at the Company's requested 50 percent equity capital

[2] Bloomberg as of December 4, 2020.

[3] Id.

[4] Id.

structure. The 9.75 percent ROE requested by Orange and Rockland is conservative and based on my finding at the middle of the reasonable range for electric utilities of 9.5 to 10.0 percent. The data shows a slightly higher cost of equity for gas distribution utilities in the range of 9.5 percent to 10.5 percent. The results from these two industries reflects Orange and Rockland's business risk. This recommendation is based on my implementation of standard cost of capital estimation models including two versions each of the Discounted Cash Flow ("DCF") model and the Capital Asset Pricing Model ("CAPM"), as well as an Implied Risk Premium analysis and an analysis of Orange and Rockland's business risk. Figure 1 below summarizes the model results using the requested 50 percent equity capital structure. The table also presents the corresponding reasonable ranges, which I discuss further in Section 5 below. Based on my consideration of the results from the various cost of capital estimation models as well as the context of New York State and Orange and Rockland's specific risk, I believe it is appropriate to place Orange and Rockland's allowed return in the middle of the reasonable ranges.

FIGURE 1: SUMMARY OF REASONABLE RANGES OF ESTIMATES AT 50% EQUITY

	Electric Sample	**Gas Sample**	**Full Sample**
CAPM/ ECAPM	9.5% - 10.0%	9.5% - 10.5%	9.5% - 10.0%
DCF*	9.25% - 10.75%	10.0% - 13.25%	9.5% - 11.5%
Risk Premium	9.5%	9.4%	N/A

Note: Full sample considers electric and natural gas proxy companies

*The lower figure is that from the multi-stage model, while the higher number originates from the single stage DCF results.

Using Orange and Rockland's requested 50 percent equity capital structure, I find a range of 9.5 percent to 10.00 percent return on equity to be reasonable using a sample of regulated electric utilities. I further support that range by analyzing a sample of natural gas distribution utilities, which are slightly higher and thus confirm that the range of estimates for the electric utilities is reasonable. I find that a range of 9.75 to 10 percent is reasonable for Orange and Rockland, so that the requested 9.75 percent is conservative.

Q6: Do you have other recommendations?

A6: Yes. I recommend that Orange and Rockland be allowed to recover flotation costs associated with the issuance of equity shares that supports the Company's assets. Specifically, as the flotation costs are not included as a line item in the revenue requirement, I recommend that the flotation costs be recovered as an additional adjustment to the allowed return on equity.[5] I further discuss this issue in Section 6 below.

Q7: How is the remainder of your testimony organized?

A7: Section 3 formally defines the cost of capital and explains the techniques for estimating it in the context of utility rate regulation. Section 4 discusses conditions and trends in capital markets and their impacts on the cost of capital. Section 5 explains my analyses and presents the results. Section 6 discusses Orange and Rockland's business risk characteristics, unique risks facing New York State-based utilities and other business risks specific to Orange and Rockland that are relevant to my recommended allowed ROE. Finally, Section 7 concludes with a summary of my recommendations.

[5] See Direct Testimony of Company Witness Saegusa.

3. COST OF CAPITAL PRINCIPLES AND APPROACH

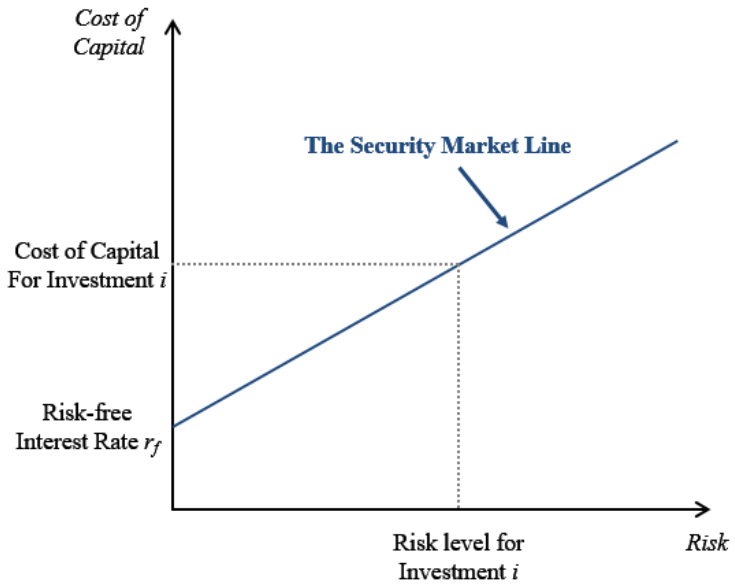
A. Risk and the Cost of Capital

Q8: How is the "Cost of Capital" defined?

A8: The cost of capital is defined as the expected rate of return in capital markets on alternative investments of equivalent risk. Put differently, it is the rate of return investors require based on the risk-return alternatives available in competitive capital markets. 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 2 below. The higher the risk, the higher the cost of capital required.

FIGURE 2: THE SECURITY MARKET LINE



Q9: What factors contribute to systematic risk for an equity investment?

A9: When estimating the cost of equity for a given asset or business venture, two categories of risk are important. The first is business risk, which is the degree to which the cash flows generated by the business (and its assets) vary in response to moves in the broader market. In context of the CAPM, business risk can be quantified in terms of an "assets beta" or "unlevered beta." For a company with an assets beta of 1, the value of its enterprise will increase (decrease) by 1% for a 1% increase (decline) in the market index.

The second category of risk relevant for an equity investment depends on how the business enterprise is financed and is called financial risk. Section B below explains how financial risk affects the systematic risk of equity.

Q10: What are the guiding standards that define a just and reasonable allowed rate of return on rate-regulated utility investments?

A10: The seminal guidance on this topic was provided by the U.S. Supreme Court in the *Hope* and *Bluefield* cases,[6] which found that:

- The return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks;[7]
- The return should be reasonably sufficient to assure confidence in the financial soundness of the utility; and
- The return should be adequate, under efficient and economical management for the utility to maintain and support its credit and enable it to raise the money necessary for the proper discharge of its public duties.[8]

Q11: How does the standard for just and reasonable rate of return relate to the cost of capital?

A11: The first component of the *Hope* and *Bluefield* standard, as articulated above, is directly aligned with the financial concept of the opportunity cost of capital.[9] The cost of capital is

[6] Bluefield Water Works & Improvement Co. v. Public Service Com'n of West Virginia, 262 U.S. 679 (1923)("Bluefield"), and Federal Power Com'n v. Hope Natural Gas Co., 320 U.S. 591 (1944) ("Hope").

[7] Hope, 320 U.S. at 603.

[8] Bluefield, 262 U.S. at 680.

[9] A formal link between the opportunity cost of capital as defined by financial economics and the proper expected rate of return for utilities was developed by Stewart C. Myers, "Application of Finance Theory to Public Utility Rate Cases," Bell Journal of Economics & Management Science 3:58-97 (1972).

the rate of return investors can expect to earn in capital markets on alternative investments of equivalent risk.[10]

By investing in a regulated utility asset, investors are tying up capital in that investment, thereby foregoing alternative investment opportunities. Hence, the investors are incurring an "opportunity cost" equal to the returns available on those alternative investments. The allowed return on equity needs to be at least as high as the expected return offered by alternative investments of equivalent risk or investors will choose these alternatives instead. If it is not, the utility's ability to raise capital and fund its operations will be negatively impacted. This is a fundamental concept in cost of capital proceedings for regulated utilities such as Orange and Rockland.

Q12: Please summarize how you considered risk when estimating the cost of capital.

A12: To evaluate comparable business risk, I looked to proxy groups of regulated electric and natural gas utilities. The electric and natural gas utilities I consider have a high proportion of regulated assets and revenue with the majority having more than 80 percent of assets subject to regulation. Additionally, they all have a network of assets that are used to serve end-use customers and they are capital intensive (meaning that each dollar in revenue requires substantial investment in fixed assets). My recommendation focuses on the electric utilities proxy group as the Commission traditionally has used an electric group in its analysis for electric and gas utilities in New York.[11] Further (as explained in Section B below), I analyzed and adjusted for differences in financial risk due to different levels of

[10] The opportunity cost of capital is also referred to as simply the "cost of capital," and can be equivalently described in terms of the "required return" needed to attract investment in a particular security or other asset (*i.e.*, the level of expected return at which investors will find that asset at least as attractive as an alternative investment).

[11] State of New York Public Service Commission, "Staff Finance Panel Testimony", Case Nos. 18-E-0067, 18-G-0068, May 2018.

financial leverage among the proxy companies and between the capital structures of the proxy companies and the regulatory capital structure that will be applied to Orange and Rockland for ratemaking purposes. To determine where in the estimated range of Orange and Rockland's ROE reasonably falls, I compared the business risk of Orange and Rockland to that of the proxy group companies.

B. Financial Risk and the Cost of Equity

Q13: How does capital structure affect the cost of equity?

A13: Debt holders in a company have a fixed claim on the assets of the company and are paid prior to the company's owners (equity holders) who hold the inherently variable residual claim on the company's operating cash flows. Because equity holders only receive the profit that is left over after the fixed debt payments are made, higher degrees of debt in the capital structure amplify the variability in the expected rate of return earned by equity-holders. This phenomenon of debt resulting in financial leverage for equity holders means that, all else equal, a greater proportion of debt in the capital structure increases risk for equity holders, causing them to require a higher rate of return on their equity investment, even for an equivalent level of underlying business risk.

Q14: How do differences in financial leverage affect the estimation of the cost of equity?

A14: The DCF models and the CAPM rely on market data to estimate the cost of equity for the proxy companies, so the results reflect the value of the capital that investors hold during the estimation period (market values).

The authorized ROE is applied to the regulatory equity portion of Orange and Rockland's rate base. Because the cost of equity is measured using a group of proxy companies, it may well be the case that these companies finance their operations with a different debt and equity proportion than the proportion the Commission allows in Orange and Rockland's rate base. Specifically, the DCF models (and the CAPM) measure the cost of equity using market data and consequently are measures of the cost of equity using the proportion of debt and equity that is inherent in that data. Therefore, I consider the impact of any difference between the financial risk inherent in those cost of equity estimates and the capital structure used to determine Orange and Rockland's required ROE.

Differences in financial risk due to the different degree of financial leverage in Orange and Rockland's regulatory capital structure compared to the capital structures of the proxy companies mean that the equity betas measured for the proxy companies must be adjusted before they can be applied in determining Orange and Rockland's return on equity. Similarly, the cost of equity measured by applying the DCF models to the proxy companies' market data requires adjustment if it is to serve as an estimate of the appropriate allowed ROE for Orange and Rockland at the regulatory capital structure the Commission grants.

Importantly, taking differences in financial leverage into account does not change the value of the rate base. Rather, it acknowledges the fact that a higher degree of financial leverage in the regulatory capital structure imposes a higher degree of financial risk for an equity investment in Orange and Rockland's rate base than is experienced by equity investors in the market-traded stock of the less leveraged proxy companies.

Q15: How specifically do you consider financial risk in your analysis using market data for the proxy group companies?

A15: The impact of financial risk is taken into account in an analysis of cost of equity using market-based models such as the DCF and CAPM in several manners.[12] One way is to determine the after-tax weighted-average cost of capital for the proxy group using the equity and debt percentages as the weight assigned to the cost of equity and debt. Financial theory holds that for a given level of business risk, the weighted average cost of capital is constant over a broad set of capital structures, *i.e.*, the weighted average cost of capital is the same at, for example, 55 and 45 percent equity, as the cost of equity increases as the percentage of equity decreases. I estimate the weighted cost of capital for each utility in the proxy group based on that utility's capital structure. I then evaluate the average weighted cost of capital across the proxy group. Once the weighted cost of capital is determined for the proxy group, I can then determine the cost of equity that is required at Orange and Rockland's capital structure. This approach assumes that the after-tax weighted average cost of capital is constant for a range that spans the capital structures used to estimate the cost of equity and the regulatory capital structure.

A second approach was developed by Professor Hamada, who estimated the cost of equity using the CAPM and made comparisons between companies with different capital structures using beta. Specifically, in the Hamada approach, I use the estimated beta to calculate what beta would be associated with a 100 percent equity financed firm to obtain a so-called all-equity or assets beta and then re-lever the beta to determine the beta associated with the

[12] The impact of financial leverage on the risk premium model needs to be considered separately as it uses regulatory data rather than market data, meaning that it is the differences in regulatory capital structures are relevant for this model.

regulatory capital structure. This requires an estimate of the systematic risk associated with debt (*i.e.*, the debt beta), which is usually quite small. In Exhibit BV-2, I set forth additional technical details regarding the methods that can be used to account for financial risk when estimating the cost of capital.

Q16: Can you provide a numerical illustration of how the cost of equity changes, all else being equal, when the degree of leverage changes?

A16: Yes. I constructed a simple example below, where only the leverage of a company varies. I assumed the return on equity is 11.00 percent at a 50 percent 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 45 percent.

FIGURE 3: ILLUSTRATION OF THE IMPACT OF FINANCIAL RISK ON ROE

		Company A (50% Equity)	Company B (45% Equity)
Rate Base	[a]	$1,000	$1,000
Equity	[b]	$500	$450
Debt	[c]	$500	$550
Total Cost of Capital (8%)	[d] = [a] × 8%	$80.0	$80.0
Cost of Debt (5%)	[e] = [c] × 5%	$25.0	$27.5
Equity Return	[f] = [d] - [e]	$55.0	$52.5
Rate of Return on Equity (ROE)	**[g] = [f] / [b]**	**11.00%**	**11.67%**

Figure 3, above, illustrates how financial risk[13] affects returns and the ROE. The overall return remains the same for Company A and B at $80. But Company B with the lower equity share and higher financial leverage must earn a higher percentage ROE in order to maintain the same overall return. This higher percentage allowed ROE represents the increased risk

[13] Financial risk is risk that a company has due to its capital structure; specifically, the higher a company's debt, the larger the financial risk.

to equity investors caused by the higher degree of leverage. Importantly, regardless of the equity percentage, customers will pay $80 in capital costs – the only difference between the two companies is how that $80 is sourced between equity and debt holders.

The principle illustrated in Figure 3 is an example of the first adjustment I performed to account for differences in financial risk when conducting estimates of the cost of equity applicable to Orange and Rockland.

Q17: Does this approach apply to the risk premium analysis?

A17: Yes, to the extent that there are differences between the capital structures of the companies used to determine the benchmark ROE for Orange and Rockland, I need to consider whether an adjustment is needed. Because the allowed ROE usually is applied to book value capital structures, it is the book value capital structure that is relevant for the risk premium method. In examining the average book value capital structure for electric and natural gas utilities for which I have allowed ROE data for, I determined that it has historically been close to that of Orange and Rockland's request for 50 percent equity, I do not need to make any adjustments to the estimated ROE. I note, however, that for 2020, the average and median allowed equity percentage was 49.4% and 51.2%, respectively for electric utilities and 51.8% and 51.3%, respectively, for natural gas utilities.[14]

C. Approach to Estimating the Cost of Equity

Q18: Please describe your approach for determining the cost of equity for Orange and Rockland.

[14] S&P Global Market Intelligence, "Rate Case History" Online version as of October 1, 2020.

A18: As stated above, the standard for establishing a fair rate of return on equity requires that a regulated utility 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 Orange and Rockland focuses on measuring the expected returns required by investors to invest in companies that face business and financial risks comparable to those faced by Orange and Rockland. Because certain models require market data, my consideration of comparable companies is restricted to those that have publicly traded stock. To this end, I have selected two proxy groups consisting of publicly traded companies. The first proxy group consists of companies providing primarily regulated electric distribution services, the second group consists of regulated natural gas distribution utilities I consider the electric distribution, natural gas distribution, and the full samples when deriving estimates of the representative cost of equity according to standard financial models, including two versions of the DCF.

I also perform analyses of historical allowed ROEs for electric and nature gas utilities in relation to prevailing risk-free interest rates at the time the ROE was authorized, and use the implied allowed risk-premium relationship to estimate a utility cost of equity consistent with current economic conditions. The results of this implied risk premium analysis (sometimes referred to herein as the “Risk Premium” model) are an additional consideration that supports my recommendation and serves as a check on the reasonableness of my market-based results.

Q19: How does your approach and the models you employ compare to those traditionally employed by the Staff of the New York State Department of Public Service ("Staff")?

A19: As exemplified in the Commission's 2019 Orange and Rockland Rate Order and in the testimony of Staff witnesses in the 2018 Orange and Rockland Rate Cases,[15] the Commission's Generic Finance Methodology is broadly similar to, but also has important differences from, my approach.

The market-based DCF and CAPM estimation techniques I rely on align with the Commission's historical reliance on both DCF and CAPM results to inform its allowed ROE determinations. Of note, Staff has consistently implemented a "zero-beta" version of the CAPM,[16] which is conceptually and methodologically aligned with the version of the empirical CAPM (*i.e.*, ECAPM) that I implement.

While Staff and I both derive estimates from the DCF and CAPM, there are differences in how we select inputs to implement the models. For example, Staff's approach to the DCF attempts to infer a "sustainable growth" rate based on Value Line forecasts of return on book equity and retention ratio, whereas I implement both single- and multi-stage DCF models based directly on forecasts (including by Value Line) of growth in earnings available for distribution to investors. As discussed further below, I believe considering the results of both single and multi-stage models is appropriate in light of current market conditions and their impact on dividend yields.

[15] 2018 O&R Rate Cases, Staff Finance Panel Testimony.

[16] Id., p. 134

For the CAPM, Staff recently averaged the 10-year and 30-year government bond yield over the most recent three months to obtain an estimate on the risk-free rate,[17] whereas I look at forecasts of the Treasury yield in an attempt to capture investor expectations for the risk-free rate of return during the period rates set in this proceeding will be in effect. While currently prevailing yields are somewhat lower than the forecasted yield I use, the reverse is true of the MRP estimates traditionally relied on by Staff, which are significantly higher than the estimate I employ, which (as discussed below) is supported by both historical and forward-looking evidence.

Importantly, as discussed in Section 3.B below, my CAPM and DCF analyses employ standard finance techniques to adjust explicitly for differences in financial leverage between the proxy group companies and the Company's requested regulatory capital structure. The fact that Staff's typical approach does not take financial risk into account by using the standard adjustment techniques means that Staff's analysis misses an important step in estimating the opportunity cost of capital commensurate with an investment of equivalent risk.[18]

Finally, in contrast to Staff's practice, I do not believe it is appropriate to place fixed primary emphasis on one model in deriving a recommended allowed ROE. Whereas the Commission has traditionally placed 2/3 weight on the DCF and 1/3 on the CAPM, I consider the ranges of results produced by the models I employ: two versions of the CAPM, two versions of the DCF, and the implied Risk Premium method. The reason I believe it is important to consider the range is that I prefer to focus on the tendency of the data rather than a weighted average

[17] Id., p. 94.

[18] I am not aware of any MBA finance textbooks that do not discuss methods to account for financial risk.

of results for two models – either of which may be affected by idiosyncratic market conditions (model risk) at any given point in time. This is particularly important currently given the ongoing market uncertainty.

Q20: Why do you believe your approach to considering ranges of estimates derived from multiple version of both the DCF and CAPM, and also relying on an implied Risk Premium analysis, is justified?

A20: There is no one perfect model for estimating the cost of equity, and the various models and estimation approaches I employ each have different strengths and sensitivities. For example, the CAPM relies on an explicit measurement of systematic risk (beta) for which the cost of equity capital must compensate investors, but this parameter must be measured using historical data,[19] and thus changes more slowly in response to changes in industry risk characteristics. Conversely, the DCF models incorporate current market prices and the most recent dividends, enabling them to capture shifts over time. However, this also makes the DCF sensitive to short-term market phenomena that may or may not be representative of the capital market conditions and required investor returns that will prevail during the time Orange and Rockland's electric and gas rates are in effect. In contrast to both the CAPM and DCF models, the implied risk premium analysis focuses directly on the relationship of allowed returns for regulated utility companies to observable rates of return (*i.e.*, bond yields) reflective of contemporaneous capital market conditions.

[19] I note that Value Line applies an empirical adjustment (the Blume adjustment) that converts the beta derived from historical return data into a better indicator of forward-looking systematic risk (*i.e.*, a better predictor of beta going forward).

Q21: Have other utility regulatory bodies acknowledged the importance of relying multiple models?

A21: Yes. Notably FERC, which regulates electric transmission operations, recently issued an order proposing to rely explicitly on multiple models in its determination of just and reasonable ROEs for transmission owners.[20] In FERC's most recent (Order 569-A), the FERC relies on versions of the DCF and CAPM, as well as the implied Risk Premium method. These recent FERC ROE Orders represent a substantial change of FERC's historical practice of relying on only a single model—the DCF—to set allowed ROEs. In it, FERC explicitly recognizes that different models offer complementary views of investor requirements and market expectations and that it is necessary to evaluate and consider all such evidence.

Q22: What reasons did FERC give for revising its approach to consider multiple models rather than only the DCF?

A22: In the FERC Coakley Order (October 2018), FERC stated its concern that compared to when it originally adopted the DCF model as its only focus of consideration for determining utility ROEs, "the DCF methodology may no longer singularly reflect how investors make their decisions," since "investors have increasingly used a diverse set of data sources and models to inform their investment decisions." The FERC Coakley Order also lays out other "difficulties with sole reliance on the DCF methodology," including that the single model's results appear at times to diverge from its underlying principles and the real world experience

[20] See Coakley v. Bangor Hydro-Electric Co., 165 FERC ¶ 61,030 (October 2018) ("Coakley Order") wherein FERC switched from relying on the DCF to relying on four cost of equity estimation methodologies (DCF, CAPM, Implied Risk Premium, and Expected Earnings). See also FERC Order 569-A, Docket No. EL14-12-004, May 21, 2020 and FERC Order 569-B, Docket No. EL14-12-004, November 19, 2020, which confirmed Order 569-A.

of capital market participants, and that the results sometimes move differently from the results of other models on which those market participants may rely to inform their investment decisions. Ultimately, FERC views its proposal to rely on multiple models as a way to avoid this "model risk" and summarizes its rationale as follows.

> In relying on a broader range of record evidence to estimate [New England Transmission Owners'] cost of equity, we ensure that our chosen ROE is based on substantial evidence and bring our methodology into closer alignment with how investors inform their investment decisions.[21]

In FERC's most recent Order 569-A, the Commission affirmed this view stating, "We continue to find that ROE determinations should consider multiple models, both to capture the variety of models used by investors and to mitigate model risk."[22] FERC's assessment and reasoning in this regard is very much in line with the principles that guide my own decision to inform my analysis based on the results of multiple complementary analyses.

4. CAPITAL MARKET CONDITIONS AND THE COST OF CAPITAL

Q23: What do you cover in this section?

A23: In this section, I address recent changes in capital market conditions, the increased volatility in equity and debt markets, how these factors affects the cost of equity and its estimation. Specifically, I address (i) interest rate developments; (ii) recent changes in utility credit spreads; and (iii) investors perception of the MRP.

Q24: Why do you discuss capital market conditions in a testimony aimed at determining Orange and Rockland's ROE?

[21] FERC Coakley Order, p. 15.

[22] FERC Order 569-A, p. 25.

A24: Capital market conditions are important to cost of equity estimation methodologies and can affect the inputs to the cost of equity models. Inputs to the DCF models are affected by the economy in general as economic growth will affect growth rates and utility stock prices. Consequently, the capital market developments affect the growth rates, dividend yield, and the assessment of estimates' reasonableness.

Furthermore, the risk-free rate is an input to the risk premium model and CAPM, so that recent and expected developments in government bond yields are important to assess the validity of any measure of the risk-free rate. Similarly, the MRP is an input to the CAPM, so factors that affect the MRP (*e.g.*, volatility and changes in investors' risk perceptions) are vital for accurate determination of the ROE.

Q25: Can you provide a summary of recent events, which have impacted capital market conditions?

A25: Capital markets have seen historic changes since Orange and Rockland's last rate case settlement was approved in March 2019.[23] Starting in January 2020, long-standing trade tensions that were weighing on the economy began to ease. The U.S. signed Phase 1 of the U.S.-China Trade Agreement and also the United States-Mexico-Canada Agreement ("USMCA"). However, around the same time, a novel virus was beginning to spread in China and Europe. By March 2020, the World Health Organization declared that the COVID-19 outbreak was a pandemic. Many governments around the world, including in the U.S., sought measures to limit the health and economic impacts from the pandemic. By mid-March, local and state governments began issuing stay-at-home orders and major portions

[23] See also testimony of Company witness Saegusa for further discussion on current and expected capital market conditions.

of the U.S. economy were shut down. As a result, over 65 million people in the U.S. have filed initial unemployment claims since March 21, 2020.[24] To help mitigate the economic impacts, the U.S. Federal Government passed the $2.1 trillion CARES Act on March 27, 2020.[25] The U.S. Federal Reserve also cut its policy rate to 0 to 0.25 percent and announced "unlimited" quantitative easing and emergency liquidity programs to support financial markets.[26] Despite this, the U.S. economy contracted substantially in the first half of 2020. According to the Bureau of Economic Analysis ("BEA") first and second quarter 2020 GDP decreased by annualized rate of 5.0% and 31.4%, respectively.[27] By June 2020, the National Bureau of Economic Research declared the U.S. was in a recession. As of September 2020, the U.S. unemployment rate stands at 7.9% with permanent job losses at 3.8 million, up 2.5 million since February.[28] More recently, In October 2020, the New York statewide unemployment rate decreased from 9.7% to 9.6%.[29]

Q26: What are the expectations going forward?

A26: The extent and length of the economic and financial impacts from the COVID-19 pandemic are still unknown. The impacts on the economy and unemployment will depend on how long

[24] U.S. Department of Labor, "Unemployment Insurance Weekly Claims," New Release, November 26, 2020.

[25] The White House, "Statement by the President," March 27, 2020, accessed April 16, 2020, https://www.whitehouse.gov/briefings-statements/statement-by-the-president-38/.

[26] U.S. Federal Reserve, "Federal Reserve Announces Extensive New Measures to Support the Economy," Press Release, March 23, 2020.

[27] Bureau of Economic Analysis, "Gross Domestic Product, 2nd Quarter 2020 (Third Estimate); Corporate Profits, (Revised), U.S. Department of Commerce, September 30, 2020. Accessed October 2, 2020, https://www.bea.gov/news/2020/gross-domestic-product-third-estimate-corporate-profits-revised-and-gdp-industry-annual.

[28] U.S. Department of Labor, "The Employment Situation – September 2020," News Release, October 2, 2020, https://www.dol.gov/newsroom/economicdata/empsit_10022020.pdf.

[29] New York State Department of Labor, "NYS Economy, Added 45,600 Private Sector Jobs in October 2020, Marking 6th Straight Month of Gains," November 19, 2020, https://labor.ny.gov/pressreleases/2020/november-19-2020.shtm.

social-distancing measures are required and how long it takes to distribute a vaccine. Recent surveys by economists, such as in the *Blue Chip Economic Indicators* survey, indicate that the nominal U.S. GDP will decline by 3.0% in 2020 before recovering by 5.5% in 2021.[30] The Congressional Budget Office expects nominal GDP will contract by 5.1% in 2020 before recovery by 4.8% in 2021. [31] Longer term, the forecasted nominal GDP growth remains at a bit over 4%,[32] and that is the figure that impacts the cost of equity estimate in the DCF model. In August, the U.S. Federal Reserve announced a policy change whereby they would target inflation at 2% *on average* indicating the Federal Reserve may hold interest rates for longer.[33] After their September 2020 meeting, the Federal Reserve released economic projections indicating that policy rates would remain at current levels through 2023.[34] The policy was confirmed in the Federal Reserve's December 16, 2020 meeting.[35] This will likely continue to exert downward pressure on interest rates over the near to medium term. While the length and extent of the economic impacts from the COVID-19

[30] Wolters Kluwer Blue Chip Economic Indicators and PwC Analysis, October 2020, pp. 2-3.

[31] Congressional Budget Office, "An Update to the Economic Outlook: 2020 to 2030," U.S. Department of Commerce, July 2020. Accessed September 1, 2020, https://www.cbo.gov/publication/56465.

[32] Wolters Kluwer Blue Chip Economic Indicators and PwC Analysis, October 2020, p. 14 shows a long-term nominal GDP growth of 4.1%.

[33] U.S. Federal Reserve, "Federal Open Market Committee announces approval of updates to its Statement on Longer-Run Goals and Monetary Policy Strategy," August 27, 2020, accessed September 10, 2020, https://www.federalreserve.gov/newsevents/pressreleases/monetary20200827a.htm.

[34] U.S. Federal Reserve, "Table 1. Economic Projections of Federal Reserve Board members and Federal Reserve Bank presidents under their individual assumptions of projected appropriate monetary policy, September 2020," September 15, 2020, accessed September 21, 2020, https://www.federalreserve.gov/monetarypolicy/files/fomcprojtabl20200916.pdf.

[35] U.S. Federal Reserve, "Press Release," December 16, 2020. https://www.federalreserve.gov/monetarypolicy/files/monetary20201216a1.pdf

pandemic are currently unknown, the impacts are expected to persist for some time until a vaccine or some other effective treatment is developed.[36]

Q27: How does this impact the cost of equity estimation for Orange and Rockland?

A27: It is important to remember that the cost of equity and capital structure established for Orange and Rockland in this proceeding is expected to be in effect beyond the current extraordinary impacts of the COVID-19 pandemic. The analysis and recommendations should reflect expected market conditions that will prevail over the relevant rate period and not exclusively current market conditions. As discussed further below, many of the inputs to the cost of equity estimation methodologies are currently at unprecedented levels and widely expected to change in the upcoming year. Sole reliance on current economic and financial conditions to estimate Orange and Rockland's cost of equity would unfairly lock Orange and Rockland and their customers into the current economic and financial environment. Doing so would also not provide a fair return, especially when compared to other utilities that did not undergo a cost of capital proceeding during period.

A. Interest Rates

Q28: How do interest rates affect the cost of equity?

A28: The current interest rate environment affects the cost of equity estimation in several ways. Most directly, the CAPM takes as one of its inputs a measure of the risk-free rate (see Figure 2). The estimated cost of equity using the CAPM decreases (increases) by one percentage

[36] The Federal Reserve in their September 16, 2020 FOMC statement said, "The ongoing public health crisis will continue to weight on economic activity, employment, and inflation in the near term, and poses considerable risks to the economic outlook over the medium term."
https://www.federalreserve.gov/newsevents/pressreleases/monetary20200916a.htm.

point when the risk-free rate decreases (increases) by one percentage point. Therefore, to the extent that prevailing government yields are depressed due to economic uncertainties related to the COVID-19 pandemic or the monetary policy responses, using current yields as the risk-free rate will depress the CAPM estimate below what is representative of the forward-looking cost of equity, which will be in effect during the relevant regulatory period. Put another way, with current government bond yields downwardly biased due to flight-to-quality behavior by investors and "unlimited" quantitative easing programs by the U.S. Federal Reserve, using current yields in the CAPM will also downwardly bias the cost of equity estimate. At the same time, a low interest rate is associated with a high market risk premium, so that these two measures offset one another to a degree. To avoid any bias in the cost of equity estimate, it is important to use a forecasted risk-free rate and consider whether the rate needs to be normalized (or the risk premium investors require needs to be adjusted) so that the resulting CAPM estimate reflects a non-biased estimate of Orange and Rockland's cost of equity over the relevant regulatory period. As the economy begins to recover, as forecasted, in 2021 interest rates are expected to increase from current lows. Therefore, the allowed fair return on equity for utilities should reflect the future interest rate environment.

Q29: What are the relevant developments regarding interest rates?

A29: Interest rates are currently near historic lows due to flight-to-quality behaviors by investors as well as the Federal Reserve's expansion of its quantitative easing programs. Interest rates on 10-year U.S. Government bonds were at 1.86% at the end of 2019.[37] As large parts of

[37] Bloomberg accessed October 23, 2020.

the economy began to shut down in response to the pandemic, investors fled riskier assets for safer assets. This demand for U.S. government bonds caused bond yields to decrease rapidly. On March 9, 2020, the entire U.S. yield curve fell below 100 basis points for the first time in history and the 10-year U.S. government bond yield hit a record low of 0.339%.[38] Since then, long-term government bond yields have increased somewhat—10-year U.S. Government bond yields are currently at 0.96%.[39]

Most economists expect the economy to begin to recover in 2021.[40] This is expected to cause interest rates to rise from near-historic lows. Blue Chip Economic Indicators' ("BCEI") October 2020 edition forecasts that the yield on 10-year treasury bonds will increase to 0.9% by 2021.[41] BCEI projects the 10-year government bond yield will be 1.4% and 1.7% in 2022 and 2023, respectively (Figure 4).[42] That is, the consensus forecast is that the yield on long-term treasury bonds will increase from current levels of 0.96%.[43] The expectations for 2021 and onward is what is relevant for this proceeding as rates are expected to be in effect starting in November 2021 and notably, the December 2020 forecast for 2021 increased from 0.9% to 1.1%.[44] Because the risk-free rate is an input to several cost of equity estimation models, the relationship between current and forecasted risk-free rates is an important consideration.

[38] Sunny Oh, "Treasury yield curve sinks below 1% after oil and coronavirus worries rout stocks," *Market Watch*, March 9, 2020, accessed March 31, 2020, https://www.marketwatch.com/story/30-year-treasury-yield-tumbles-below-1-after-oil-and-coronavirus-worries-rout-stocks-2020-03-09

[39] Bloomberg as of December 4, 2020.

[40] For example, Wolters Kluwer Blue Chip Economic Indicators and PwC Analysis, October 2020 collects GDP growth data from 40 financial institutions, academic institutions and other entities – all of whom predict a positive growth for 2021 with an average of 5.5%.

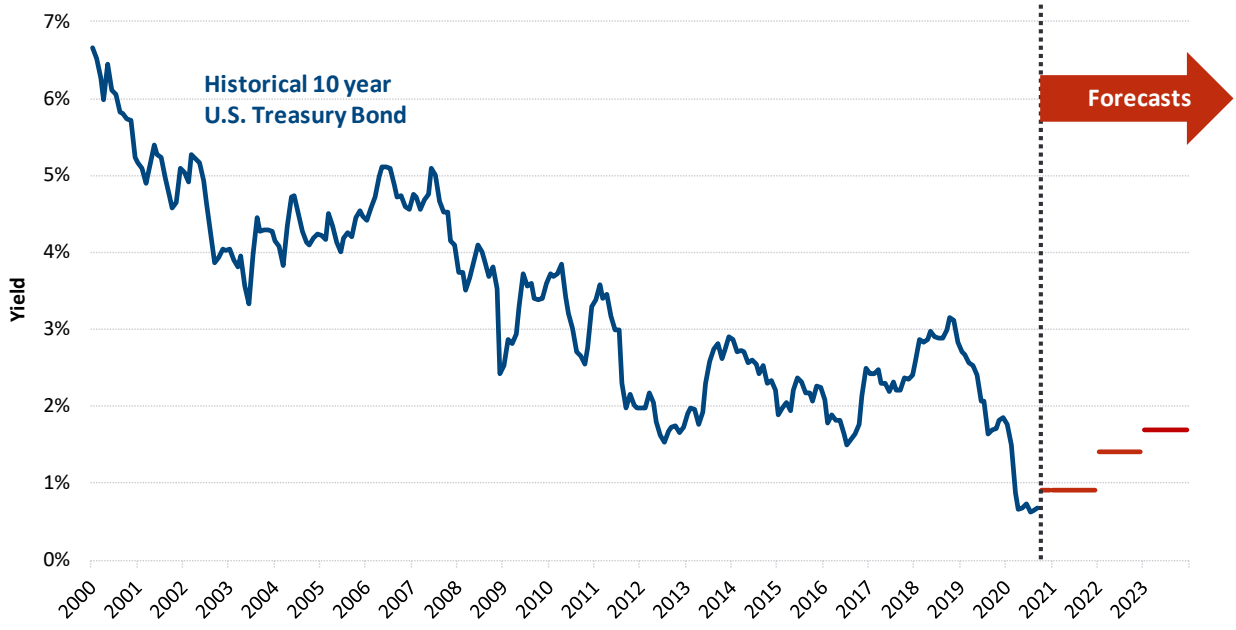
[41] Wolters Kluwer Blue Chip Economic Indicators and PwC Analysis, October 2020, p. 3. The historical maturity premium for a 20-year treasury bond over a 10-year treasury bond is approximately 50 basis points.

[42] Wolters Kluwer Blue Chip Economic Indicators and PwC Analysis, October 2020, p. 14.

[43] Bloomberg, as of December 4, 2020.

[44] Blue Chip Economic Indicators, December 10, 2020, p. 3.

FIGURE 4: HISTORICAL AND PROJECTED TEN-YEAR TREASURY BOND YIELDS[45]



Source: Historical data from Bloomberg. Forecasts from Blue Chip Economic Indicators October 2020.

B. Yield Spreads

Q30: Why are bond yield spreads relevant to your cost of equity analysis?

A30: Bond yield spreads (also called credit spreads) reflect the premium that investors demand to hold debt securities (specifically corporate or utility bonds) that are not risk free. Analogously, the MRP—which is a key input to the CAPM cost of equity estimation—represents the risk premium that investors require to hold equities rather than risk-free government bonds.

If bond yields are influenced to some extent by the same underlying market factors that drive the systematic risk premium for equities, shifts in directly observable credit spreads can assist

[45] Id.

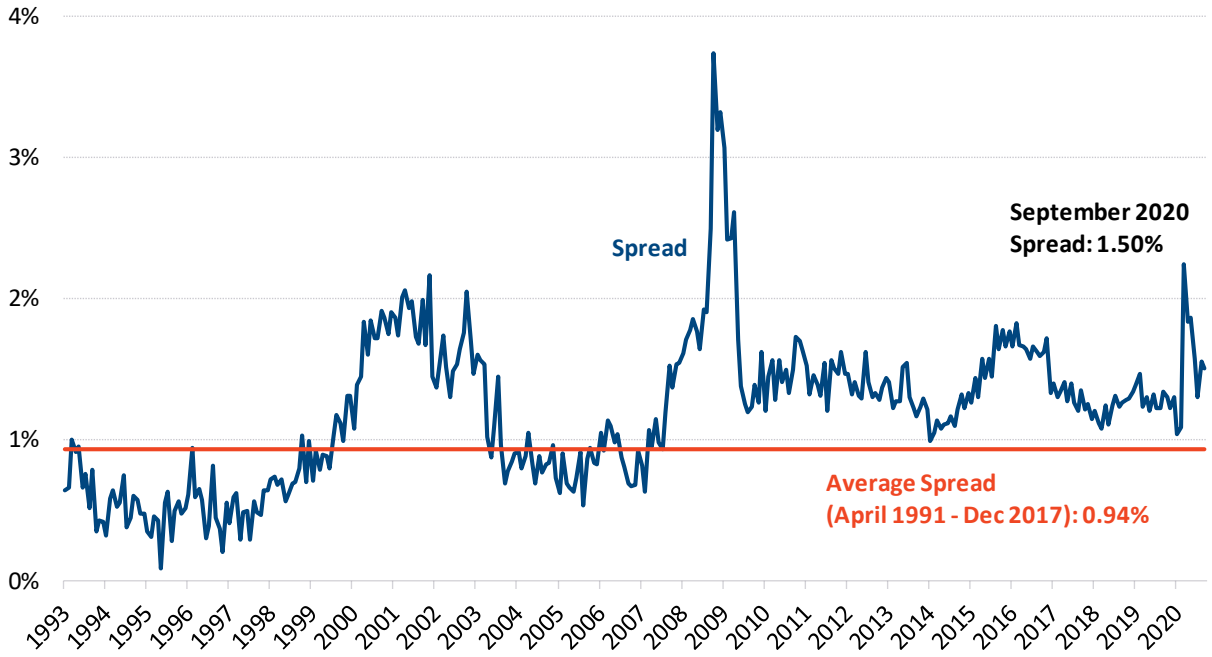
with inference about changes in the MRP, which itself must be estimated.[46] More specifically, if both credit spreads and equity premiums are determined in part by the general premium required by investors for bearing systematic risk, then an increase in credit spreads may indicate an increase in the forward-looking MRP.

Q31: How does the current spread between utility and U.S. government bond yields compare to historical spreads?

A31: Utility bond yield spreads have increased substantially recently as investors require additional compensation to hold non-government debt due to the increased business risks and economic uncertainties. As shown in Figure 5 below, the spread between 20-year A-rated utility bond yields and 20-year U.S. government bond yields are currently at 1.50%, approximately 56 basis points above the pre-financial crisis average of 0.94%. I note that the spread increased dramatically in early 2020 but has since declined some.

[46] This is the same issue as in cost of capital estimation more generally: the cost of debt can often be directly observed in the form of market bond yields, whereas the cost of equity must be estimated based on financial models.

FIGURE 5: YIELD SPREAD BETWEEN UTILITY A-RATED BOND YIELDS AND 20-YEAR U.S. TREASURY BONDS

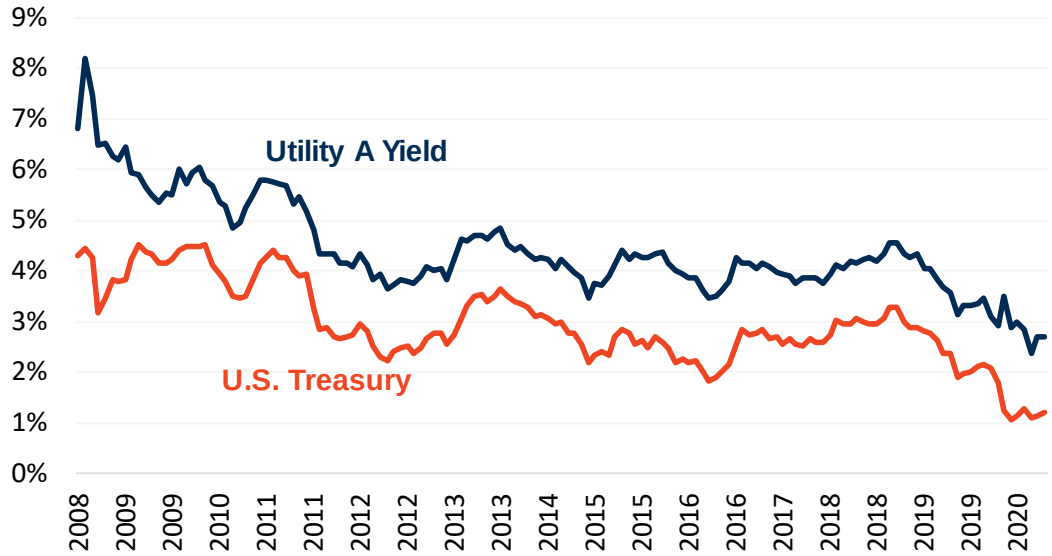


Source: Bloomberg as of 9/30/2020.

The yield spread is commonly thought to be explained by default risk, taxes, downward pressure on government bond yields due to monetary policy, or the equity risk premium. Hence, an increase in the spread could be caused by any or all of these components. As the default risk has not changed materially for highly rated utility bonds[47] and taxes are a very small portion of the spread, the remaining components: downward pressure and the equity risk premium must explain the majority of the spread increase. Figure 6 below illustrates that the increased spread is attributable both to lower yields on government bonds and also an increased premium required by investors to hold riskier assets.

[47] S&P Ratings reports Utility defaults are down slightly in 2020 versus 2019 year to date. S&P Global Ratings, "Corporate Defaults Slow In The Third Quarter While The Oil and Gas Total Remains High," October 2, 2020.

FIGURE 6: UTILITY A-RATED BOND YIELDS AND 20-YEAR U.S. TREASURY YIELDS



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Source: Bloomberg, data as of September 30, 2020.

While spreads have narrowed since the height of the COVID-19 pandemic in March and April, they remain elevated compared to the pre-COVID-19 period indicating lingering uncertainty and elevated risk. On April 2, 2020, S&P Global Ratings ("S&P") downgraded the outlook for North American utilities from "stable" to "negative" due to COVID-19 pandemic risks, citing concerns about the adequacy of utilities' financial cushions to weather the financial downturn.[48] With heightened concern about utility credit, spreads and risk premiums are likely to remain elevated.

C. Risk Premiums

Q32: What is the current evidence regarding market volatility?

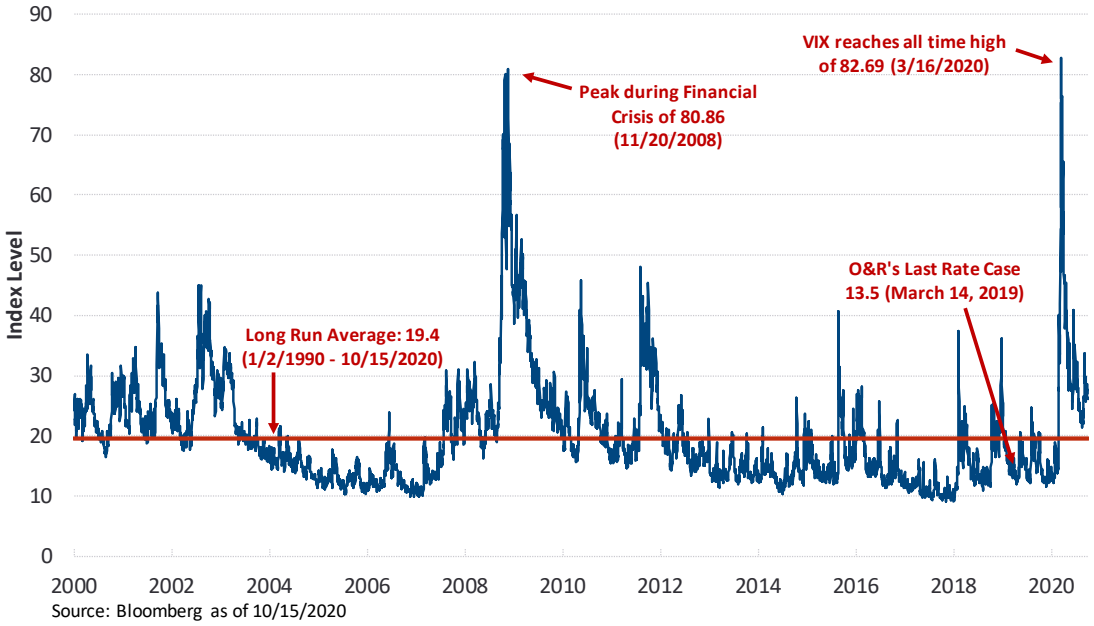
[48] *S&P Global Market Intelligence*, "S&P lowers North American utilities outlook to negative on coronavirus risk," April 2, 2020, Accessed April 3, 2020, https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/s-p-lowers-north-american-utilities-outlook-to-negative-on-coronavirus-risk-57886477.

A32: Recently, financial markets have become extremely volatile as shown in near-term common volatility measures, such as the VIX, which is frequently referred to as the market's fear index. The VIX reached an all-time high of 82.69 on March 16, 2020, which was higher than the peak of 80.86 during the Financial Crisis. Although, the VIX has slowly retreated from recent highs to 22.01 currently and it remains elevated relative to the long run average of 19.4.[49] Comparably, at the time of the 2019 Orange and Rockland Rate Order (March 2019), the VIX stood at approximately 13.5.[50] Clearly, investors are faced with substantially higher volatility today than during Orange and Rockland's most recent rate case and higher volatility implies a higher risk premium.

[49] Bloomberg, as of December 4, 2020.

[50] Ibid.

FIGURE 7: VIX

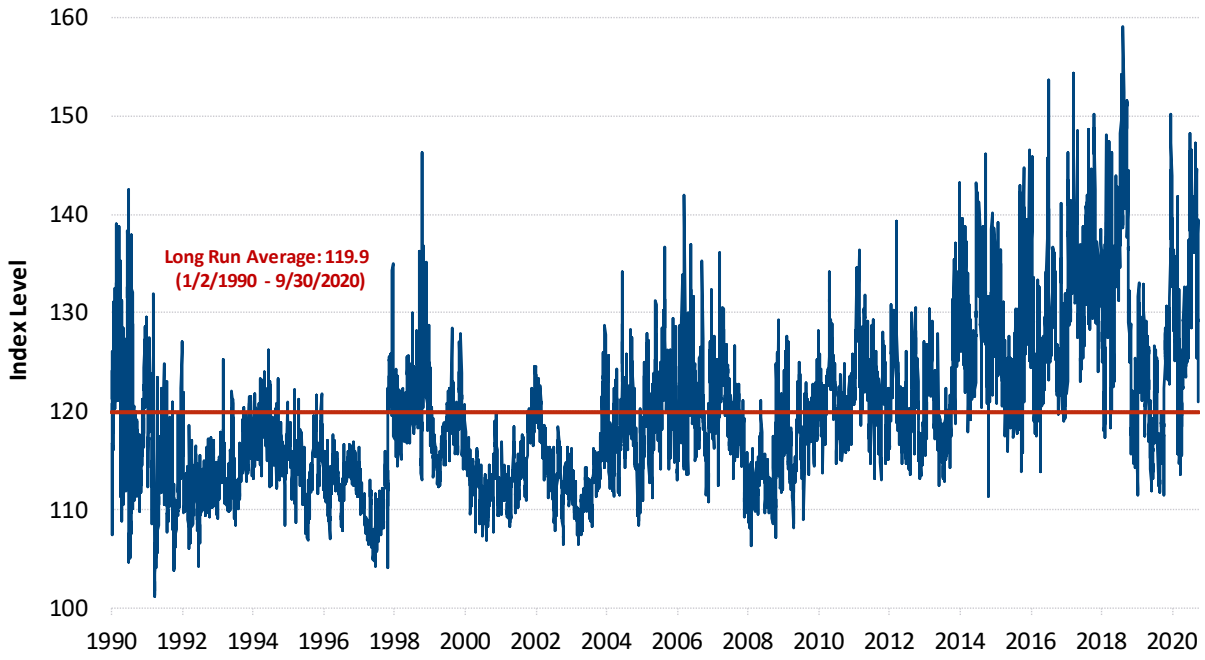


Source: Bloomberg as of 10/15/2020

Similarly, 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),[51] shows that investors are cautious. A SKEW value of 100 indicates outlier returns are unlikely, but as the SKEW increases, the probability of outlier returns becomes more significant. Figure 8 below shows the development in the SKEW since 1990 and that the index has recently increased following a period of declining SKEW. The index spiked over 148.3 on June 30, 2020, which is 28 points above its long run average of 119.9. The recent spike in the SKEW shows that investors are willing to pay for protection against downside risks.

[51] See, http://www.cboe.com/products/vix-index-volatility/volatility-indicators/skew.

FIGURE 8: SKEW



Source: Bloomberg as of 9/30/2020

The currently very high level of both the VIX and SKEW is consistent with day-to-day observations of volatile financial markets and shows that investors are cautious about investing in equity. Such circumstances lead investors to require a higher premium to invest in assets or financial instruments that are not risk-free.

Q33: What is the Market Risk Premium?

A33: In general, a risk premium is the amount of "excess" return—above the risk-free rate of return—that investors require to compensate them for taking on risk. As illustrated in Figure 2, the riskier the investment, the larger the risk premium investors will require.

The MRP is the risk premium associated with investing in the market as a whole. Since the so-called "market portfolio" embodies the maximum possible degree of diversification for

investors,[52] the MRP is a highly relevant benchmark indicating the level of risk compensation demanded by capital market participants. It is also a direct input necessary to estimating the cost of equity using the CAPM and other risk-positioning models.

Q34: Please explain the current evidence related to the Market Risk Premium.

A34: The heightened volatility has increased the premium that investors require to hold risky assets, especially when measured utilizing forward-looking methodologies that estimate expected market returns with reference to current dividend yields. This year, Bloomberg's forward-looking estimate of the MRP for the U.S. increased to as high as 9.84% in March 2020 and is currently at 7.85%.[53] At the same time, the MRP measured using FERC's methodology in Order 569-A increased to 9.00% as of September 30, 2020.[54] This is consistent with an increase in the MRP of over 185 basis points relative to the historic average.[55]

[52] In finance theory, the "market portfolio" describes a value-weighted combination of all risky investment assets (*e.g.*, stocks, bonds, real estate) that can be purchased in markets. In practice, academics and financial analysts nearly always use a broad-based stock market index, such as the S&P 500, to represent the overall market.

[53] Bloomberg, as of December 4, 2020. Measured over a 10-year U.S. Treasury bond.

[54] FERC Opinion No. 569-A, Docket No. EL14-12-004, EL15-45-013, May 21, 2021, FERC Order on Rehearing.

[55] The long-term historical average arithmetic MRP as calculated by Duff & Phelps using the Ibbotson method is 7.15 percent. Source: Duff & Phelps 2019.

FIGURE 9: BLOOMBERG'S DAILY MARKET RISK PREMIUM AND RISK-FREE RATE (NOV. 2019 TO SEP. 2020)

Q35: Are higher risk premiums relevant given that treasures are near historic lows?

A35: Yes—this is highly relevant for cost of equity estimation as current risk-free rates are extremely low. On March 9, 2020, the entire U.S. yield curve settled below 1.00% for the first time in history.[56] Since then, U.S. Government bond yields have increased somewhat with the 20-year and 30-year bond yields at or slightly above 1.00%. This decrease in bond yields has occurred as investors fled to safer assets due to the heightened market uncertainty. As shown above in Figure 9, the MRP has also increased as risk-free rates decreased.

[56] According to the Federal Reserve, the yield on the 10-year, 20-year, and 30-year Treasury bonds on March 9, 2020 was 0.54%, 0.87%, and 0.99% respectively. These yields have since increased slightly. Source:https://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/TextView.aspx?data=yield

Further, as shown in both academic and industry analysis, the allowed risk premium over the risk-free rate is inversely related to the risk-free rate. For example, Villadsen et al. (2017) found that the allowed risk premium increases by approximately 0.44% for each 1% decline in the risk-free rate using data for the period 1990 through 2015.[57] Morin finds that the risk premium increases by 0.52% for each 1% decline in the risk-free rate.[58] Thus, the risk premium is likely to increase as the risk-free rate declines. As shown in Figure 9 above, this phenomenon is also documented in the forward-looking market risk premium calculated by Bloomberg. According to Bloomberg, the current market risk premium is 7.85%,[59] which is substantially higher than the historical average MRP of about 7.15%. It is also an increase over the forward-looking MRPs at the end of 2019 of 6.48%, which were much more in line with the historical average MRP.[60]

Q36: Is there evidence that the MRP will remain elevated going forward?

A36: Yes. In 2015, Duarte and Rose of the Federal Reserve of New York performed a study that aggregated the results of many models of the required MRP in the United States and tracked them over time.[61] This analysis found a very high MRP after the financial crisis, relative to time periods prior the crisis.

The authors estimated the MRP that resulted from a range of models each year from 1960 through the time of their study. The authors then reported the average, as well as the first

[57] Bente Villadsen, Michael J. Vilbert, Dan Harris, and A. Lawrence Kolbe, "*Risk and Return for Regulated Industries*," Academic Press, 2017, pp. 118-119.

[58] Roger A. Morin, "*New Regulatory Finance*," Public Utilities Reports, Inc., 2006, pp. 123-125.

[59] Bloomberg, as of December 4, 2020.

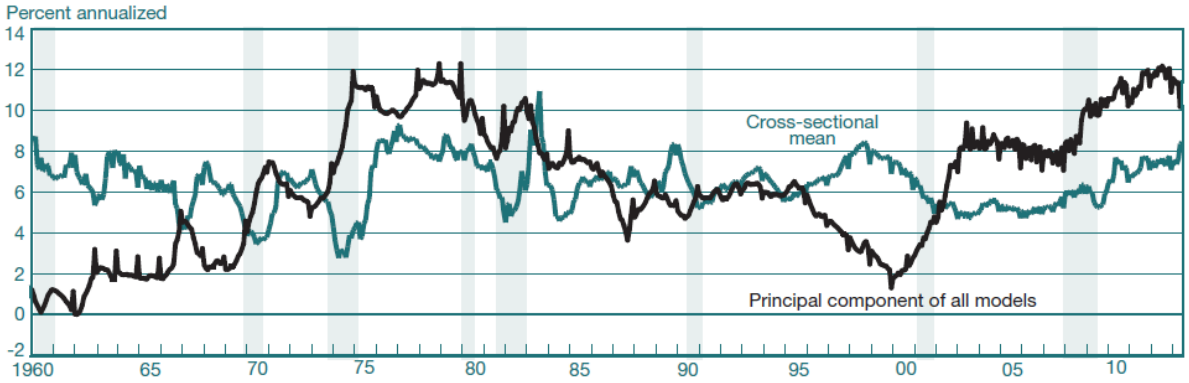
[60] Id.

[61] Fernando Durate and Carlo Rosa, "The Equity Risk Premium: A Review of Models," *Federal Reserve Bank of New York*, December 2015 ("Duarte and Rosa, 2015")
https://www.newyorkfed.org/research/staff_reports/sr714.html.

principal component of the results.[62] 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 MRP had reached an all-time high in 2012-2013. (Figure 10 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 MRP over its historical pre-crisis levels was a persistent feature of capital markets in the time following the financial crisis. Specifically, the financial crisis saw high volatility and a flight to quality – similar to conditions seen in 2020 in response to the COVID-19 pandemic. Therefore, it is reasonable to expect that the current MRP will remain elevated compared to historical levels, especially given the uncertainty related to the extent of economic and financial impacts from the COVID-19 pandemic and the historically low interest rates.

[62] Duarte and 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 variability among the 20 models over time.

FIGURE 10: DUARTE AND ROSA'S CHART 3
ONE-YEAR AHEAD MRP AND CROSS-SECTIONAL MEAN OF MODELS



Q37: Please summarize how the economic developments discussed above have affected the return on equity and debt that investors require.

A37: Utilities rely on investors in capital markets to provide funding to support their capital expenditure programs and efficient business operations. 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 developments in the risk-free rate and the growth in the U.S. GDP.

These investors have been dramatically affected by the ongoing market uncertainty, so there are reasons to believe that their risk aversion remains elevated relative to pre-COVID-19 pandemic levels. As Orange and Rockland is expected to be compensated as a utility on the equity component of its rate base, the same factors would affect Orange and Rockland's equity.

5. ESTIMATING THE COST OF EQUITY

A. Proxy Group Selection

Q38: How do you identify proxy companies of comparable business risk to Orange and Rockland?

A38: Orange and Rockland is engaged in the regulated electric and natural gas distribution business. 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. Consequently, it is not possible to identify publicly traded proxy companies that replicate every aspect of Orange and Rockland's risk profile. However, selecting companies with business operations concentrated in regulated industries or having similar lines of business and/or business environments is an appropriate starting point for selecting one or more proxy groups of comparable risk to Orange and Rockland. As a second step, I must evaluate Orange and Rockland or New York-specific risks so that the Company's ROE is placed appropriately relative to the sample companies.

To this end, I have selected a sample of electric and natural gas utilities. Jointly these companies comprise the "Full Sample." I also report results for the electric utilities that are included in the Full Sample and refer to that sample as the "Electric Sample." I similarly report the results for natural gas utilities that are included in the full sample and refer to that as the "Natural Gas Sample." The proxy companies are similar to Orange and Rockland in that they are rate regulated by state utility commissions, provide customers a product through a network of assets, and rely on substantial capital to provide service; *i.e.*, they are capital intensive as is Orange and Rockland. Additionally, all regulated utilities are subject to

conservation initiatives, many have recently faced moratoriums on shut-offs,[63] and consumption patterns have changed toward residential use during the COVID-19 pandemic.[64]

It is important that a proxy group used to assess the cost of equity for Orange and Rockland (absent of any unique New York or Company characteristics) is regulated, because regulation tends to place substantial requirements and also protections on the companies. I also believe the physical characteristics of the industry – *e.g.*, network, capital intensive, serving different customer groups (residential, commercial, industrial) – is a characteristic of Orange and Rockland and of the selected electric and natural gas distribution utilities. The network characteristic implies that assets cannot readily be employed in a different capacity, capital intensity affects the operating risks through the split between fixed and variable costs, and the customer composition affects the demand risk. For example, many electric and natural gas utilities face declining per-customer demand due to conservation and regulation (legislation or voluntary commitments).

Q39: Please summarize how you selected the Electric, Natural Gas, and Full samples?

A39: To identify companies suitable for inclusion in the Full Sample, I started with the universe of publicly traded companies in the electric and natural gas utility industry as identified by Value Line Investment Analyzer ("Value Line"). Next, I reviewed business descriptions and

[63] Lillian Federico, "Bans on utility shut-offs during COVID-19 pandemic challenge regulators," *S&P Market Intelligence*, August 28, 2020, https://www.spglobal.com/marketintelligence/en/news-insights/blog/bans-on-utility-shut-offs-during-covid19-pandemic-challenge-regulators.

[64] Darren Sweeney, "Warm weather, residential power sales help utilities offset demand declines," *S&P Market Intelligence*, August 4, 2020, https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/warm-weather-residential-power-sales-help-utilities-offset-demand-declines-59727866

financial reports of these companies and eliminated companies that had less than 50 percent of their assets dedicated to regulated utility activities in their industry.[65]

With this group of companies, I applied further screening criteria to eliminate companies that have had recent significant events that could affect the market data necessary to perform cost of capital estimation. Specifically, I identified companies that have cut their dividends or engaged in substantial merger and acquisition ("M&A") activities over the relevant estimation window.[66] I eliminated companies with such dividend cuts because the announcement of a cut may produce disturbances in the stock prices and growth rate expectations in addition to potentially being a signal of financial distress. I eliminated companies with significant M&A activities because such events typically affect a company's stock price in ways that are not representative of how investors perceive its business and financial risk characteristics. For example, a utility's stock price will commonly jump upon the announcement of an acquisition to match the acquirer's bid.

Further, I require companies have an investment grade credit rating[67] and more than $300 million in annual revenues for liquidity purposes. A final, and fundamental, requirement is that the proxy companies have the necessary data available for estimation.

[65] For electric utilities, I rely on Edison Electric Institute (EEI), 2019 Financial Review. This report gives industry financial information as well as a percentage of regulated assets for each of the companies.

[66] As described in Sections 5.B and 5.C, the CAPM requires five years of historical data, while the DCF relies on current market data.

[67] In some cases, a proxy 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 instances, I assign the company the average credit rating of the rest of the proxy group.

Q40: What are the characteristics of the Electric and Natural Gas Utility samples?

A40: I calculate my results for the electric proxy group, the natural gas proxy group, and for the combined electric and natural gas proxy group. The proxy group(s) are comprised of electric and natural gas utilities whose primary source of revenues and majority of assets are subject to regulation. The final proxy group consists of the 29 electric utilities and nine natural gas utilities listed in Figure 11 and Figure 12 below, respectively.

The figures below report the proxy companies' annual revenues for the most recent four quarters as of 2Q 2020 and also reports the market capitalization, credit rating, beta and growth rate. The annual revenue as well as the market cap was obtained from Bloomberg. The credit rating is reported by Bloomberg.[68] The growth rate estimate is a weighted average between estimates from Thomson Reuters and *Value Line*. Betas were obtained from *Value Line*.

[68] In cases where a company does not have an S&P rating from Bloomberg, Moody's rating was obtained from Moody's, annual reports, or Bloomberg.

FIGURE 11: ELECTRIC UTILITY PROXY GROUP

Company	Annual Revenue (Q2 2020) ($MM)	Regulated Assets	Market Cap. (Q2 2020) ($MM)	Value Line Beta	S&P Credit Rating	Long-Term Growth Estimate
	[1]	[2]	[3]	[4]	[5]	[6]
ALLETE	$1,148	MR	$2,900	0.85	BBB	7.6%
Alliant Energy	$3,549	R	$12,056	0.85	A-	5.4%
Amer. Elec. Power	$15,173	R	$40,171	0.75	A-	5.8%
Ameren Corp.	$5,813	R	$17,560	0.80	BBB+	6.2%
Avista Corp.	$1,317	R	$2,455	0.90	BBB	6.8%
Black Hills	$1,667	R	$3,517	0.95	BBB+	4.6%
CMS Energy Corp.	$6,648	R	$16,667	0.80	BBB+	7.3%
Consol. Edison	$12,269	R	$24,515	0.75	A-	3.4%
Dominion Energy	$16,825	R	$69,707	0.80	BBB+	4.2%
DTE Energy	$11,872	MR	$20,524	0.90	BBB+	6.0%
Edison Int'l	$12,488	R	$21,542	0.90	BBB	15.2%
Entergy Corp.	$10,443	R	$19,176	0.95	BBB+	6.5%
Eversource Energy	$8,553	R	$28,702	0.90	A-	6.3%
Exelon Corp.	$33,341	MR	$36,448	0.95	BBB+	-0.1%
Hawaiian Elec.	$2,784	MR	$3,973	0.80	BBB-	3.3%
IDACORP Inc.	$1,289	R	$4,391	0.80	BBB	3.4%
MGE Energy	$546	R	$2,310	0.70	AA-	3.8%
NorthWestern Corp.	$1,208	R	$2,985	0.90	BBB	4.0%
OGE Energy	$2,163	R	$6,151	1.05	BBB+	3.4%
Otter Tail Corp.	$872	R	$1,598	0.85	BBB	7.7%
Pinnacle West Capital	$3,453	R	$8,366	0.85	A-	3.8%
Portland General	$2,132	R	$3,885	0.85	BBB+	9.5%
PPL Corp.	$7,680	R	$20,211	1.10	A-	-6.4%
Public Serv. Enterprise	$9,611	MR	$24,939	0.90	BBB+	2.5%
Sempra Energy	$11,256	R	$35,471	0.95	BBB+	6.7%
Southern Co.	$20,547	R	$57,430	0.90	A-	4.7%
Unitil Corp.	$416	R	$691	0.85	BBB+	4.8%
WEC Energy Group	$7,213	R	$28,012	0.80	A-	6.0%
Xcel Energy Inc.	$11,208	R	$33,561	0.80	A-	6.0%
Average	$7,706		$18,963	0.87	BBB+	5.1%

Sources and Notes:
[1]: Latest Bloomberg data available as of October 15, 2020.
[2]: Key R - Regulated (80% or more of assets regulated).
MR - Mostly Regulated (less than 80% of assets regulated).
[3]: See Schedule No. BV-3 Panels A through I.
[4]: See Schedule No. BV-10
[5]: Bloomberg as of October 15, 2020.
[6]: See Schedule No. BV-5.

FIGURE 12: NATURAL GAS UTILITY PROXY GROUP

Company	Annual Revenue (Q2 2020) ($MM)	Regulated Assets	Market Cap. (Q2 2020) ($MM)	Value Line Beta	S&P Credit Rating	Long-Term Growth Estimate
	[1]	[2]	[3]	[4]	[5]	[6]
Atmos Energy	$2,790	MR	$12,331	0.80	A	6.9%
Chesapeake Utilities	$474	R	$1,396	0.75	A-	6.9%
New Jersey Resources	$2,033	R	$3,056	0.90	A-	6.0%
NiSource Inc.	$4,897	R	$8,852	0.85	BBB+	6.9%
Northwest Natural	$758	MR	$1,724	0.80	BBB+	5.7%
ONE Gas Inc.	$1,503	R	$4,039	0.80	A	6.5%
South Jersey Inds.	$1,518	R	$2,510	1.00	BBB	12.2%
Southwest Gas	$3,167	MR	$3,767	0.90	BBB+	8.4%
Spire Inc.	$1,829	R	$3,426	0.80	A-	18.8%
Average	$2,108		$4,567	0.84	A-	8.7%

Sources and Notes:
[1]: Latest Bloomberg data available as of October 15, 2020.
[2]: Key R - Regulated (80% or more of assets regulated).
MR - Mostly Regulated (less than 80% of assets regulated).
[3]: See Schedule No. BV-3 Panels A through I.
[4]: See Schedule No. BV-10
[5]: Bloomberg as of October 15, 2020.
[6]: See Schedule No. BV-5.

I note that I included Consolidated Edison Inc., Orange and Rockland's parent company, in the electric proxy group for comparability, but I ensure the parent company does not unduly influence the estimated cost of equity.[69]

Q41: How do the proxy companies compare to Orange and Rockland in terms of financial metrics?

A41: Orange and Rockland's regulated electric and gas operations generated an annual revenue of $893 million in 2019,[70] which is smaller than the average member of the electric and natural gas proxy companies. Orange and Rockland's senior unsecured credit rating is A- and Baa1 from S&P and Moody's, which is above the average credit rating of the electric

[69] I include Con Edison within a larger proxy group of 28 other electric utilities in my proxy group so that the company does not unduly influence the estimated cost of equity. Specifically, I check that Con Edison Inc.'s financial characteristics Figure 11 are not outlier or extreme values relative to the rest of the proxy group, and therefore do not unduly influence the financial characteristics of the proxy sample and hence the estimates of the ROE.

[70] Con Edison, Inc. 2019 Annual Report, p. 50.

proxy companies and in line with the average credit rating of the average natural gas utility proxy companies. Lastly, as noted above, Orange and Rockland is a regulated distribution company as are all the companies in the natural gas proxy group, while the electric proxy group include a mixture of distribution and vertically integrated electric utilities.

Q42: What regulatory capital structure did you use for Orange and Rockland?

A42: As recommended by Orange and Rockland Company witness Saegusa, I use a capital structure including 50% equity in my recommendation, which is a 2% higher equity percentage than the capital structure awarded in Orange and Rockland's prior rate case.[71]

B. The CAPM Based Cost of Equity Estimates

Q43: Please briefly explain the CAPM.

A43: The CAPM assumes 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 2 in Section 3), in which the required expected return on an asset (above the risk-free return) is proportional to that asset's relative risk as measured by that asset's beta.

More precisely, the CAPM states that the cost of capital for an investment, S (*e.g.*, a particular common stock), is determined by the risk-free rate plus the stock's systematic risk

[71] See Direct testimony of Company witness Saegusa, who recommends 50% equity, 0.6% customer deposits and 49.4% debt.

(as measured by beta) multiplied by the MRP. Mathematically, the relationship is given by the following equation:

$$r_s = r_f + \beta_s \times MRP \quad (1)$$

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
- MRP is the market equity risk premium.

The CAPM is a "risk-positioning model," which operates on the principle (corroborated by empirical data) 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 2), whereas investments of the same risk as the overall market (*i.e.*, those that by definition have average systematic market risk) are priced so as to expect to return the risk-free rate plus the MRP. 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 MRP.

1. Inputs to the CAPM

Q44: What inputs does your implementation of the CAPM require?

A44: 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 MRP, as well as a measure of the stock's beta. There are several choices and sources of data that inform the selection of these inputs. I discuss these issues below. (Additional technical detail, along with a discussion of the finance theory underlying the CAPM is provided in Exhibit BV-2.)

Q45: What value did you use for the risk-free rate of interest?

A45: I use the yield on a 20-year U.S. Treasury bond as the risk-free rate for purposes of my analysis.[72] Recognizing the fact that the cost of capital set in this proceeding will be in effect starting 2021 and through 2023, I rely on a forecast of what Government bond yields will be in the middle of the rate period (2022). In October 2020, the *Blue Chip Economic Indicators* ("*BCEI*") survey estimated the 10-year U.S. Treasury bond yields will be 1.4% in 2022.[73] I then adjust this value upwards by 50 basis points to reflect the historical maturity premium for the 20-year U.S. Treasury bond yield over the 10 U.S. Treasury bond yield.[74] This gives me an estimated U.S. Treasury bond yield of 1.90% for 2022.

Additionally, it is important to recognize the implication of higher spreads between utility bond yields and U.S. Government bond yields. As of October 15, 2020, this spread is approximately 50 basis points higher than it was prior to the 2008 financial crisis. One explanation of this is that prevailing government bond yields are depressed relative to longer-term market expectations due to monetary policy and flight-to-quality behaviors by investors. Therefore, I also consider an appropriate risk-free rate is conservatively 0.25% higher at 2.15%.

Q46: What value did you use for the MRP?

A46: Like the cost of capital itself, the MRP 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

[72] The use of a 20-year government bond is consistent with the measurement of the historic Ibbotson MRP and permits me to use a series that has been in consistent circulation since the 1990's (the 30-year government bond was not issued from 2002 to 2006).

[73] Wolters Kluwer Blue Chip Economic Indicators and PwC Analysis, Consensus Forecasts, October 2020, p. 14.

[74] This maturity premium is estimated by comparing the average excess yield on 20-year versus 10-year Government Bonds over the period 1990-2020, using data from Bloomberg.

value-weighted portfolio of all risky investments in the market. The premium is not directly observable. Rather, it must be inferred or forecasted based on known market information. One commonly used method for estimating the MRP is to measure the historical average premium of market returns over the income returns on government bonds a long historical period.[75] The average market risk premium from 1926 to the present (2019) is 7.15%.[76] I use this value of the MRP along with a risk-free rate of 2.15% in my CAPM implementation.

However, I note that 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 4 below, there is evidence that investors' level of risk aversion is elevated relative to the time before the COVID-19 pandemic and may remain elevated for some time, even after the pandemic. For example, Bloomberg's forward-looking measures of expected market equity risk premium is higher than the long-term historical average at 7.47 percent.[77]

Q47: Please summarize the parameters of the scenarios and variations you considered in your CAPM and ECAPM analyses.

A47: The parameters are displayed in Figure 13 below. The increase yield spreads could reflect the increase in MRP or downward pressure on the yield of government bonds due to monetary policy and flight-to-quality behaviors. In my CAPM and ECAPM analyses, I use

[75] The longest period for which Duff & Phelps reports data is 1926 to current. Based on financial textbooks such as Ross, Westerfield and Jaffe, "*Corporate Finance*," 10'th Edition, 2013, pp. 324-327, I use the longest period for which reliable estimates are available – in this case 1926 to 2019.

[76] Duff & Phelps, *Ibbotson SBBI 2019 Valuation Yearbook* 10-21.

[77] Bloomberg as of September 30, 2020. Because as of September 30, 2020, there is little difference between using a forward-looking Bloomberg MRP in combination with the base risk-free rate and the inputs described above and in Figure 14 below, I do not report results from the forecasted MRP.

an unadjusted historic average MRP with the increased estimate of the risk-free rate. To be conservative, I do not simultaneously normalize the risk-free rate and elevate the MRP.

Specifically, I use the forecasted 20-year U.S. Treasury rate for 2022 and then adjust this to include half of the current spread between utility and Government bond yields. This results in a risk-free rate of 2.15%. I pair this with the long-term average historic MRP of 7.15% as estimated by Duff & Phelps.

FIGURE 13: CAPM AND ECAPM SCENARIOS

Risk-Free Interest Rate	2.15%
Market Risk Premium	7.15%

Q48: What betas did you use for the companies in your proxy groups?

A48: I used *Value Line* betas, which are estimated using the most recent five years of weekly historical returns data.[78] The *Value Line* levered equity betas are reported in Figure 11 above. Importantly, these betas—which are measured (by *Value Line*) using the market stock return data of the proxy companies—reflect the level of financial risk inherent in the proxy companies' market value leverage ratios over the estimation period. Because Orange and Rockland's regulatory capital structure includes a substantially higher proportion of debt financing than does the market data on the proxy companies used to estimate the ROE,[79] the financial risk associated with an equity investment in Orange and Rockland's rate base is correspondingly greater than the financial risk borne by investors in the proxy companies'

[78] See Value Line Glossary, accessible at http://www.valueline.com/Glossary/Glossary.aspx

[79] Orange & Rockland's proposed regulatory debt ratio of 49.4% is above the average five-year average debt ratio measured for the Electric and Natural Gas Proxy Groups. The average debt percentages of the Electric and Natural Gas proxy groups are 43% and 45%, respectively.

publicly traded stock. Importantly, the DCF model and the CAPM-based models use market data to estimate the ROE, so that it is the market value capital structure that is the relevant comparison across companies. As the risk premium model's ROE estimates are based on book value capital structures, the relevant comparison is across book value capital structures for that model.

Consequently, standard textbook techniques are applied to unlever the *Value Line* betas reported in Figure 11 above and relever the resulting asset betas at Orange and Rockland's regulatory capital structure. See Exhibit BV-2.[80]

2. The Empirical CAPM

Q49: What other equity risk premium model do you use?

A49: 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.[81] 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.

[80] Exhibit BV-2 to this testimony provides a detailed description of the standard textbook formulas used to implement the "Hamada" technique for unlevering measured equity betas based on the proxy companies' capital structures to calculate "asset betas" that measure the proxy companies' business risk independent of the financial risk impact of differing capital structures. The proxy group average asset betas are then relevered at the target capital structure (*i.e.*, Orange and Rockland's regulatory capital structure), with the precise relevered beta depending on the specific version of the unlevering/relevering formula employed.

[81] *See* Figure A-2 in Exhibit BV-2 for references to relevant academic articles.

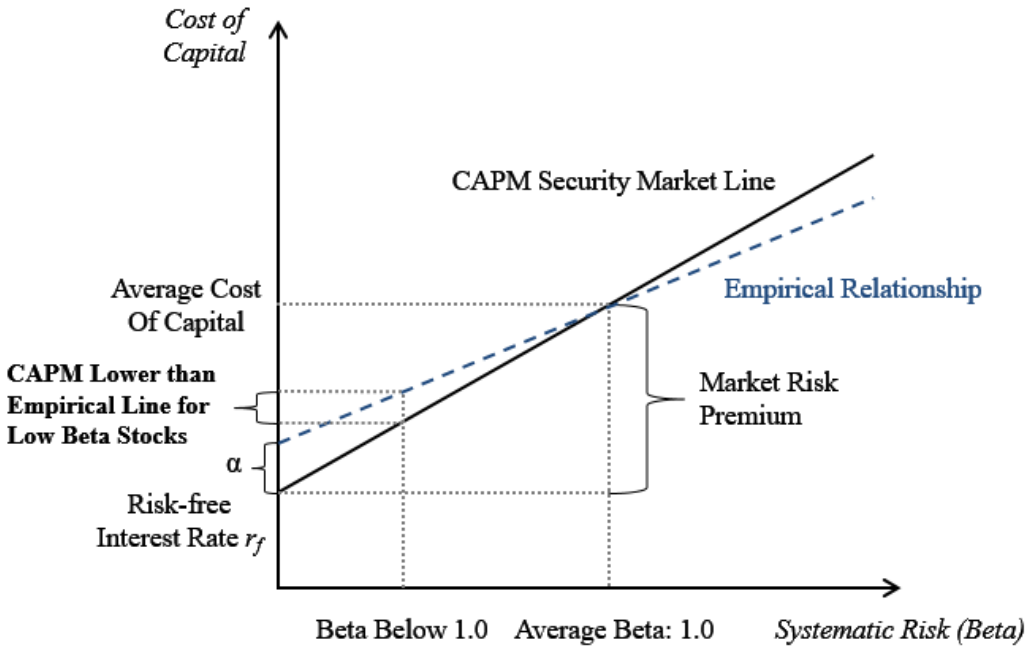
The second variation on the CAPM that I employ makes use of these empirical findings. It estimates the cost of capital with the equation,

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

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 2, which results in a Security Market Line that more closely matches the results of empirical tests. This adjustment is portrayed in Figure 14 below. In other words, the ECAPM produces more accurate predictions of eventual realized risk premiums than does the CAPM.

FIGURE 14: THE EMPIRICAL SECURITY MARKET LINE



Q50: Why do you use the ECAPM?

A50: Academic research finds that the CAPM has not generally performed well as an empirical model. One of its shortcomings 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. In summary, these studies estimate alpha parameters that range between 1%[82] and 7.32%.[83] I apply an alpha parameter of 1.5% in my application

[82] Black, Fischer. Beta and Return. *The Journal of Portfolio Management* 20 (Fall): 8-18.

[83] Eugene F. Fama and Kenneth R. French. 1992. The Cross-Section of Expected Stock Returns. *Journal of Finance* 47 (June): 427-465.

of the ECAPM. Exhibit BV-2 provides further discussion of the empirical findings that have tested the CAPM and also provides documentation for the magnitude of the adjustment, α.

3. Results from the CAPM Based Models

Q51: Please summarize the results of the CAPM-based models.

A51: The results of CAPM and ECAPM estimation for the three proxy groups are presented in Figure 15 below. The ranges of results for each model (CAPM and ECAPM) reflect the application of different specific versions of the textbook formulas used to account for the impact of different financial leverage on financial risk.

FIGURE 15: CAPM AND ECAPM SUMMARY AT 50% EQUITY CAPITAL STRUCTURE

Full Sample	
Financial Risk Adjusted Method	
CAPM	9.8%
ECAPM (α = 1.5%)	10.1%
Hamada Adjustment Without Taxes	
CAPM	9.8%
ECAPM (α = 1.5%)	9.7%
Hamada Adjustment With Taxes	
CAPM	9.5%
ECAPM (α = 1.5%)	9.4%
Electric Sample	
Financial Risk Adjusted Method	
CAPM	9.8%
ECAPM (α = 1.5%)	10.0%
Hamada Adjustment Without Taxes	
CAPM	9.7%
ECAPM (α = 1.5%)	9.6%
Hamada Adjustment With Taxes	
CAPM	9.4%
ECAPM (α = 1.5%)	9.4%
Gas Sample	
Financial Risk Adjusted Method	
CAPM	10.1%
ECAPM (α = 1.5%)	10.4%
Hamada Adjustment Without Taxes	
CAPM	10.0%
ECAPM (α = 1.5%)	9.8%
Hamada Adjustment With Taxes	
CAPM	9.6%
ECAPM (α = 1.5%)	9.6%

Sources and Notes:
Long-Term Risk Free Rate of 2.15%.
Long-Term Market Risk Premium of 7.15%.

Q52: How do you interpret the results of your CAPM and ECAPM Analyses?

A52: The results in Figure 15 above range from 9.4% to 10.4% with the majority of the results in the range of 9.5% to 10.0%.[84] As I discussed above, the established academic evidence

[84] I round to the nearest 0.25% when determining ranges of reasonable results. There are numbers below 9.5% and above 10.5% in Figure 15, but if rounding to the nearest 0.25%, I have a small number of observations above and below the range. I round to the nearest 0.25% because the cost of capital cannot, in my opinion, be determined with greater precision.

indicates that the traditional CAPM tends to underestimate the cost of equity for lower-than-average risk companies, such as the electric and natural gas utilities in Figure 11, so the ECAPM results are more reliable. I also note that the CAPM may underestimate the cost of equity for smaller companies such as Orange and Rockland. As a result, I consider a reasonable range of 9.5% to 10.0% for the electric sample, which is supported by a reasonable range of 9.5% to 10.5% percent for the natural gas sample.

C. DCF Based Estimates

Q53: Please describe the DCF model's approach to estimating the cost of equity.

A53: 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 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:

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

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 assume that the growth rate lasts into perpetuity, so the formula can be rearranged algebraically to estimate the cost of capital directly. 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.

Q54: Are there other versions of the DCF model?

A54: 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).[85] 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. [86]

In my implementation of the multi-stage DCF, I assume that companies grow their dividend for five years at the forecasted company-specific rate of earnings growth, with that growth then tapering over the next five years toward the growth rate of the overall economy (*i.e.*, the long-term gross domestic product ("GDP") growth rate forecasted to be in effect ten years or more into the future).

1. DCF Inputs and Results

Q55: What growth rate information do you use?

A55: 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 proxy group. 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*.

[85] 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.

[86] See Exhibit BV-2 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.

For the long-term growth rate for the final, constant-growth stage of the multistage DCF estimates, I use the long-term U.S. GDP growth forecast of 4.1 from Blue Chip Economic Indicators.[87] Thus, the long-run (or terminal) growth rate in the multi-stage model is nominal GDP growth.

Additionally, I relied on the dividend yield of the companies, which I estimate using the most recently available dividend information (currently) and the average of the last 15 days of stock prices ending October 15, 2020. As the single largest advantage of the DCF model is that it uses current market information, I find it is important to use a relatively short time period to determine the dividend yield – yet to avoid the bias caused by any one day. I believe a 15-day average accomplishes that goal. Because some companies engage in share buybacks,[88] the dividend yield may underestimate the yield on cash distributions to investors.

Q56: Please explain how input data can affect the DCF models.

A56: The Gordon Growth/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.

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. While

[87] See Blue Chip Economic Indicators, October 2020, p. 15.

[88] For example, in the electric utility sample Dominion Energy is engaged in a share buyback program; Dominion Energy, "Dominion Energy Provides Update on Closing of Gas Transmission, Storage Assets Sale and Status of Share Repurchases," Press Release, September 30, 2020.

there are companies in my sample that have engaged in share buybacks in the past, the magnitude is currently not large.

A second issue is that the flight to quality has resulted in higher than usual stock prices for electric and natural gas utilities and hence lower than usual dividend yields. As a result, the dividend yield may be downward biased. The multi-stage DCF model additionally requires a measure of the long-term GDP growth.

Q57: Please summarize the DCF-based cost of equity estimates for the proxy groups.

A57: The results of the DCF based estimation for the proxy groups are displayed below in Figure 16.

FIGURE 16: DCF MODEL RESULTS AT 50% EQUITY CAPITAL STRUCTURE

	Simple	Multi-stage
	[1]	[2]
Electric Sample	10.7%	9.3%
Gas Sample	13.3%	10.0%
Full Sample	11.4%	9.4%

Q58: How do you interpret the results of your DCF Analyses?

A58: The DCF model estimates presented in Figure 16 exhibit a wide range from 9.3% to 13.3%. As discussed above, there is unprecedented levels of volatility currently in the market. When market prices fall, dividend yields increase and reflect the increased cost of equity. However, the DCF model requires forecasted growth rates that are based on stable economic conditions to satisfy the constant dividend growth assumption. Growth rates may also be slower than dividend yields to reflect market uncertainty. Consequently, I give more weight to the results from the Multi-Stage DCF implementation although I recognize that the single-stage results

indicate that the multi-stage estimates may be below or towards the low end of what is reasonable. For the electric sample, the result is 9.3% with a reasonable range of 9.25% to 10.75%, where the lower end is below the range of the CAPM and ECAPM estimates. The result for the natural gas sample result is 10.0% - 13.25%, where the lower end is in line with the results obtained from the CAPM and ECAPM estimates. Based on these results, the single-stage results indicate that the multi-stage results are too low.

D. Risk Premium Model Estimates

Q59: Did you estimate the cost of equity that results from analysis of risk premiums implied by allowed ROEs in past utility rate cases?

A59: Yes. In this type of analysis, sometimes called the "risk premium model," the cost of equity capital for utilities is estimated based on the historical relationship between allowed ROEs in utility rate cases and the risk-free rate of interest at the time the ROEs were granted. These estimates add a "risk premium" implied by this relationship to the relevant (prevailing or forecast) risk-free interest rate:

$$Cost\ of\ Equity = r_f + Risk\ Premium \quad (5)$$

Q60: What are the merits of this approach?

A60: First, it estimates the cost of equity from regulated entities as opposed to holding companies, so that the relied-upon figure is directly applicable to a rate base. Second, the allowed returns are readily observable to market participants, who will use this one data input in making investment decisions, so that the information is at the very least a good check on whether the return is comparable to that of other investments. Third, I analyze the spread between the allowed ROE at a given time and the then-prevailing interest rate to so that I properly

consider the interest rate regime at the time the ROE was awarded. This implementation allows me to compare allowed ROE granted at different times and under different interest rate regimes.

Q61: How did you use rate case data to estimate the risk premiums for your analysis?

A61: The rate case data from 1990 through Q3 2020 is derived from Regulatory Research Associates.[89] Using this data I compared (statistically) the average allowed rate of return on equity granted by U.S. state regulatory agencies in electric utility rate cases to the average 20-year Treasury bond yield that prevailed in each quarter.[90] I calculated the allowed utility "risk premium" in each quarter as the difference between allowed returns and the Treasury bond yield, since this represents the compensation for risk allowed by regulators. Then I used the statistical technique of ordinary least squares ("OLS") regression to estimate the parameters of the linear equation:

$$Risk\ Premium\ =\ A_0\ +\ A_1\ \times\ (Treausury\ Bond\ Yield) \qquad (6)$$

I derived my estimates of A_0 and A_1 using standard statistical methods (OLS regression) and found that the regression has a high degree of explanatory power in a statistical sense. I report my results for the respective classifications of rate cases below in Figure 17. I note that the results displayed in Figure 17 below show that the risk premium model fits the data well as the R-squared is above 0.85 and R-squared is a measure of how well the data fits the model. An R-squared above 0.8 indicates a solid result.

[89] S&P Market Intelligence, as of October 2020.

[90] I rely on the 20-year government bond to be consistent with the analysis using the CAPM to avoid confusion about the risk-free rate. While it is important to use a long-term risk-free rate to match the long-lived nature of the assets, the exact maturity is a matter of choice.

FIGURE 17: IMPLIED RISK PREMIUM MODEL ESTIMATES: ELECTRIC UTILITIES

	R Squared	Estimate of Intercept (A0)	Estimate of Slope (A1)	
	[1]	[2]	[3]	[4]
Electric Utility	0.853	8.53%	-0.551	9.5%

Sources and Notes:
[1]-[3]: Estimated Using S&P Market Intelligence, as of September 2020
[4]: Risk-free rate of 2.15% (includes utility yield spread adjustment of 0.25%)

FIGURE 18: IMPLIED RISK PREMIUM MODEL ESTIMATES: NATURAL GAS UTILITIES

	R Squared	Estimate of Intercept (A0)	Estimate of Slope (A1)	
	[1]	[2]	[3]	[4]
Natural Gas Utility	0.874	8.51%	-0.564	9.4%

Sources and Notes:
[1]-[3]: Estimated Using S&P Market Intelligence, as of September 2020
[4]: Risk-free rate of 2.15% (includes utility yield spread adjustment of 0.25%)

Q62: What conclusions did you draw from your risk premium analysis?

A62: The results in Figure 17 and Figure 18 indicate a ROE of 9.5% for an average electric utility and a ROE of 9.4% for an average natural gas utility based on the risk premium model, which is consistent with the reasonable range of CAPM and DCF estimates. While the risk premium model is based on historical allowed returns and not underpinned by fundamental financial principles in the manner of the CAPM and DCF models, I believe that this analysis, when properly designed, executed, and placed in the proper context, is a valid and useful approach to estimating utility ROEs. Because the risk premium analysis as implemented takes into account the interest rate prevailing during the quarter the decision that granted an ROE used in the analysis was issued, it provides a useful benchmark for the cost of equity

in any interest environment. Because it relies on the returns for regulated utilities, I believe this method provides a good way to assess directly whether the ROE is commensurate with that available to alternative regulated investments of similar risk.

E. Summary of Results

Q63: Please summarize your results before considering where to place Orange and Rockland.

A63: Assuming a 50% equity capital structure for Orange and Rockland, I find the reasonable range of ROE results displayed in Figure 19. Next, I consider Orange and Rockland and New York specific risks to inform my recommendation of a reasonable ROE for Orange and Rockland.

FIGURE 19: SUMMARY OF REASONABLE RANGES AT 50% EQUITY

	Electric Sample	Gas Sample	Full Sample
CAPM/ ECAPM	9.5% - 10.0%	9.5% - 10.5%	9.5% - 10.0%
DCF*	9.25% - 10.75%	10.0% - 13.25%	9.5% - 11.5%
Risk Premium	9.5%	9.4%	N/A

Note: Full sample considers electric and natural gas proxy companies

6. ORANGE and ROCKLAND SPECIFIC CIRCUMSTANCES

A. Business Risk Characteristics

Q64: How does the regulatory environment in which Orange and Rockland operate compare to the other sample companies?

A64: The state of New York has undertaken a package of energy and utility policy reforms known as New York's Reforming the Energy Vision ("REV") programs. The stated goal of the these programs is

> promoting more efficient use of energy, deeper penetration of renewable energy resources such as wind and solar, wider deployment of "distributed" energy resources, such as micro grids, roof-top solar and other on-site power supplies, and storage …[91]

From an electric utility perspective, energy efficiency and distributed energy resources reduces the amount of power the utility distributes and most of the comparable companies operate in states without such comprehensive plans.[92] In addition, the New York REV programs reflect a new regulatory environment, so that its ultimate impact on the utilities is unknown and therefore results in higher business risk.

Second, Orange and Rockland's electric operations have the opportunity to earn incentive for Non-Wires Alternatives based on the net benefits of such programs. Based on periodic filings with the Commission, the Company can earn up to 30% (with customers earning 70%)

[91] *See*, http://www3.dps.ny.gov/W/PSCWeb.nsf/All/CC4F2EFA3A23551585257DEA007DCFE2?OpenDocument

[92] New York does have a decoupling mechanism in place. Source: SNL, "Adjustment Clauses: A State-by State Overview," September 28, 2018.

of the net benefits associated with pursuing non-wires alternative projects.[93] As these incentives are granted for replacing wires with alternatives and capital deployed for non-wire alternative projects can be added to rate base, there is no distinct impact on the cost of capital or the estimation hereof.

Third, Orange and Rockland is undertaking an aggressive cost mitigation program - the Business Cost Optimization ("BCO") Program - and has reflected projected savings from the BCO Program in its revenue requirements. I also understand Orange and Rockland has not proposed a reconciliation mechanism if the savings actually realized are less than the projected amounts. As a result, the Company bears additional business risk associated with not achieving the BCO Program related costs savings that it provides to customers. This business risk increases the difficulty the Company will face earning its allowed ROE going forward.

Q65: Please explain what impact the BCO program has on Orange and Rockland's business risk.

A65: Broadly speaking, the Company has in the past proposed a level of BCO savings that will be used in place of the traditional productivity savings. To the extent that such savings are aggressive, it puts Orange and Rockland at risk for under-earning their allowed ROE. Specifically, if all savings accrue to customers and all cost overruns accrue to Orange and Rockland, there is an asymmetric risk exposure from the BCO / productivity plan and the Company has higher risk of under-earning than overearning its allowed ROE.

[93] State of New York Public Service Commission, "Order Adopting Terms of Joint Proposal and Establishing Electric and Gas Rate Plans," Case Nos., 18-E-0067, 18-G-0068, 18-E-0414, 14-E-0493, 14-G-0494, March 14, 2019, p. 65.

Q66: How have recently proposed changes to regulatory oversight in New York impacted the credit risk of Orange and Rockland?

A66: On November 5, 2020, Governor Cuomo announced Program Bill Number 13, which aims to reform State law related to enforcement and oversight of New York State utilities.[94] The bill aims to codify utility performance standards, eliminate statutory penalty caps, and provide greater authority to the Commission to take enforcement actions, such as revoking a utility's operating license. The bill follows concerns raised by Governor Cuomo over the state utilities' response to Tropical Storm Isaias in August 2020 and recent gas utility service moratoriums in downstate New York. The proposal has since been introduced to the New York Assembly as Assembly Bill A11120.[95] Amid concerns of regulatory independence, Moody's issued a sector commentary report stating that the proposed bill is credit negative for New York utilities.[96]

On November 19, Governor Cuomo's office announced several downstate utilities, including Orange and Rockland, face potential penalties for their response to power outages in 2020.[97] Specifically, Orange and Rockland faces potential penalties of $19 million

[94] New York State, "No. 13: An Act to Reform the Enforcement, Oversight and Franchise Revocation Process for Public Utilities," https://www.governor.ny.gov/sites/governor.ny.gov/files/atoms/files/GPB13-AN_ACT_TO_REFORM_THE_ENFORCEMENT_OVERSIGHT_AND_FRANCHISE_REVOCATION_PROCESS_FOR_PUBLIC_UTILITIES-BILL.pdf

[95] New York State Senate, Assembly Bill A11120, https://www.nysenate.gov/legislation/bills/2019/A11120 https://www.nysenate.gov/legislation/bills/2019/A11120 https://www.nysenate.gov/legislation/bills/2019/A11120 https://www.nysenate.gov/legislation/bills/2019/A11120

[96] Moody's Investor Services, "Latest political intervention into regulatory oversight is credit negative for New York utilities," November 13, 2020.

[97] New York State, "Governor Cuomo Announces Completion of Tropical Storm Isaias Utility Investigation," *Press Release*, November 19, 2020, https://www3.dps.ny.gov/pscweb/WebFileRoom.nsf/ArticlesByCategory/DF794A561D630755852586250073398 7/$File/gov_cuomo_announces_completion_tropical_storm_isaias_utility_investigation_111920.pdf?OpenElement

associated with its response to Tropical Storm Isaias.[98] In addition, Orange and Rockland and its affiliate, Consolidated Edison Company of New York, Inc. ("CECONY"), were the two utilities identified in the Governor's press release that face potential operating license revocations. In response to the proposed changes to regulatory oversight and potential penalties announced by the Governor, S&P put Con Edison, Inc. and its subsidiaries on negative credit outlook.[99] To the extent that regulatory independence risks continue materialize, S&P notes that it could increase Con Edison, Inc.'s business risk assessment which would likely lead to a credit downgrade given the company's current FFO to debt of approximately 16%.[100]

Q67: How does these initiatives affect Orange and Rockland's business risks?

A67: Initiatives such as those outline above and the combination of a BCO savings program reduces on Orange and Rockland's probability of recovering all costs it incurs and hence pressures the Company's ability to earn the allowed ROE.

Q68: How have recent energy and climate policies impacted the business risk of Orange and Rockland's gas utility operations?

A68: New York State also recently passed the Climate Leadership and Community Protection Act ("CLCPA") which adopts aggressive targets related to greenhouse gas ("GHG") reduction and clean energy targets.[101] Specifically, the CLPCA requires the State to reach a 70%

[98] Ibid.

[99] S&P Global Ratings, "Consolidated Edison Inc. and Subs Outlooks Revised to Negative Amid Potential Political Headwinds; Rating Affirmed," November 24, 2020.

[100] Id., p. 2.

[101] New York State, "Governor Cuomo Executives the Nation's Largest Offshore Wind Agreement and Signs Historic Climate Leadership and Community Protection Act," July 18, 2019, https://www.governor.ny.gov/news/governor-cuomo-executes-nations-largest-offshore-wind-agreement-and-signs-historic-climate.

renewable energy target by 2030 and then a carbon-free electricity system by 2040. The CLPCA also mandates a reduction in GHG emissions by 85% below 1990 levels by 2050.[102]

For Orange and Rockland's natural gas operations, the emphasis on decreasing carbon emissions and transitioning to a carbon electricity system results in some uncertainty about Orange and Rockland's future gas demand. At the same time, there are substantial efforts to increase non-carbon heating through, for example, incentives for heat pumps installation, which will reduce the amount of gas (and/or oil) used for heating.[103]

At a more local level, some cities across the United States have shifted their policy to reducing reliance on natural gas entirely. For example, the City of Berkeley was the first city in the country to institute a ban on new natural gas service connections and instead require new buildings to install electric heating. Since then, 17 local governments have instituted similar bans and other cities, including those on the East Coast, are considering similar measures.[104] In Westchester and Long Island, moratoriums on new natural gas connections were implemented due to existing interstate pipeline constraints and the increasing difficulty of constructing new natural gas infrastructure.[105] [106]

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[102] Ibid.

[103] For example, Orange and Rockland offers residential customers rebates for installing heat pumps. https://www.oru.com/en/save-money/rebates-incentives-credits/rebates-incentives-tax-credits-for-residential-customers/clean-heating-cooling-with-heat-pumps.

[104] Tom DiChristopher, "'Banning' natural gas is out; electrifying builds in it," S&P Global Market Intelligence, July 8, 2020, https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/banning-natural-gas-is-out-electrifying-buildings-is-in-59285807

[105] Con Edison, "About the Westchester Natural gas Moratorium," accessed October 29, 2020, https://www.coned.com/en/save-money/convert-to-natural-gas/westchester-natural-gas-moratorium/about-the-westchester-natural-gas-moratorium.

[106] I note that National Grid reached an agreement with the State of New York to life the natural gas moratorium in Long Island, Brooklyn, and Queens for the next two years. National Grid, "National Grid to Lift Natural Gas Moratorium Immediately for Customers in Brooklyn, Queens, and Long Island," November 25 2019, https://www.nationalgridus.com/News/2019/11/-National-Grid-to-Lift-Natural-Gas-Moratorium-Immediately-for-Customers-in-Brooklyn,-Queens-and-Long-Island/.

The state and local government trends in regulation, the many paths in which decarbonization could move forward, and the uncertain customer adoption rates of new technologies all add business risk for the Company. These risks are not included in my current recommendation.

Q69: How do these regulatory mechanisms compare to those of the comparable companies?

A69: As noted above, REV-like programs are not common. Looking next to adjustment clauses, a study published by Regulatory Research Associates has found that New York State is neither at the top nor at the bottom regarding the use of adjustment mechanisms for new investments.[107] However, New York is among the few states that operate with a multi-year rate plan for both electric and gas utilities.[108] I also note that Orange and Rockland has a decoupling mechanism, as do more than half of the electric and natural gas proxy companies, although the specifics of each plan differ.[109] Because a decoupling mechanism is common, any impact on the ROE or the ability to earn the allowed ROE would be included in the proxy group data, so there is no impact on what the Company should be allowed. In addition, research has shown that statistically the presence of a decoupling mechanism has no impact on the cost of capital for electric or gas utilities.[110]

Q70: What is Orange and Rockland's size relative to the sample companies?

A70: The majority of the publicly traded electric and natural gas utilities in the U.S., as well as the companies I select for my full sample, are larger than Orange and Rockland. For

[107] Regulatory Research Associates, "Adjustment Clauses: A state-by-state overview," November 12, 2019.

[108] Mark A. Lowry, "Multi-year Rate Plans," NRRI, May 9, 2017.

[109] Regulatory Research Associates, "Adjustment Clauses: A state-by-state overview," November 12, 2019.

[110] *See*, for example, Joe Wharton and Michael J. Vilbert, "Decoupling and the Cost of Capital," The Electricity Journal vol. 28, 2015, pp. 19-28.

example, the average total assets of the electric and natural gas sample is $38.5 billion and $8.5 billion, respectively. That is about twelve times larger than Orange and Rockland's total assets of $3.0 billion.[111]

Q71: Why does the size of Orange and Rockland matter?

A71: Empirically, investors have required a higher premium to invest in smaller companies than in larger ones. For example, Duff & Phelps data indicate that Orange and Rockland's total assets puts it in the 7th decile, while the average electric and natural gas utilities in the sample falls in the 2nd and 4th size decile, respectively.[112] Companies in the 7th decile on average have a return on equity evidence suggests that investors in smaller companies require a higher return than do investors in larger companies. The majority of the sample companies are materially larger than Orange and Rockland. Empirical evidence suggests that investors in Orange and Rockland may require a premium over and above that required for larger companies. For example, recent reports from S&P and Fitch state that Orange and Rockland's small size increases its business risk, which would impact the Company's credit rating and financing costs if the Company had to raise capital on a standalone basis.[113] However, as the rating agencies note, Orange and Rockland benefits from its ownership by its larger parent, Con Edison, Inc., which could provide financial support to the Company, if needed. Therefore, Orange and Rockland will have an easier access to debt capital and plausibly at a lower rate than without the Con Edison, Inc. affiliation. However, on a

[111] Con Edison, Inc. 2019 Annual Report, p. 50.

[112] Duff & Phelps, CRSP Deciles Size Study and Risk Premium Report Study, U.S. Cost of Capital Navigator, 2020.

[113] S&P Global Ratings, "Orange and Rockland Utilities, Inc." March 3, 2020, p. 4; Fitch Ratings, "Orange and Rockland Utilities, Inc.," September 11, 2020, p. 2.

standalone basis Orange and Rockland requires a cost of equity higher than the average of that for the sample companies all else equal.[114]

Q72: How have the current market uncertainties impacted Orange and Rockland?

A72: New York State saw significant impacts from the COVID-19 pandemic earlier than many other states.[115] For example, in mid-March, the total infections in New York City, the area served by Con Edison Inc.'s other regulated utility, CECONY, accounted for approximately half of total daily U.S. infections.[116] On March 18, Governor Cuomo issued the PAUSE Executive Order, which closed all non-essential businesses and banned non-essential gatherings across the State to mitigate the impacts of the COVID-19 pandemic.[117] As a result, economic activity in the State declined steeply – New York State's real GDP declined by 36.3% from Q1 2020 to Q2 2020.[118] The unemployment rate for the State increased from 3.8% at the beginning of the year to as high as 15.6% in July.[119] In Orange and Rockland counties specifically, initial unemployment claims are 224% and 460% year-over-year as of

[114] S&P Ratings p. 2 notes Orange and Rockland's small size as a key risk factor.

[115] See testimony of Company witness Saegusa for additional discussion on current market conditions and impacts to Orange and Rockland.

[116] USA Facts, "US Coronavirus Cases and Deaths," accessed October 28, 2020, https://usafacts.org/visualizations/coronavirus-covid-19-spread-map.

[117] New York State, "Governor Cuomo Signs the 'New York State on PAUSE' Executive Order", March 20, 2020, https://www.governor.ny.gov/news/governor-cuomo-signs-new-york-state-pause-executive-order

[118] Bureau of Economic Analysis, "Gross Domestic Product by State, 2nd Quarter 2020," October 2, 2020, p. 4, accessed October 28, 2020, https://www.bea.gov/sites/default/files/2020-10/qgdpstate1020_0.pdf

[119] Bureau of Labor Statistics, "Local Area Unemployment Statistics, New York" Series ID LASST360000000000003, accessed October 28, 2020, https://data.bls.gov/timeseries/LASST360000000000003?amp%253bdata_tool=XGtable&output_view=data&include_graphs=true

October 17[120] and the unemployment rate currently stands at approximately 6.4% and 6.5%, respectively.[121]

To protect consumers as unemployment and economic hardships increased, many States implemented moratoriums on utility disconnects due to non-payment. In New York, the New York State Department of Public Service announced on March 13, 2020, that utilities were suspending disconnects.[122] Subsequently, New York State enacted legislation which put moratoriums in place until 180 days after the declared state of emergency has been lifted or expires.[123]

As with any outstanding amount, there is some risk to utilities that they will not be fully compensated for customer non-payments. As a result, utilities continue to serve all their customers, even if they are not collecting revenues from all their customers. These impacts will be felt more strongly for utilities with large commercial and industrial customer bases or utilities that serve areas hit hardest by layoffs. In 2019, Orange and Rockland's industrial and commercial comprised 15% of sales volumes and 17% of revenues.[124] From March 16 through September 30, Orange and Rockland's electric delivery volumes are up 9% for

[120] New York State Department of Labor, "Weekly UI Claims Report, Week Ending October 17, 2020," October 22, 2020, https://www.labor.ny.gov/stats/PDFs/Research-Notes-Initial-Claims-WE-10172020.pdf.

[121] New York State Department of Labor, "Rate of Unemployment By County of Residence New York State, September 2020," accessed October 28, 2020, https://www.labor.ny.gov/stats/PressReleases/county_rates.pdf.

[122] New York Department of Public Service, "Utilities to Suspend Disconnections for Households Facing Hardships during COVID-19 Outbreak," March 13, 2020, https://www3.dps.ny.gov/pscweb/WebFileRoom.nsf/ArticlesByCategory/3F74F913F5E331B28525852A006FB646/$File/pr20023.pdf?OpenElement

[123] New York State Assembly, S08113A, March 23, 2020, https://nyassembly.gov/leg/?default_fld=&leg_video=&bn=S08113&term=2019&Summary=Y&Actions=Y&Memo=Y&Text=Y.

[124] Con Edison Inc., 2019 Annual Report, p. 60. https://investor.conedison.com/static-files/3b97b264-e5de-4ac3-95a4-57b19a9e0109

residential customers, but down 10% for commercial customers. Similarly, revenues are up 7% for residential customers, but down 9% for commercial customers.[125] Orange and Rockland saw a $12 million increase in aged accounts receivable in the first nine months of the year.[126] I note that Orange and Rockland does have a revenue decoupling mechanism for both gas and electric in New York.[127] However, while decoupling mechanism may mitigate the impacts, utilities are still at heightened business risk given the broad economic impacts across all customer classes and structural limitations regarding decoupling mechanisms (*e.g.*, caps on cost recovery, limitations on sharing across customer classes, the rate of amortizing balances). On June 11, 2020, the Commission initiated a proceeding to address the impacts the COVID-19 pandemic has had on utilities in the State, including on utility financial strength, collection and termination of service, and impacts on rate-setting.[128] The outcome of that proceeding remains unknown.

Rating agencies have also noted the increased risk for utilities. On April 2, S&P lowered its outlook for North American utilities from "stable" to "negative" citing concerns about the financial cushions of utilities.[129] S&P also said they expect that a prolonged recession may cause utilities to reduce capital spending and potentially cut dividends. This could affect utilities ability to attract capital and would undoubtedly increase their business risk.

[125] Con Edison, 3 Quarter 2020 Earnings Release presentation, November 5, 2020, p. 17.

[126] Id., p. 14.

[127] Id. p. 19.

[128] New York State Public Service Commission, "Order Establishing Proceeding," Case 20-M-0266, June 11, 2020.

[129] S&P Global Market Intelligence ,"S&P lowers North American utilities outlook to negative on coronavirus risk," April 2, 2020, Accessed April 3, 2020, https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/s-p-lowers-north-american-utilities-outlook-to-negative-on-coronavirus-risk-57886477.

Q73: Can you please summarize your assessment of Orange and Rockland's business risk relative to the sample?

A73: Relative to the sample companies, Orange and Rockland is smaller and has multi-year rate plans. Similar to other utility companies, the Company has faced substantial impacts from the on-going COVID-19 pandemic due to customer non-payment and economic hardships within its service territory. With recent climate and energy policies in New York State, the Company is facing significant changes to its operations, such as the reduction of fossil fuel usage and decarbonization of the electric system. While the impact of carbon reduction on Orange and Rockland's risk profile could be substantial, I have not taken these aspects into account in my ROE recommendation. I simply note that these are factors that need to be monitored closely as the impact could be substantial in future years. My recommendation does not account for such risks. Consequently, from a business risk perspective, Orange and Rockland is at least as risky as the average sample company.

B. Flotation Costs

Q74: Are there any other Orange and Rockland specific considerations relevant to the determination of its allowed ROE?

A74: Yes. It is my understanding that the Company (through its parent company Con Edison, Inc.) has incurred flotation costs associated with equity issuances that have not been recovered in rates. These costs take the form of underwriting fees and discounts to the offer price. For example, if flotation costs represent approximately 2.5% of the proceeds raised by the issuances, only $97.50 out of every $100 raised in equity issuances would actually be available to finance Con Edison Inc.'s assets and operations. One method of recovery is to

include such costs as an expense in the revenue requirement and allow recovery in rates. Another method to recover these costs is via an adjustment to the return on equity going forward. It is my understanding from the Company that in its most recent rate case, CECONY was awarded a 10 basis point increase to the allowed return on equity for anticipated equity issuance flotation costs. Given the costs has not been recovered otherwise, a number of basis points, as calculated below, should be added to the requested ROE of 9.75%.

Q75: How should Orange and Rockland recover flotation costs?

A75: A standard approach to adjusting the allowed ROE to provide recovery of all past equity issuance costs can be implemented via a straightforward adjustment to the single-stage DCF model. In place of the standard single-stage DCF formula (equation 7), the following formula is used.

$$r = \frac{D_1}{P_0(1-f)} + g$$

where f is the percentage of proceeds lost to underwriting fees or other flotation costs. This formula recognizes that if shares trade at (for example) $100, but 2.5% of the proceeds of the initial issuance of those shares was consumed by flotation costs, only $\$100 \times (1 - 0.025) = \$97.5$ represents value invested in cash-flow generating assets. Therefore, it is relative to this "adjusted" price, not the nominal market price, that investors' required return should be measured.

Comparing the flotation cost-adjusted formula to the standard DCF formula for values of the dividend yield, growth rate, and financial leverage that are representative of the Electric

Proxy Group (see Figure 20 below), I find that 20 basis points is an appropriate ROE adjustment to allow recovery of costs amounting to 2.5% of equity issuance proceeds.

FIGURE 20: REPRESENTATIVE FLOTATION COST ADJUSTMENT CALCULATION

		Without Flotation Cost Adjustment	With Flotation Cost Adjustment
Flotation Cost Share of Issuance Proceeds	[a]		2.5%
Sample Average Dividend Yield	[b]	5.6%	5.8%
Growth Rate Estimate	[c]	5.1%	5.1%
Single Stage DCF Cost of Equity	[d]	10.8%	10.9%
Sample Average Equity to Market Value Ratio	[e]	57%	57%
Sample Average Debt to Market Value Ratio	[f]	42%	43%
Sample Average Implied Marginal Cost of Debt	[g]	3%	3%
Tax Rate of Orange & Rockland	[h]	26%	26%
Single Stage DCF Overall Cost of Capital	[i]	7.09%	7.19%
Orange&Rockland's Regulatory Equity Ratio %	[j]	50%	50%
Orange&Rockland's Regulatory Debt Ratio %	[k]	50%	50%
Orange&Rockland's Cost of Debt Estimate	[l]	2.7%	2.7%
Implied Cost of Equity	[m]	12.18%	12.37%

7. COST OF CAPITAL RECOMMENDATION

Q76: Please summarize your conclusion regarding Orange and Rockland's risk and the necessary return.

A76: I find that Orange and Rockland to have at least as high risk as the average sample company. I therefore recommend that Orange and Rockland be placed near the middle of the 9.5% to 10.25% range.

Q77: What do you recommend for Orange and Rockland's cost of equity in this proceeding?

A77: The CAPM/ ECAPM show a reasonable range of 9.5% to 10.0%, while the DCF model shows a reasonable range of 9.25% to 10.75% for the electric proxy group rounding to the nearest ¼ percent. This is supported by the broader range of 9.5% to 10.00% for the CAPM / ECAPM and 9.5% to 11.5% for the DCF results for the full sample. Consequently, I find the middle of the electric range: 9.5 – 10.0 percent to be the most reasonable range for Orange and Rockland. Because the average for the non-electric samples is higher and because Orange and Rockland is smaller than the electric proxy companies, I recommend a ROE of at least 9.75 percent on 50 percent equity. I also recommend that Orange and Rockland be allowed to recover flotation costs through an additional 20 basis point adjustment to its allowed ROE.

Q78: Does this conclude your Direct Testimony?

A78: Yes, it does.

Dr. Bente Villadsen's work concentrates in the areas of regulatory finance and accounting. Her recent work has focused on accounting issues, damages, cost of capital and regulatory finance. Dr. Villadsen has testified on cost of capital and accounting, analyzed credit issues in the utility industry, risk management practices as well the impact of regulatory initiatives such as energy efficiency and de-coupling on cost of capital and earnings. Among her recent advisory work is the review of regulatory practices regarding the return on equity, capital structure, recovery of costs and capital expenditures as well as the precedence for regulatory approval in mergers or acquisitions. Dr. Villadsen's accounting work has pertained to disclosure issues and principles including impairment testing, fair value accounting, leases, accounting for hybrid securities, accounting for equity investments, cash flow estimation as well as overhead allocation. Dr. Villadsen has estimated damages in the U.S. as well as internationally for companies in the construction, telecommunications, energy, cement, and rail road industry. She has filed testimony and testified in federal and state court, in international and U.S. arbitrations and before state and federal regulatory commissions on accounting issues, damages, discount rates and cost of capital for regulated entities.

Dr. Villadsen holds a Ph.D. from Yale University's School of Management with a concentration in accounting. She has a joint degree in mathematics and economics (BS and MS) from University of Aarhus in Denmark. Prior to joining The Brattle Group, Dr. Villadsen was a faculty member at Washington University in St. Louis, University of Michigan, and University of Iowa.

She has taught financial and managerial accounting as well as econometrics, quantitative methods, and economics of information to undergraduate or graduate students. Dr. Villadsen serves as the president of the Society of Utility Regulatory Financial Analysts for 2016-2018.

AREAS OF EXPERTISE

- Regulatory Finance
  - Cost of Capital
  - Cost of Service (including prudence)
  - Energy Efficiency, De-coupling and the Impact on Utilities Financials
  - Relationship between regulation and credit worthiness
  - Risk Management
  - Regulatory Advisory in Mergers & Acquisitions
- Accounting and Corporate Finance
  - Application of Accounting Standards
  - Disclosure Issues
  - Forensics
  - Credit Issues in the Utility Industry
- Damages and Valuation (incl. international arbitration)

- Utility valuation
- Lost Profit for construction, oil&gas, utilities
- Valuation of construction contract
- Damages from the choice of inaccurate accounting methdology

EXPERIENCE

Regulatory Finance

- Dr. Villadsen has testified on cost of capital and capital structure for many regulated entities including electric and gas utilities, pipelines, railroads, water utilities and barges in many jurisdictions including at the FERC, the Surface Transportation Board, the states of Alaska, Arizona, California, Hawaii, Illinois, Michigan, New Mexico, New York, Oregon, and Washington as well as in the provinces of Alberta and Ontario.
- On behalf of the Association of American Railroads, Dr. Villadsen appeared as an expert before the Surface Transportation Board (STB) and submitted expert reports on the determination of the cost of equity for U.S. freight railroads. The STB agreed to continue to use two estimation methods with the parameters suggested.
- For several electric, gas and transmission utilities as well as pipelines in Alberta, Canada, Dr. Villadsen filed evidence and appeared as an expert on the cost of equity and appropriate capital structure for 2015-17. Her evidence was heard by the Alberta Utilities Commission.
- Dr. Villadsen has estimated the cost of capital and recommended an appropriate capital structure for natural gas and liquids pipelines in Canada, Mexico, and the US. using the jurisdictions' preferred estimation technique as well as other standard techniques. This work has been used in negotiations with shippers as well as before regulators.
- For the Ontario Energy Board Staff, Dr. Villadsen submitted evidence on the appropriate capital structure for a power generator that is engaged in a nuclear refurbishment program.
- She has estimated the cost of equity on behalf of Anchorage Municipal Light and Power, Arizona Public Service, Portland General Electric, Anchorage Water and Wastewater, American Water, California Water, and EPCOR in state regulatory proceedings. She has also submitted testimony before the Bonneville Power Authority. Much of her testimony involves not only cost of capital estimation but also capital structure, the impact on credit metrics and various regulatory mechanisms such as revenue stabilization, riders and trackers.
- In Australia, she has submitted led and co-authored a report on cost of equity and debt estimation methods for the Australian Pipeline Industry Association. The equity report was

filed with the Australian Energy Regulator as part of the APIA's response to the Australian Energy Regulator's development of rate of return guidelines and both reports were filed with the Economic Regulation Authority by the Dampier Bunbury Pipeline. She has also submitted a report on aspects of the WACC calculation for Aurizon Network to the Queensland Competition Authority.

- In Canada, Dr. Villadsen has co-authored reports for the British Columbia Utilities Commission and the Canadian Transportation Agency regarding cost of capital methodologies. Her work consisted partly of summarizing and evaluating the pros and cons of methods and partly of surveying Canadian and world-wide practices regarding cost of capital estimation.
- Dr. Villadsen worked with utilities to estimate the magnitude of the financial risk inherent in long-term gas contracts. In doing so, she relied on the rating agency of Standard & Poor's published methodology for determining the risk when measuring credit ratios.
- She has worked on behalf of infrastructure funds, pension funds, utilities and others on understanding and evaluating the regulatory environment in which electric, natural gas, or water utilities operate for the purpose of enhancing investors ability to understand potential investments. She has also provided advise and testimony in the approval phase of acquisitions.
- On behalf of utilities that are providers of last resort, she has provided estimates of the proper compensation for providing the state-mandated services to wholesale generators.
- In connection with the AWC Companies application to construct a backbone electric transmission project off the Mid-Atlantic Coast, Dr. Villadsen submitted testimony before the Federal Energy Regulatory Commission on the treatment the accounting and regulatory treatment of regulatory assets, pre-construction costs, construction work in progress, and capitalization issues.
- On behalf of ITC Holdings, she filed testimony with the Federal Energy Regulatory Commission regarding capital structure issues.
- For a FERC-regulated entity, Dr. Villadsen undertook an assessment of the company's classification of specific long-term commitments, leases, regulatory assets, asset retirement obligations, and contributions / distributions to owners in the company's FERC Form 1.
- Testimony on the impact of transaction specific changes to pension plans and other rate base issues on behalf of Balfour Beatty Infrastructure Partners before the Michigan Public Service Commission.

- On behalf of financial institutions, Dr. Villadsen has led several teams that provided regulatory guidance regarding state, provincial or federal regulatory issues for integrated electric utilities, transmission assets and generation facilities. The work was requested in connection with the institutions evaluation of potential investments.
- For a natural gas utility facing concerns over mark to market losses on long term gas hedges, Dr. Villadsen helped develop a program for basing a portion of hedge targets on trends in market volatility rather than on just price movements and volume goals. The approach was refined and approved in a series of workshops involving the utility, the state regulatory staff, and active intervener groups. These workshops evolved into a forum for quarterly updates on market trends and hedging positions.
- She has advised the private equity arm of three large financial institutions as well as two infrastructure companies, a sovereign fund and pension fund in connection with their acquisition of regulated transmission, distribution or integrated electric assets in the U.S. and Canada. For these clients, Dr. Villadsen evaluated the regulatory climate and the treatment of acquisition specific changes affecting the regulated entity, capital expenditures, specific cost items and the impact of regulatory initiatives such as the FERC's incentive return or specific states' approaches to the recovery of capital expenditures riders and trackers. She has also reviewed the assumptions or worked directly with the acquirer's financial model.
- On behalf of a provider of electric power to a larger industrial company, Dr. Villadsen assisted in the evaluation of the credit terms and regulatory provisions for the long-term power contract.
- For several large electric utility, Dr. Villadsen reviewed the hedging strategies for electricity and gas and modeled the risk mitigation of hedges entered into. She also studies the prevalence and merits of using swaps to hedge gas costs. This work was used in connection with prudence reviews of hedging costs in Colorado, Oregon, Utah, West Virginia, and Wyoming.
- She estimated the cost of capital for major U.S. and Canadian utilities, pipelines, and railroads. The work has been used in connection with the companies' rate hearings before the Federal Energy Regulatory Commission, the Canadian National Energy Board, the Surface Transportation Board, and state and provincial regulatory bodies. The work has been performed for pipelines, integrated electric utilities, non-integrated electric utilities, gas distribution companies, water utilities, railroads and other parties. For the owner of Heathrow and Gatwick Airport facilities, she has assisted in estimating the cost of capital of U.K. based airports. The resulting report was filed with the U.K. Competition Commission.
- For a Canadian pipeline, Dr. Villadsen co-authored an expert report regarding the cost of equity capital and the magnitude of asset retirement obligations. This work was used in arbitration between the pipeline owner and its shippers.

- In a matter pertaining to regulatory cost allocation, Dr. Villadsen assisted counsel in collecting necessary internal documents, reviewing internal accounting records and using this information to assess the reasonableness of the cost allocation.
- She has been engaged to estimate the cost of capital or appropriate discount rate to apply to segments of operations such as the power production segment for utilities.
- In connection with rate hearings for electric utilities, Dr. Villadsen has estimated the impact of power purchase agreements on the company's credit ratings and calculated appropriate compensation for utilities that sign such agreements to fulfill, for example, renewable energy requirements.
- Dr. Villadsen has been part of a team assessing the impact of conservation initiatives, energy efficiency, and decoupling of volumes and revenues on electric utilities financial performance. Specifically, she has estimated the impact of specific regulatory proposals on the affected utilities earnings and cash flow.
- On behalf of Progress Energy, she evaluated the impact of a depreciation proposal on an electric utility's financial metric and also investigated the accounting and regulatory precedent for the proposal.
- For a large integrated utility in the U.S., Dr. Villadsen has for several years participated in a large range of issues regarding the company's rate filing, including the company's cost of capital, incentive based rates, fuel adjustment clauses, and regulatory accounting issues pertaining to depreciation, pensions, and compensation.
- Dr. Villadsen has been involved in several projects evaluating the impact of credit ratings on electric utilities. She was part of a team evaluating the impact of accounting fraud on an energy company's credit rating and assessing the company's credit rating but-for the accounting fraud.
- For a large electric utility, Dr. Villadsen modeled cash flows and analyzed its financing decisions to determine the degree to which the company was in financial distress as a consequence of long-term energy contracts.
- For a large electric utility without generation assets, Dr. Villadsen assisted in the assessment of the risk added from offering its customers a price protection plan and being the provider of last resort (POLR).
- For several infrastructure companies, Dr. Villadsen has provided advice regarding the regulatory issues such as the allowed return on equity, capital structure, the determination of

rate base and revenue requirement, the recovery of pension, capital expenditure, fuel, and other costs as well as the ability to earn the allowed return on equity. Her work has spanned 12 U.S. states as well as Canada, Europe, and South America. She has been involved in the electric, natural gas, water, and toll road industry.

Accounting and Corporate Finance

- For an electric utility subject to international arbitration, Dr. Villadsen submitted expert testimony on the application of IFRS as it pertains to receivables, the classification of liabilities and contingencies.
- In international arbitration, she submitted an expert report on IFRS' requirements regarding carve out financials, impairment, the allocation of costs to segments, and disclosure issues.
- On behalf of a construction company in arbitration with a sovereign, Dr. Villadsen filed an expert report report quantifying damages in the form of lost profit and consequential damages.
- In arbitration before the International Chamber of Commerce Dr. Villadsen testified regarding the true-up clauses in a sales and purchase agreement, she testified on the distinction between accruals and cash flow measures as well as on the measurement of specific expenses and cash flows.
- On behalf of a taxpayer, Dr. Villadsen recently testified in federal court on the impact of discount rates on the economic value of alternative scenarios in a lease transaction.
- On behalf of a taxpayer, Dr. Villaden has provided an expert report on the nature of the cost of equity used in regulatory proceedings as well as the interest rate regine in 2014.
- In an arbitration matter before the International Centre for Settlement of Investment Disputes, she provided expert reports and oral testimony on the allocation of corporate overhead costs and damages in the form of lost profit. Dr. Villadsen also reviewed internal book keeping records to assess how various inter-company transactions were handled.
- Dr. Villadsen provided expert reports and testimony in an international arbitration under the International Chamber of Commerce on the proper application of US GAAP in determining shareholders' equity. Among other accounting issues, she testified on impairment of long-lived assets, lease accounting, the equity method of accounting, and the measurement of investing activities.

- In a proceeding before the International Chamber of Commerce, she provided expert testimony on the interpretation of certain accounting terms related to the distinction of accruals and cash flow.
- In an arbitration before the American Arbitration Association, she provided expert reports on the equity method of accounting, the classification of debt versus equity and the distinction between categories of liabilities in a contract dispute between two major oil companies. For the purpose of determining whether the classification was appropriate, Dr. Villadsen had to review the company's internal book keeping records.
- In U.S. District Court, Dr. Villadsen filed testimony regarding the information required to determine accounting income losses associated with a breach of contract and cash flow modeling.
- Dr. Villadsen recently assisted counsel in a litigation matter regarding the determination of fair values of financial assets, where there was a limited market for comparable assets. She researched how the designation of these assets to levels under the FASB guidelines affect the value investors assign to these assets.
- She has worked extensively on litigation matters involving the proper application of mark-to-market and derivative accounting in the energy industry. The work relates to the proper valuation of energy contracts, the application of accounting principles, and disclosure requirements regarding derivatives.
- Dr. Villadsen evaluated the accounting practices of a mortgage lender and the mortgage industry to assess the information available to the market and ESOP plan administrators prior to the company's filing for bankruptcy. A large part of the work consisted of comparing the company's and the industry's implementation of gain-of-sale accounting.
- In a confidential retention matter, Dr. Villadsen assisted attorneys for the FDIC evaluate the books for a financial investment institution that had acquired substantial Mortgage Backed Securities. The dispute evolved around the degree to which the financial institution had impaired the assets due to possible put backs and the magnitude and estimation of the financial institution's contingencies at the time of it acquired the securities.
- In connection with a securities litigation matter she provided expert consulting support and litigation consulting on forensic accounting. Specifically, she reviewed internal documents, financial disclosure and audit workpapers to determine (1) how the balance's sheets trading assets had been valued, (2) whether the valuation was following GAAP, (3) was properly

documented, (4) was recorded consistently internally and externally, and (5) whether the auditor had looked at and documented the valuation was in accordance with GAAP.

- In a securities fraud matter, Dr. Villadsen evaluated a company's revenue recognition methods and other accounting issues related to allegations of improper treatment of non-cash trades and round trip trades.
- For a multi-national corporation with divisions in several countries and industries, Dr. Villadsen estimated the appropriate discount rate to value the divisions. She also assisted the company in determining the proper manner in which to allocate capital to the various divisions, when the company faced capital constraints.
- Dr. Villadsen evaluated the performance of segments of regulated entities. She also reviewed and evaluated the methods used for overhead allocation.
- She has worked on accounting issues in connection with several tax matters. The focus of her work has been the application of accounting principles to evaluate intra-company transactions, the accounting treatment of security sales, and the classification of debt and equity instruments.
- For a large integrated oil company, Dr. Villadsen estimated the company's cost of capital and assisted in the analysis of the company's accounting and market performance.
- In connection with a bankruptcy proceeding, Dr. Villadsen provided litigation support for attorneys and an expert regarding corporate governance.

Damages and Valuation

- For the Alaska Industrial Development and Export Authority, Dr. Villadsen co-authored a report that estimated the range of recent acquisition and trading multiples for natural gas utilities.
- On behalf of a taxpayer, Dr. Villadsen testified on the economic value of alternative scenarios in a lease transaction regarding infrastructure assets.
- For a foreign construction company involved in an international arbitration, she estimated the damages in the form of lost profit on the breach of a contract between a sovereign state and a construction company. As part of her analysis, Dr. Villadsen relied on statistical analyses of cost structures and assessed the impact of delays.

- In an international arbitration, Dr. Villadsen estimated the damages to a telecommunication equipment company from misrepresentation regarding the product quality and accounting performance of an acquired company. She also evaluated the IPO market during the period to assess the possibility of the merged company to undertake a successful IPO.

- On behalf of pension plan participants, Dr. Villadsen used an event study estimated the stock price drop of a company that had engaged in accounting fraud. Her testimony conducted an event study to assess the impact of news regarding the accounting misstatements.

- In connection with a FINRA arbitration matter, Dr. Villadsen estimated the value of a portfolio of warrants and options in the energy sector and provided support to counsel on finance and accounting issues.

- She assisted in the estimation of net worth of individual segments for firms in the consumer product industry. Further, she built a model to analyze the segment's vulnerability to additional fixed costs and its risk of bankruptcy.

- Dr. Villadsen was part of a team estimating the damages that may have been caused by a flawed assumption in the determination of the fair value of mortgage related instruments. She provided litigation support to the testifying expert and attorneys.

- For an electric utility, Dr. Villadsen estimated the loss in firm value from the breach of a power purchase contract during the height of the Western electric power crisis. As part of the assignment, Dr. Villadsen evaluated the creditworthiness of the utility before and after the breach of contract.

- Dr. Villadsen modeled the cash flows of several companies with and without specific power contract to estimate the impact on cash flow and ultimately the creditworthiness and value of the utilities in question.

BOOKS

"*Risk and Return for Regulated Industries,*" (with Michael J. Vilbert, Dan Harris, and A. Lawrence Kolbe) Elsevier, May 2017.

PUBLICATIONS AND REPORTS

"A Review of International Approaches to Regulated Rates of Return," (with J. Anthony, T. Brown, L. Figurelli, D. Harris, and N. Nguyen) published by the *Australian Energy Regulator*, September 2020.

"Global Impacts and Implications of COVID-19 on Utility Finance," (with R. Mudge, F. Graves, J. Figueroa, T. Counts, L. Mwalenga, and S. Pant), *The Brattle Group*, July 2020.

"Impact of New Tax Law on Utilities' Deferred Taxes," (with Mike Tolleth and Elliott Metzler), *CRRI 37'th Annual Eastern Conference*, June, 2018.

"Implications of the New Tax Law for Regulated Utilities," The Brattle Group, January 2018.

"Using Electric and Gas Forwards to Manage Market Risks: When a power purchase agreement with a utility is not possible, standard forward contracts can act as viable hedging instruments*," North American Windpower*, May 2017, pp. 34-37.

"*Managing Price Risk for Merchant Renewable Investments: Role of Market Interactions and Dynamics on Effective Hedging Strategies*," (with Onur Aydin and Frank Graves), Brattle Whitepaper, January 2017.

"Aurizon Network 2016 Access Undertaking: Aspects of the WACC," (with Mike Tolleth), filed with the *Queensland Competition Authority*, Australia, November 2016.

"Report on Gas LDC multiples," with Michael J. Vilbert, *Alaska Industrial Development and Export Authority*, May 2015.

"Aurizon Network 2014 Draft Access Undertaking: Comments on Aspects of the WACC," prepared for Aurizon Network and submitted to the *Queensland Competition Authority*, December 2014

"Brattle Review of AE Planning Methods and Austin Task Force Report." (with Frank C. Graves) September 24, 2014.

Report on "Cost of Capital for Telecom Italia's Regulated Business" with Stewart C. Myers and Francesco Lo Passo before the *Communications Regulatory Authority of Italy* ("AGCOM"), March 2014. *Submitted in Italian.*

"Alternative Regulation and Ratemaking Approaches for Water Companies: Supporting the Capital Investment Needs of the 21st Century," (with J. Wharton and H. Bishop), prepared for the *National Association of Water Companies*, October 2013.

"Estimating the Cost of Debt," (with T. Brown), prepared for the Dampier Bunbury Pipeline and filed with the *Economic Regulation Authority*, Western Australia, March 2013.

"Estimating the Cost of Equity for Regulated Companies," (with P.R. Carpenter, M.J. Vilbert, T. Brown, and P. Kumar), prepared for the Australian Pipeline Industry Association and filed with the *Australian Energy Regulator* and the *Economic Regulation Authority*, Western Australia, February 2013.

"Calculating the Equity Risk Premium and the Risk Free Rate," (with Dan Harris and Francesco LoPasso), prepared for *NMa and Opta, the Netherlands*, November 2012.

"Shale Gas and Pipeline Risk: Earnings Erosion in a More Competitive World," (with Paul R. Carpenter, A. Lawrence Kolbe, and Steven H. Levine), *Public Utilities Fortnightly*, April 2012.

"Survey of Cost of Capital Practices in Canada," (with Michael J. Vilbert and Toby Brown), prepared for *British Columbia Utilities Commission*, May 2012.

"Public Sector Discount Rates" (with rank Graves, Bin Zhou), *Brattle* white paper, September 2011

"FASB Accounting Rules and Implications for Natural Gas Purchase Agreements," (with Fiona Wang), *American Clean Skies Foundation*, February 2011.

"IFRS and You: How the New Standards Affect Utility Balance Sheets," (with Amit Koshal and Wyatt Toolson), *Public Utilities Fortnightly*, December 2010.

"Corporate Pension Plans: New Developments and Litigation," (with George Oldfield and Urvashi Malhotra), Finance Newsletter, Issue 01, *The Brattle Group*, November 2010.

"Review of Regulatory Cost of Capital Methodologies," (with Michael J. Vilbert and Matthew Aharonian), *Canadian Transportation Agency*, September 2010.

"Building Sustainable Efficiency Businesses: Evaluating Business Models," (with Joe Wharton and Peter Fox-Penner), *Edison Electric Institute*, August 2008.

"Understanding Debt Imputation Issues," (with Michael J. Vilbert and Joe Wharton and *The Brattle Group* listed as an author), *Edison Electric Institute*, June 2008.

"Measuring Return on Equity Correctly: Why current estimation models set allowed ROE too low," *Public Utilities Fortnightly*, August 2005 (with A. Lawrence Kolbe and Michael J. Vilbert).

"The Effect of Debt on the Cost of Equity in a Regulatory Setting," (with A. Lawrence Kolbe and Michael J. Vilbert, and with "*The Brattle Group*" listed as author), *Edison Electric Institute,* April 2005.

"Communication and Delegation in Collusive Agencies," *Journal of Accounting and Economics*, Vol. 19, 1995.

"Beta Distributed Market Shares in a Spatial Model with an Application to the Market for Audit Services" (with M. Hviid), *Review of Industrial Organization*, Vol. 10, 1995.

SELECTED PRESENTATIONS

"FERC's new ROE methodology for pipelines and electric transmission," (with Michael J. Vilbert) *UBS Fireside Chat*, June 24, 2020.

"Managing Price Risk for Merchant Renewable Investments," (with Onur Aydin) *EIA Electricity Pricing Workgroup* (webinar), April 30, 2019.

"Decoupling and its Impact on Cost of Capital" presented to *SURFA Members and Friends*, February 27, 2019.

"Current Issues in Cost of Capital" presented to *EEI Members*, July, 2018-19.

"Introduction to Capital Structure & Liability Management", *the American Gas Association/Edison Electric Institute "Introduction and Advanced Public Utility Accounting Courses",* August 2018-2019.

"Lessons from the U.S. and Australia" presented at *Seminar on the Cost of Capital in Regulated Industries: Time for a Fresh Perspective?* Brussels, October 2017.

"Should Regulated Utilities Hedge Fuel Cost and if so, How?" presented at *SURFA's 49 Financial Forum*, April 20-21, 2017.

"Transmission: The Interplay Between FERC Rate Setting at the Wholesale Level and Allocation to Retail Customers," (with Mariko Geronimo Aydin) presented at *Law Seminars International: Electric Utility Rate Cases*, March 16-17, 2017.

"Capital Structure and Liability Management," *American Gas Association and Edison Electric Institute Public Utility Accounting Course*, August 2015-2017.

"Current Issues in Cost of Capital," *Edison Electric Institute Advanced Rate School*, July 2013-2017.

"Alternative Regulation and Rate Making Approaches for Water Companies," *Society of Depreciation Professionals Annual Conference*, September 2014.

"Capital Investments and Alternative Regulation," *National Association of Water Companies Annual Policy Forum*, December 2013.

"Accounting for Power Plant," *SNL's Inside Utility Accounting Seminar*, Charlotte, NC, October 2012.

"GAAP / IFRS Convergence," *SNL's Inside Utility Accounting Seminar*, Charlotte, NC, October 2012.

"International Innovations in Rate of Return Determination," *Society of Utility Financial and Regulatory Analysts' Financial Forum*, April 2012.

"Utility Accounting and Financial Analysis: The Impact of Regulatory Initiatives on Accounting and Credit Metrics," 1.5 day seminar, EUCI, Atlanta, May 2012.

"Cost of Capital Working Group Eforum," *Edison Electric Institute webinar*, April 2012.

"Issues Facing the Global Water Utility Industry" Presented to Sensus' Executive Retreat, Raleigh, NC, July 2010.

"Regulatory Issues from GAAP to IFRS," NASUCA *2009 Annual Meeting*, Chicago, November 2009.

"Subprime Mortgage-Related Litigation: What to Look for and Where to Look," *Law Seminars International: Damages in Securities Litigation*, Boston, May 2008.

"Evaluating Alternative Business / Inventive Models," (with Joe Wharton). *EEI Workshop, Making a Business of Energy Efficiency: Sustainable Business Models for Utilities*, Washington DC, December 2007.

"Deferred Income Taxes and IRS's NOPR: Who should benefit?" *NASUCA Annual Meeting*, Anaheim, CA, November 2007.

"Discussion of 'Are Performance Measures Other Than Price Important to CEO Incentives?'" *Annual Meeting of the American Accounting Association*, 2000.

"Contracting and Income Smoothing in an Infinite Agency Model: A Computational Approach," (with R.T. Boylan) *Business and Management Assurance Services Conference*, Austin 2000.

TESTIMONY

Written Evidence in Review and Variance of Decision 22570-D01-2018 Stage 2 (AltaGas' capital structure) (joint with Paul R. Carpenter) on behalf of AltaGas Utilities Inc. Filed with the *Alberta Utilities Commission*, Proceeding 25031, January 2010.

Written Evidence on Cost of Equity and Capital Structure on behalf of ATCO, AltaGas and FortisAlberta in 2021-2022 Generic Cost of Capital Proceeding. Filed with the *Alberta Utilities Commission*, Proceeding No. 24110, January 2020.

Report on the Return Margin for the Alberta Bottle Depots on behalf of the Alberta Beverage Container Recycling Corporation, February 2020.

Verified Statement and Reply Verified Statement regarding Revisions to the Board's Methodology for Determining the Railroad Industry's Cost of Capital on behalf of the American Association of Railroads before the *Surface Transportation Board*, Docket No. EP 664 (Sub-No. 4), January, February 2020.

Affidavit regarding the creation of a regulatory asset for earthquake related costs on behalf of Anchorage Water and Wastewater submitted to the *Regulatory Commission of Alaska*, December 2019.

Expert Report and Hearing Appearance on Going Concern and Impairment, American Arbitration Association: International Engineering & Construction S.A., Greenville Oil & Gas Co. Ltd and GE Oil & Gas, Inc., November, December 2019.

Direct Testimony and Rebuttal Testimony on the cost of equity on behalf of DTE Gas submitted to the *Michigan Public Service Commission*, Docket No. U-20642, November 2019.

Expert Report on IFRS Issues and Forensics. *SIAC Arbitration* No. 44 of 2018, October 2019.

Expert Report, Reply Report and Hearing Appearance on IFRS issues. *ICC Arbitration* No. 23896/GSS, September 2019, September and November 2020.

Direct Testimony on the cost of debt and equity capital as well as capital structure on behalf of Young Brothers, LLC. submitted to the *Public Utilities Commission of the State of Hawaii,* Docket No. 2019-0117, September 2019.

Expert Report on discount rates in property tax matter for Union Pacific Company in *Union Pacific Railroad Co. v. Utah State Tax Comm'n, et. al.,* Case No. 2:18-cv-00630-DAK-DBP, Utah August 2019.

Answering Testimony on the Cost of Equity on behalf of Northern Natural Gas Company submitted to the *Federal Energy Regulatory Commission,* Docket No. RP19-59-000, August 2019.

Direct Testimony, Rebuttal Testimony, and Hearing Appearance on Cost of Equity on behalf of DTE Electric Company submitted to the *Michigan Public Service Commission,* Docket No. U-20561, July, November, December 2019.

Prepared Direct Testimony on Cost of Capital for Northern Natural Gas Company submitted to the Federal Energy Regulatory Commission, Docket No. RP19-1353-000, July 2019.

Prepared Direct Testimony on Cost of Capital and Term Differentiated Rates for Paiute Pipeline Company submitted to the Federal Energy Regulatory Commission, Docket No. RP19-1291-000, May 2019.

Expert report, deposition, and oral trial testimony on behalf of PacifiCorp in the Matter of *PacifiCorp, Inc. v. Utah State Tax Comm'n,* Case No. 180903986 TX, Utah District Court April, May, September 2019.

Direct Testimony, Rebuttal Testimony, and hearing appearance on the cost of capital for Southern California Edison submitted to the *California Public Utilities Commission,* Docket No. A.19-04-014, April 2019, August 2019.

Prepared Direct Testimony on the cost of equity for Southern California Edison's transmission assets submitted to the *Federal Energy Regulatory Commission,* Docket No. ER19-1553, April 2019.

Direct and Rebuttal Testimony on cost of equity for Consolidated Edison of New York submitted to the *New York Public Service Commission*, Matter No. 19-00317, January, June 2019.

Direct Testimony on cost of capital and capital structure for Northwest Natural Gas Company submitted to the *Washington Utilities and Transportation Commission,* Docket No. 181053, December 2018.

Pre-filed Direct Testimony and Reply Testimony on cost of capital and capital structure for Anchorage Water Utility and Anchorage Wastewater Utility submitted to the *Regulatory Commission of Alaska*, TA163-122 and TA164-126, December 2018, October 2019.

Direct Testimony on cost of capital for Portland General Electric Company submitted to the *Oregon Public Utility Commission* on behalf of Portland General Electric Company (with Hager and Liddle), UE 335, February 2018.

Direct Testimony and Rebuttal Testimony on cost of capital for NW Natural submitted to the *Oregon Public Utility Commission* on behalf of NW Natural, UG 344, December 2017, May 2018.

Direct Pre-filed Testimony and Reply Pre-filed Testimony on cost of equity and capital structure for Anchorage Water and Wastewater Utilities before the *Regulatory Commission of Alaska*, TA161-122 and TA162-126, November 2017, September 2018.

Direct Testimony, Rebuttal Testimony, deposition, and hearing appearance on wholesale water rates for Petitioner Cities, *Texas Public Utility Commission*, PUC Docket 46662, SOAH Docket 473-17-4964.WS, November 2017, January, June, July, October 2018.

Affidavit on Lifting the Dividend Restriction for Anchorage Water Utility for AWWU, *Regulatory Commission of Alaska*, U-17-095, November 2017.

Written Evidence, Rebuttal Evidence and Hearing appearance on the Cost of Capital and Capital Structure for the ATCO Utilities and AUI, 2018-2020 Generic Cost of Capital Proceeding, *Alberta Utilities Commission*, October 2017, February – March 2018.

Written Evidence, Rebuttal Evidence, and Hearing Appearance on Regulatory Tax Treatment for the ATCO Utilities and AUI, 201802020 Generic Cost of Capital Proceeding, *Alberta Utilities Commission*, October 2017, February – March 2018.

Affidavit on the Creation of a Regulatory Assets for PRV Rebates for Anchorage Water Utility, submitted to the *Regulatory Commission of Alaska*, U-17-083, August 2017.

Direct and Rebuttal Testimony, Hearing Appearance on Cost of Capital for California-American Water Company for California-American Water submitted to the *California Public Utilities Commission*, Application 17-04-003, April, August, September 2017.

Direct, Rebuttal, Surrebuttal, Supplemental, Supplemental Rebuttal Testimony and Hearing Appearance on the Cost of Capital for Northern Illinois Gas Company submitted to the *Illinois Commerce Commission*, GRM #17-055, March, July, August, September, and November 2017.

Direct and Rebuttal Testimony on Cost of Capital for Portland General Electric Company submitted to the *Oregon Public Utility Commission* on behalf of Portland General Electric Company, Docket No. UE 319, February, July 2017.

Pre-filed Direct and Reply Testimony and Hearing Appearance on Cost of Equity and Capital Structure for Anchorage Municipal Light and Power, *Regulatory Commission of Alaska*, Docket No. TA357-121, December 2016, August and December 2017.

Expert report and Hearing Appearance regarding the Common Equity Ratio for OPG's Regulated Generation for OEB Staff, *Ontario Energy Board*, EB-2016-0152, November 2016, April 2017.

Pre-filed Direct Testimony on Cost of Equity and Capital Structure for Anchorage Municipal Wastewater Utility, *Regulatory Commission of Alaska*, Docket No. 158-126, November 2016.

Expert Report, Reply Expert Report and Hearing on damages (quantum) in exit arbitration (with Dan Harris), *International Center for the Settlement of Investment Disputes*, October 2016, October 2018, July 2019.

Direct Testimony on capital structure, embedded cost of debt, and income taxes for Detroit Thermal, Michigan Public Service Commission, Docket No. UE-18131, July 2016.

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Expert Report, Rebuttal Expert Report, and Hearing Appearance regarding investing activities, impairment of assets, leases, shareholder' equity under U.S. GAAP and valuation. *International Chamber of Commerce* (ICC), Case No. 14144/CCO, May 2007, August 2007, September 2007. (Joint with Carlos Lapuerta, *Confidential*)

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Direct Testimony, Rebuttal Testimony, Rejoinder Testimony, and Hearing Appearance on cost of capital before *the Arizona Corporation Commission* on behalf of Arizona-American Water in Docket No. W-01303A-06-0014, January 2006, October 2006, November 2006.

Expert report, rebuttal expert report, and deposition on behalf of a major oil company regarding the equity method of accounting and classification of debt and equity, *American Arbitration Association*, August 2004 and November 2004. (*Confidential*).

Technical Appendix to the Direct Testimony of Bente Villadsen

This technical appendix contains methodological details related to my implementations of the DCF and CAPM / ECAPM models. It also contains a discussion of both the basic finance principles and the specific standard formulations of the financial leverage adjustments employed to determine the cost of equity for a company with the level of financial risk inherent in Orange & Rockland's requested regulatory capital structure.

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I. DCF Models

A. DCF Estimation of Cost of Equity

The DCF method for estimating the cost of equity capital 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 stream:

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

where P_0 is the current market price of the stock; D_t is the dividend cash flow expected at the end of period t; r is the cost of equity capital; and T is the last period in which a dividend cash flow is to be received. The formula simply says that the stock price is equal to the sum of the expected future dividends, each discounted for the time and risk between now and the time the dividend is expected to be received. Since the current market price is known, it is possible to infer the cost of equity that corresponds to that price and a forecasted pattern of expected future dividends. In terms of Equation (1), if P_0 is known and $D_1, D_2, \ldots D_T$ are estimated, an analyst can "solve for" the cost of equity capital r.

B. Details of the DCF Model

Perhaps the most widely known and used application of the DCF method assumes that the expected rate of dividend growth remains constant forever. In the so-called Gordon Growth Model, the relationship expressed in Equation (1) is such that the present value equation can be rearranged algebraically into a formula for estimating the cost of equity. Specifically, if investors expect a dividend stream that will grow forever at a steady rate, then the market price of the stock will be given by

$$P_0 = \frac{D_1}{r-g} \quad (2)$$

where D_1 is the dividend expected at the end of the first period, g is the perpetual growth rate, and P_0 and r are the market price and the cost of capital, as before. Equation (2) is a simplified version of Equation (1) that can be solved algebraically to yield the well-known "DCF formula" for the cost of equity capital,

$$r = \frac{D_1}{P_0} + g = \frac{D_0 \times (1+g)}{P_0} + g \qquad (3)$$

There are other versions of the DCF model that relax this restrictive assumption and posit a more complex or nuanced pattern of expected future dividend payments. For example, if there is reason to believe that investors do *not* expect a company's dividends to grow at a steady rate forever, but rather have different growth rate expectations in the near term (e.g., over the next five or ten years), compared to the distant future (e.g., a period *starting* ten years from the present moment), a "multi-stage" growth pattern can be modeled in the present value formula (Equation (1)).

1. Dividends, Cash Flows, and Share Repurchases

In addition to the DCF model described above, there are many alternative formulations. Notable among these are versions of the model that use cash flows rather than dividends in the present value formula (Equation (1)).[1]

Because investors are interested in cash flow, it is technically important to capture *all* cash flows that are distributed to shareholders when estimating the cost of equity using the DCF method. In some circumstances, investors may expect to receive cash in forms other than dividends. An important example concerns the fact that many companies distribute cash to shareholders through share buybacks in addition to dividends. To the extent such repurchases are expected by investors, but not captured in the forecasted pattern of future dividends; a dividend-based implementation of the DCF model will underestimate the cost of equity.

Similarly, if investors have reason to suspect that a company's dividend payments will not reflect a full distribution of its available cash free cash flows in the period they were generated, it may be appropriate replace the forecasted dividends with estimated free cash flows to equity in the present value formula (Equation (1)). Focusing on *available* cash rather than that actually distributed in the form of dividends can help account for instances when near-term investing and financing activities (e.g., capital expenditures or asset sales, debt issuances or retirements, or share repurchases) may cause dividend growth patterns to diverge from growth in earnings.

[1] For an example in a regulatory context, the U.S. Surface Transportation Board uses a cash flow based model with three stages to estimate the cost of equity for the railroads. See Surface Transportation Board Decision, "STB Ex Parte No. 664 (Sub-No. 1)," Decided January 23, 2009. Confirmed in EP-664 (Sub-No. 2), October 31, 2016 and EP 664 (Sub-No. 4), June 23, 2020.

Many utility companies such as those included in my proxy group have long histories of paying a dividend. In fact, as mentioned in Section I of this Appendix, one of my standard requirements for inclusion in my proxy group is that a company pays dividends for 5-years without a gap or a dividend cut (on per share basis). Additionally, although some utility companies have engaged in share repurchase programs, the companies in my proxy group do not distribute substantial cash flows by means other than dividends.

C. DCF Model Inputs

1. Dividends and Prices

As described above, DCF models are forward-looking, comparing the *current* price of a stock to its expected *future* dividends to estimate the required expected return demanded by the market for that stock (i.e., the cost of equity). Therefore, the models demand the current market price and currently prevailing forecasts of future dividends as inputs.

The stock price input I employ for each proxy group company is the average of the closing stock prices for the 15 trading days ending on the date of my analysis. This guards against biases that may arise on a single trading day, yet is consistent with using current stock prices.

2. Company Specific Growth Rates

a. Analysts' Forecasted Growth Rates

Finding the right growth rate(s) is usually the "hard part" of applying the DCF model, which is sometimes criticized due to what has been called "optimism bias" in the earnings growth rate forecasts of security analysts. Optimism bias is defined as tendency for analysts to forecast earnings growth rates that are higher than are actually achieved. Any optimism bias might be related to incentives faced by analysts that provide rewards not strictly based upon the accuracy of the forecasts. To the extent optimism bias is present in the analysts' earnings forecasts the cost of capital estimates from the DCF model would be too high.

While academic researchers during the 1990s as well as in early 2000s found evidence of analysts' optimism bias, there is some evidence that regulatory reforms have eliminated the issue. A more recent paper by Hovakimina and Saenyasiri (2010) found that recent efforts to curb analysts' incentive to provide optimistic forecasts have worked, so that "the median forecast bias essentially

disappeared."[2] Thus, some recent research indicates that the analyst bias may be a problem of the past.

The findings of several academic studies[3] show that analyst earnings forecasts turn out to be too optimistic for stocks that are more difficult to value, for instance, stocks of smaller firms, firms with high volatility or turnover, younger firms, or firms whose prospects are uncertain. Coincidentally, stocks with greater analyst disagreement have higher analyst optimism bias—all of these describe companies that are more volatile and/or less transparent—none of which is applicable to the majority of utility companies with wide analyst coverage and information transparency. Consequently, optimism bias is not expected to be an issue for utilities.

b. Sources for Forecasted Growth Rates

For the reasons described above, I rely on analyst forecasts of earnings growth for the company-specific growth rate inputs to my implementations of the single- and multi-stage DCF models. Most companies in my proxy group have coverage from equity analysts reporting to Thomson Reuters IBES, so I use the consensus 3-5 year EPS growth rate provided by that service. I supplement these consensus values with growth rates based on EPS estimates from *Value Line*.[4]

II. CAPM and ECAPM

A. THE CAPITAL ASSET PRICING MODEL (CAPM)

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 3 in my Direct Testimony), in which

[2] A. Hovakimian and E. Saenyasiri, "Conflicts of Interest and Analyst Behavior: Evidence from Recent Changes in Regulation," *Financial Analysts Journal*, vol. 66, 2010.

[3] These studies include the following: (i) Hribar, P, McInnis, J. "Investor Sentiment and Analysts' Earnings Forecast Errors," *Management Science* Vol. 58, No. 2 (February 2012): pp. 293-307; (ii) Scherbina, A. (2004), "Analyst Disagreement, Forecast Bias and Stock Returns," downloaded from Harvard Business School Working Knowledge: http://hbswk.hbs.edu/item/5418.html; and (iii) Michel, J-S., Pandes J.A. (2012), "Are Analysts Really Too Optimistic?" downloaded from http://www.efmaefm.org.

[4] Specifically, I compute the growth rate implied by *Value Line*'s current year EPS estimate and its projected 3-5 year EPS estimate. I then average this in with the IBES consensus estimate as an additional independent estimate, giving it a weight of 1 and weighting the IBES consensus according to the number of analysts who contributed estimates.

the required expected return on an asset is proportional to that asset's risk relative to the market as measured by its "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:

$$\boldsymbol{r_s = r_f + \beta_s \times MRP} \tag{4}$$

where $\boldsymbol{r_S}$ is the required return on investment S;
$\boldsymbol{r_f}$ is the risk-free interest rate;
$\boldsymbol{\beta_S}$ is the beta risk measure for the investment S; and
$\boldsymbol{MRP}$ is the market equity risk premium.

The CAPM is based on portfolio theory, and recognizes two fundamental principles of finance: (1) investors seek to minimize the possible variance of their returns for a given level of expected returns (or alternatively, they demand higher *expected* returns when there is greater uncertainty about those returns), and (2) investors can reduce the variability of their returns by diversifying—constructing portfolios of many assets that do not all go up or down at the same time or to the same degree. Under the assumptions of the CAPM, the market participants will construct portfolios of risky investments that minimize risk for a given return so that the aggregate holdings of all investors represent the "market portfolio." The risk-return trade-off faced by investors then concerns their exposure to the risk inherent in the market portfolio, as they weight their investment capital between the portfolio of risky assets and the risk-free asset.

Because of the effects of diversification, the relevant measure of risk for an individual security is its *contribution* to the risk of the market portfolio. Therefore, beta (*β*) is defined to capture the sensitivity of the security's returns to the market's returns. Formally,

$$\boldsymbol{\beta_s} = \frac{covariance(\boldsymbol{r_s}, \boldsymbol{R_m})}{variance(\boldsymbol{R_m})} \tag{5}$$

where $\boldsymbol{R_m}$ is the return on the market portfolio.

Beta is usually calculated by statistically comparing (using regression analysis) the excess (positive or negative) of the return on the individual security over the government bond rate with the excess of the return on a market index such as the S&P 500 over a government bond rate.

The basic idea behind beta is the risk that cannot be diversified away in large portfolios is what matters to investors. Beta is a measure of the risks that *cannot* be eliminated by diversification. It is this non-diversifiable risk, or "systematic risk", for which investors require compensation in the

form of higher expected returns. By definition, a stock with a beta equal to 1.0 has average non-diversifiable risk; its returns vary to the same degree as those on the market as a whole. According to the CAPM, the required return demanded by investors (i.e., the cost of equity) for investing in that stock will match the expected return on the market as a whole. Similarly, stocks with betas above 1.0 have more than average risk, and so have a cost of equity greater than the expected market return; those with betas below 1.0 have less than average risk, and are expected to earn lower than market levels of return.

B. INPUTS TO THE CAPM

1. The Risk-free Interest Rate

The precise meaning of a "risk-free" asset according to the finance theory underlying the CAPM is an investment whose return is guaranteed, with no possibility that it will vary around its expected value in response to the movements of the broader market. (Equivalently, the CAPM beta of a risk-free asset is zero.) In developed economies like the U.S., government debt is generally considered have no default risk. In this sense they are "risk-free"; however, unless they are held to maturity, the rate of return on government bonds may in fact vary around their stated or expected yields.[5]

The theoretical CAPM is a single period model, meaning that it posits a relationship between risk and return over a single "holding period" of an investment. Because investors can rebalance their portfolios over short horizons, many academic studies and practical applications of the CAPM use the short-term government bond as the measure of the risk-free rate of return. However, regulators frequently use a version based on a measure of the long-term risk-free rate; e.g., a long-term government bond. I rely on the 20-year Treasury bond as a measure of the risk-free asset in this proceeding. [6] I use the term "risk-free rate" as describing the yield on the 20-year Treasury bond.

However, I do not believe the *current* yield on long-term Treasury bonds is a good estimate for the risk-free rate that will prevail over the time period relevant to this proceeding as currently prevailing bond yields are near historic lows for a variety of circumstances that should not be expected to persist for the reasons discussed in my direct testimony. For this reason I rely on Blue Chip's forecast of 1.4% for the yield on a 10-year Treasury bond for 2022.[7] I adjust this value

5 This is due to interest rate fluctuations that can change the market value of previously issued debt in relation to the yield on new issuances

6 The use of a 20-year government bond is consistent with the measurement of the Ibbotson MRP and permits me to use a series that has been in consistent circulation since the 1990's (the 30-year government bond was not issued from 2002 to 2006).

7 Blue Chip Economic Indicators, October 2020.

upward by 50 basis points, which is my estimate of the maturity premium for the 20-year over the 10-year Treasury Bond. This provides me with an estimate of the 20-year Treasury bond for 2022 of 1.90%.

Additionally, it is important to recognize the implications of the elevated level of spread between yields on U.S. utility bonds and U.S. Treasury bonds of the same horizon. As shown in Figure B-1 below, the current spread between utility bond yields and the 20-year U.S. Treasury bond yield is elevated by about 50 basis points.[8] One way to account for this observation is if the prevailing and near-term expected government bond yields are artificially depressed relative to longer-term market expectations. Therefore, I rely on risk-free rate (conservatively) 25 basis points higher at 2.15% when performing my CAPM-based analyses. The reason I include only approximately half of the elevation in yield spread is that as interest rates increase the yield spread may decline. Thus, I choose a conservative 25 basis points.

Figure B-1: Yield Spreads

Spreads between U.S. Utility Bond (20 year maturity) and U.S. Government Bond (20 year maturity) - bps			
Periods	A-Rated Utility and Treasury	BBB-Rated Utility and Treasury	Notes
Period 1 - Average Oct-1991 - 2007	94	124	[1]
Period 2 - Average Aug-2008 - Sep-2020	148	193	[2]
Period 3 - Average Sep-2020	150	189	[3]
Period 4 - Average 15-Day (Sep 10, 2020 to Sep 30, 2020)	144	182	[4]
Spread Increase between Period 2 and Period 1	54	70	[5] = [2] - [1]
Spread Increase between Period 3 and Period 1	57	65	[6] = [3] - [1]
Spread Increase between Period 4 and Period 1	50	58	[7] = [4] - [1]

Sources and Notes:
Spreads for the periods are calculated from Bloomberg's yield data.
Average monthly yields for the indices were retrieved from Bloomberg as of September 30, 2020.

2. The Market Equity Risk Premium

a. Historical Average Market Risk Premium

Like the cost of capital itself, the market 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

[8] This maturity premium is estimated by comparing the average excess yield on 20-year versus 10-year Treasury Bonds over the period January 1990 – September 2020, using data from Bloomberg. See BV-7.

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 use method for estimating the MRP is to measure the historical average premium of market returns over the income returns on risk-free government bonds over some long historical period. When such a calculation is performed using the traditional industry standard Ibbotson data, the result is an arithmetic average of the annual observed premiums of U.S. stock market returns over income returns on long-term (approximate average maturity of 20-years) U.S. Treasury bonds from 1926 to the present is 7.15%.[9]

b. Forward Looking Market Equity Risk Premium

An alternative approach to estimating the MRP eschews historical averages in favor of using current market information and forecasts to infer the expected return on the market as a whole, which can then be compared to prevailing government bond yields to estimate the equity risk premium. Bloomberg performs such estimates of country-specific MRPs by implementing the DCF model on the market as a whole—using forecast market-wide dividend yields and current level on market indexes; for the U.S. Bloomberg performs a multi-stage DCF using dividend-paying stocks in the S&P 500 to infer the expected market return.

When calculated relative to 20-year Treasury bond yields, Bloomberg's estimate of the forward-looking market-implied MRP over the month leading up to my analysis was 7.47% This Bloomberg forward-looking MRP estimate is above the historical long-term average. I also calculated the forward-looking MRP using the methodology from the FERC Order 569-A and found a forward-looking MRP of 9.00% over my 1.90% forecasted risk-free rate.[10]

c. Yield Spreads and the Market Equity Risk Premium

As shown in Figure B-1 above the yield spreads for 20-year A rated utility debt over 20-year Treasury bonds is elevated relative to its historical norm by about 50 bps relative to its long-term average leading up to the 2008 financial crisis. This means that investors require a higher return on investment grade utility debt relative to the return on T-bonds than they did before the crisis and ensuing economic turmoil.

This information can be used to provide a quantitative benchmark for the implied increase in MRP based on a paper by Edwin J. Elton, et al., which documents that the yield spread on corporate

9 Duff & Phelps, Cost of Capital Navigator, U.S. Cost of Capital Module 2020.

10 Exhibit BV-4, Schedule No. BV-19.

bonds is normally a combination of a default premium, a tax premium, and a systematic risk premium.[11] Of these components, it is the systematic risk premium that likely explains the vast majority of the yield spread increase. In other words, unless the risk-free rate is underestimated as described above, the market equity risk premium has increased relative to its "normal" level.[12] For example, assuming a beta of 0.25 for A rated debt[13] means that an increase in the MRP of one percentage point translates into a ¼ percentage point increase in the risk premium on A rated debt (i.e., 0.25 (beta) times 1 percentage point (increase in MRP) = ¼ percentage point increase in yield spread). Thus, a 25 bps increase in the yield spread is therefore consistent with a 1.0 percentage point increase in the MRP ($\frac{0.25\%}{0.25} = 1.0\%$). Thus, there is evidence that the current MRP is elevated relative to the historical MRP of 7.15%. While the increase in yield spread as well as an implementation of the DCF model on the S&P 500 could justify an MRP of 9.15% (consistent with the FERC MRP) or an MRP of 7.47% (consistent with the Bloomberg MRP),[14] I conservatively use the historical average of 7.15%.

C. THE EMPIRICAL CAPM

1. Description of the ECAPM

Empirical research has 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. 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.

[11] "Explaining the Rate Spread on Corporate Bonds," Edwin J. Elton, Martin J. Gruber, Deepak Agarwal, and Christopher Mann, *The Journal of Finance*, February 2001, pp. 247-277.

[12] In theory, some of the increase in yield spread for A rated debt may be due to an increase in default risk, but the increase in default risk for A rated debt is undoubtedly very small because utilities with A range rated debt have a low default risk. This means that the vast majority—if not all—of the increase in A rated yield spreads is due to a combination of the increased systematic risk premium and the downward pressure on the yields of government debt. Although there is no increase in the tax premium discussed in the Elton et al. paper due to coupon payments, there may be some increase due to a small tax effect resulting from the probability of increased capital gains taxes when the debt matures.

[13] Elton, *et al*. estimates the average beta on BBB-rated corporate debt as 0.26 over the period of their study, and A-rated debt will have a slightly lower beta than BBB-rated debt. I note that 0.25 is a conservatively high estimate of the beta on A-rated utility debt. Most academic estimates, including those presented in *Berk & Demarzo* that I utilize for my Hamada adjustments are significantly lower: in the range of 0.0 – 0.1 percent and would result in a substantially higher MRP estimate.

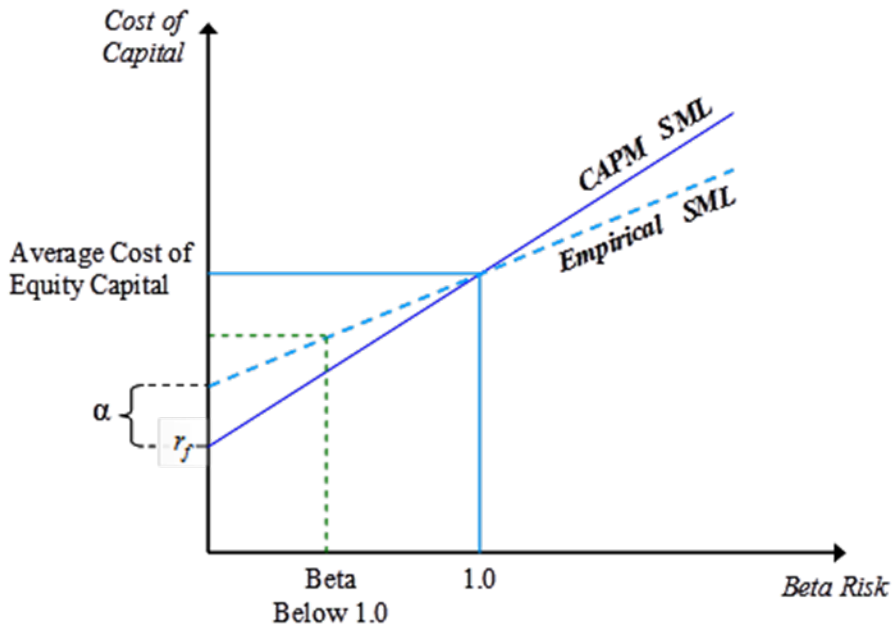
[14] Using the yield spread as estimated, the increase in the MRP is 0.50% / 0.25% = 2.00%, while Exhibit BV-4, Schedule No. BV-19 shows a forecast of approximately 9.0%.

The Empirical CAPM (ECAPM) makes use of these empirical findings. It estimates the cost of capital with the equation,

$$\boldsymbol{r_S = r_f + \alpha + \beta_S \times (MRP - \alpha)} \qquad (6)$$

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 (4)). The alpha adjustment has the effect of increasing the intercept but reducing the slope of the Security Market Line, 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.

Figure B-2
The Empirical Security Market Line



2. Academic Evidence on the Alpha Term in the ECAPM

Figure B- below summarizes the empirical results of tests of the CAPM, including their estimates of the "alpha" parameter necessary to improve the accuracy of the CAPM's predictions of realized returns.

Figure B-3

EMPIRICAL EVIDENCE ON THE ALPHA FACTOR IN ECAPM*

AUTHOR	RANGE OF ALPHA	PERIOD RELIED UPON
Black (1993)[1]	1% for betas 0 to 0.80	1931-1991
Black, Jensen and Scholes (1972)[2]	4.31%	1931-1965
Fama and McBeth (1972)	5.76%	1935-1968
Fama and French (1992)[3]	7.32%	1941-1990
Fama and French (2004)[4]	N/A	
Litzenberger and Ramaswamy (1979)[5]	5.32%	1936-1977
Litzenberger, Ramaswamy and Sosin (1980)	1.63% to 3.91%	1926-1978
Pettengill, Sundaram and Mathur (1995)[6]	4.6%	1936-1990

*The figures reported in this table are for the longest estimation period available and, when applicable, use the authors' recommended estimation technique. Many of the articles cited also estimate alpha for sub-periods and those alphas may vary.

[1]Black estimates alpha in a one step procedure rather than in an un-biased two-step procedure.

[2]Estimate a negative alpha for the subperiod 1931-39 which contain the depression years 1931-33 and 1937-39.

[3]Calculated using Ibbotson's data for the 30-day treasury yield.

[4]The article does not provide a specific estimate of alpha; however, it supports the general finding that the CAPM underestimates returns for low-beta stocks and overestimates returns for high-beta stocks.

[5]Relies on Lizenberger and Ramaswamy's before-tax estimation results. Comparable after-tax alpha estimate is 4.4%.

[6]Pettengill, Sundaram and Mathur rely on total returns for the period 1936 through 1990 and use 90-day treasuries. The 4.6% figure is calculated using auction averages 90-day treasuries back to 1941 as no other series were found this far back.

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III. Financial Risk and the Cost of Equity

A common issue in regulatory proceedings is how to apply data from a benchmark set of comparable securities when estimating a fair return on equity for the target/regulated company.[15] It may be tempting to simply estimate the cost of equity capital for each of the proxy companies (using one of the above approaches) and average them. After-all, the companies were chosen to be comparable in their business risk characteristics, so why would an investor necessarily prefer equity in one to the other (on average)?

The problem with this argument is that it ignores the fact that underlying asset risk (i.e., the risk inherent in the lines of business in which the firm invests its assets) for each company is typically divided between debt and equity holders. The firm's debt and equity are therefore financial derivatives of the underlying asset return, each offering a differently structured claim on the cash flows generated by those assets. Even though the risk of the underlying assets may be comparable, a different capital structure splits that risk differently between debt and equity holders. The relative structures of debt and equity claims are such that higher degrees of debt financing increase the variability of returns on equity, *even when the variability of asset returns remains constant*. As a consequence, otherwise identical firms with different capital structures will impose different levels of risk on their equity holders. Stated differently, increased leverage adds financial risk to a company's equity.[16]

A. The Effect of Financial Leverage on the Cost of Equity

To develop an intuition for the manner in which financial leverage affects the risk of equity, it is helpful to consider a concrete example. Figure B-4 and Figure B-5 below demonstrate the impact of leverage on the risk and return for equity by comparing equity's risk when a company uses no debt to finance its assets, and when it uses a 50-50 capital structure (i.e., it finances 50 percent of its assets with equity, 50 percent with debt). For illustrative purposes, the figures assume that the cash flows will be either $5 or $15 and that these two possibilities have the same chance of occurring (e.g., the chance that either occurs is ½).

[15] This is also a common valuation problem in general business contexts.

[16] I refer to this effect in terms of *financial risk* because the additional risk to equity holders stems from how the company chooses to finance its assets. In this context financial risk is distinct from and independent of the *business risk* associated with the manner in which the firm deploys its cash flow generating assets. The impact of leverage on risk is conceptually no different than that faced by a homeowner who takes out a mortgage. The equity of a homeowner who finances his home with 90% debt is much riskier than the equity of one who only finances with 50% debt.

Figure B-4: All Equity Capital Structure

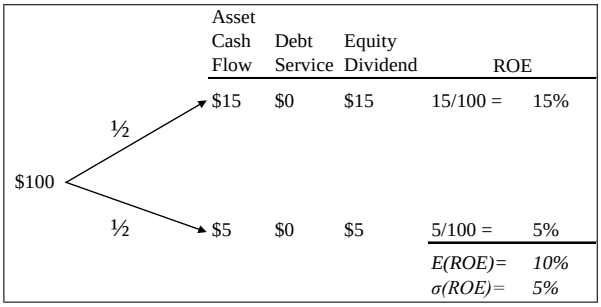
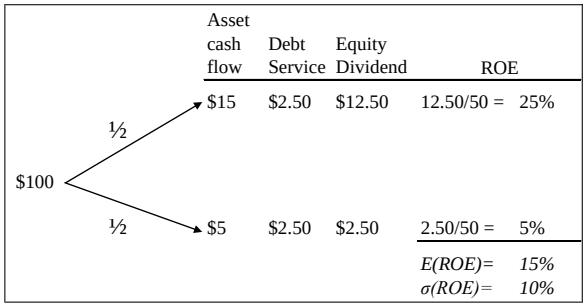


Figure B-5: 50/50 Capital Structure



In the figures, E(ROE) indicates the mean return and σ(ROE) represents the standard deviation. This simple example illustrates that the introduction of debt increases both the mean (expected) return to equity holders and the variance of that return, even though the firm's expected cash flows—which are a property of the line of business in which its assets are invested—are unaffected by the firm's financing choices. The "magic" of financial leverage is not magic at all—leveraged equity investors can only earn a higher return because they take on greater risk.

B. METHODS TO ACCOUNT FOR FINANCIAL RISK

1. Cost of Equity Implied by the Overall Cost of Capital

If the companies in a proxy group are truly comparable in terms of the systematic risks of the underlying assets, then the overall cost of capital of each company should be about the same across companies (except for sampling error), so long as they do not use extreme leverage or no leverage. The intuition here is as follows. A firm's asset value (and return) is allocated between equity and debt holders.[17] The expected return to the underlying asset is therefore equal to the value weighted

[17] Other claimants can be added to the weighted average if they exist. For example, when a firm's capital structure contains preferred equity, the term $\frac{P}{V} \times r_p$ is added to the expression for the overall cost of capital shown in Equation (7), where P refers to the market value of preferred equity, r_P is the cost of preferred equity and $V = E + D + P$. In my analysis, I attribute the same implied yield to the cost of preferred equity as to the cost of debt.

average of the expected returns to equity and debt holders – which is the overall cost of capital ($\boldsymbol{r}^*$), or the expected return on the assets of the firm as a whole.[18]

$$\boldsymbol{r}^* = \frac{E}{V} \times r_E + \frac{D}{V} \times r_D(1 - \tau_c) \qquad (7)$$

where r_D is the market cost of debt,
r_E is the market cost of equity,
τ_c is the corporate income tax rate,
D is the market value of the firm's debt,
E is the market value of the firm's equity, and
$V = E + D$ is the total market value of the firm.

Since the overall cost of capital is the cost of capital for the underlying asset risk, and this is comparable across companies, it is reasonable to believe that the overall cost of capital of the underlying companies should also be comparable, so long as capital structures do not involve unusual leverage ratios compared to other companies in the industry.[19]

The notion that the overall cost of capital is constant across a broad middle range of capital structures is based upon the Modigliani-Miller theorem that choice of financing does not affect the firm's value. Franco Modigliani and Merton Miller eventually won Nobel Prizes in part for their work on the effects of debt.[20] Their 1958 paper made what is in retrospect a very simple point: if there are no taxes and no risk to the use of excessive debt, use of debt will have no effect on a company's operating cash flows (i.e., the cash flows to investors as a group, debt and equity combined). If the operating cash flows are the same regardless of whether the company finances mostly with debt or mostly with equity, then the value of the firm cannot be affected at all by the

[18] As this is on an after-tax basis, the cost of debt reflects the tax value of interest deductibility. Note that the precise formulation of the weighted average formula representing the required return on the firm's *assets* independent of financing (sometimes called the *unlevered* cost of capital) depends on specific assumptions made regarding the value of tax shields from tax-deductible corporate debt, the role of personal income tax, and the cost of financial distress. See Taggart, Robert A., "Consistent Valuation and Cost of Capital Expressions with Corporate and Personal Taxes," *Financial Management*, 1991; 20(3) for a detailed discussion of these assumptions and formulations. Equation (7) represents the overall weighted average cost of capital to the firm, which can be assumed to be constant across a relatively broad range of capital structures.

[19] Empirically, companies within the same industry tend to have similar capital structures, while typical capital structures may vary between industries, so whether a leverage ratio is "unusual" depends upon the company's line of business.

[20] Franco Modigliani and Merton H. Miller (1958), "The Cost of Capital, Corporation Finance and the Theory of Investment," *American Economic Review*, 48, pp. 261-297.

debt ratio. In cost of capital terms, this means the overall cost of capital is constant regardless of the debt ratio, too.

Obviously, the simple and elegant Modigliani-Miller theorem makes some counterfactual assumptions: no taxes and no cost of financial distress from excessive debt. However, subsequent research, including some by Modigliani and Miller,[21] showed that while taxes and costs to financial distress affect a firm's incentives when choosing its capital structure as well as its overall cost of capital,[22] the latter can still be shown to be constant across a broad range of capital structures.[23]

This reasoning suggests that one could compute the overall cost of capital for each of the proxy companies and then average to produce an estimate of the overall cost of capital associated with the underlying asset risk. Assuming that the overall cost of capital is constant, one can then re-arrange the overall cost of capital formula to estimate what the implied cost of equity is at the target company's capital structure on a book value basis.[24]

2. Unlevering and Relevering Betas in the CAPM (Hamada Adjustment)

An alternative approach to account for the impact of financial risk is to examine the impact of leverage on beta. Notice that this means working within the CAPM framework as the methodology cannot be applied directly to the DCF models.

[21] Franco Modigliani and Merton H. Miller (1963), "Corporate Income Taxes and the Cost of Capital: A Correction," *American Economic Review*, 53, pp. 433-443.

[22] When a company uses a high level of debt financing, for example, there is significant risk of bankruptcy and all the costs associated with it. The so called costs of financial distress that occurs when a company is over-leveraged can increase its cost of capital. In contrast a company can generally decrease its cost of capital by taking on reasonable levels of debt, owing in part to the deductibility of interest from corporate taxes.

[23] This is a simplified treatment of what is generally a complex and on-going area of academic investigation. The roles of taxes, market imperfections and constraints, etc. are areas of on-going research and differing assumptions can yield subtly different formulations for how to formulate the weighted average cost of capital that is constant over all (or most) capital structures.

[24] Market value capital structures are used in estimating the overall cost of capital for the proxy companies.

Recognizing that under general conditions, the value of a firm can be decomposed into its value with and without a tax shield, I obtain:[25]

$$V = V_U + PV(ITS) \tag{8}$$

where $V = E + D$ is the total value of the firm as in Equation (7),
V_U is the "unlevered" value of the firm—its value if financed entirely by equity
$PV(ITS)$ represents the present value of the interest tax shields associated with debt

For a company with a fixed book-value capital structure and no additional costs to leverage, it can be shown that the formula above implies:

$$r_E = r_U + \frac{D}{E}(1 - \tau_c)(r_U - r_D) \tag{9}$$

where r_U is the "unlevered cost of capital"—the required return on assets if the firm's assets were financed with 100% equity and zero debt—and the other parameters are defined as in Equation (7).

Replacing each of these returns by their CAPM representation and simplifying them gives the following relationship between the "levered" equity beta β_L for a firm (i.e., the one observed in market data as a consequence of the firm's actual market value capital structure) and the "unlevered" beta β_U that would be measured for the same firm if it had no debt in its capital structure:

$$\beta_L = \beta_U + \frac{D}{E}(1 - \tau_c)(\beta_U - \beta_D) \tag{10}$$

where β_D is the beta on the firm's debt. The unlevered beta is assumed to be constant with respect to capital structure, reflecting as it does the systematic risk of the firm's assets. Since the beta on

[25] This follows development in Fernandez (2003). Other standard papers in this area include Hamada (1972), Miles and Ezzell (1985), Harris and Pringle (1985), Fernandez (2006). (See Fernandez, P., "Levered and Unlevered Beta," IESE Business School Working Paper WP-488, University of Navarra, Jan 2003 (rev. May 2006); Hamada, R.S., "The Effect of the Firm's Capital Structure on the Systematic Risk of Common Stock," *Journal of Finance*, 27, May 1972, pp. 435-452; Miles, J.A. and J.R. Ezzell, "Reformulating Tax Shield Valuation: A Note," *Journal of Finance*, XL5, Dec 1985, pp. 1485-1492; Harris, R.S. and J.J. Pringle, "Risk-Adjusted Discount Rates Extensions form the Average-Risk Case," *Journal of Financial Research*, Fall 1985, pp. 237-244; Fernandez, P., "The Value of Tax Shields Depends Only on the Net Increases of Debt," IESE Business School Working Paper WP-613, University of Navarra, 2006.) Additional discussion can be found in Brealey, Myers, and Allen (2014).

an investment grade firm's debt is much lower than the beta of its assets (i.e., $\beta_D < \beta_U$), this equation embodies the fact that increasing financial leverage (and thereby increasing the debt to equity ratio) increases the systematic risk of *levered* equity (β_L).

An alternative formulation derived by Harris and Pringle (1985) provides the following equation that holds when the market value capital structures (rather than book value) are assumed to be held constant:

$$\beta_L = \beta_U + \frac{D}{E}(\beta_U - \beta_D) \qquad (11)$$

Unlike Equation (10), Equation (11) does not include an adjustment for the corporate tax deduction. However, both equations account for the fact that increased financial leverage increases the systematic risk of equity that will be measured by its market beta. And both equations allow an analyst to adjust for differences in financial risk by translating back and forth between β_L and β_U. In principal, Equation (10) is more appropriate for use with regulated utilities, which are typically deemed to maintain a fixed book value capital structure. However, I employ both formulations when adjusting my CAPM estimates for financial risk, and consider the results as sensitivities in my analysis.

It is clear that the beta of debt needs to be determined as an input to either Equation (10), or Equation (11). Rather than estimating debt betas, I rely on the standard financial textbook of Professors Berk & DeMarzo, who report a debt beta of 0.05 for A rated debt and a beta of 0.10 for BBB rated debt.[26]

Once a decision on debt betas is made, the levered equity beta of each proxy company can be computed (in this case by Value Line) from market data and then translated to an unlevered beta at the company's market value capital structure. The unlevered betas for the proxy companies are comparable on an "apples to apples" basis, since they reflect the systematic risk inherent in the assets of the proxy companies, independent of their financing. The unlevered betas are averaged to produce an estimate of the industry's unlevered beta. To estimate the cost of equity for the regulated target company, this estimate of unlevered beta can be "re-levered" to the regulated

[26] Berk, J. & DeMarzo, P., *Corporate Finance, 2nd Edition.* 2011 Prentice Hall, p. 389.

company's capital structure, and CAPM reapplied with this levered beta, which reflects both the business and financial risk of the target company.

Hamada adjustment procedures—so-named for Professor Robert S. Hamada who contributed to their development[27]—are ubiquitous among finance practitioners when using the CAPM to estimate discount rates.

[27] Hamada, R.S., "The Effect of the Firm's Capital Structure on the Systematic Risk of Common Stock", *The Journal of Finance*, 27(2), 1971, pp. 435-452.