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Before the Public Service Commission of the State of Missouri

Direct Testimony

of

Dr. James H. Vander Weide

August 2015

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ON BEHALF OF
THE EMPIRE DISTRICT ELECTRIC COMPANY
BEFORE THE
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I. INTRODUCTION

Q. PLEASE STATE YOUR NAME, TITLE, AND BUSINESS ADDRESS.

A. My name is James H. Vander Weide. I am President of Financial Strategy Associates, a firm that provides strategic and financial consulting services to business clients. My business address is 3606 Stoneybrook Drive, Durham, North Carolina 27705.

Q. PLEASE SUMMARIZE YOUR QUALIFICATIONS.

A. I graduated from Cornell University with a Bachelor's Degree in Economics and from Northwestern University with a Ph.D. in Finance. After joining the faculty of the School of Business at Duke University, I was named Assistant Professor, Associate Professor, Professor, and then Research Professor. I have published research in the areas of finance and economics and taught courses in these fields at Duke for more than thirty-five years. I am now retired from my teaching duties at Duke. A summary of my research, teaching, and other professional experience is presented in Appendix 1.

Q. HAVE YOU PREVIOUSLY TESTIFIED ON FINANCIAL OR ECONOMIC ISSUES?

A. Yes. As an expert on financial and economic theory and practice, I have participated in more than four hundred regulatory and legal proceedings before the public service commissions of forty-five states and four Canadian provinces, the Federal Energy Regulatory Commission, the National Energy Board (Canada), the Federal Communications Commission, the Canadian Radio-Television and Telecommunications Commission, the U.S. Congress, the National Telecommunications and Information Administration, the insurance commissions of five states, the Iowa State Board of Tax Review, and the North Carolina Property Tax Commission. In addition, I have prepared expert testimony in proceedings before the U.S. District Court for the District of Nebraska; the U.S. District Court for the District of New Hampshire; the U.S. District Court for the District of Northern Illinois; the U.S. District Court for the Eastern District of North Carolina; the Montana Second Judicial District Court, Silver Bow County; the U.S. District Court for the Northern District of California; the Superior Court, North Carolina; the U.S. Bankruptcy Court for the Southern District of West Virginia; the U. S. District Court for the Eastern District of Michigan, and the Supreme Court of the State of New York.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. I have been asked by The Empire District Electric Company ("Empire" or "Company") to prepare an independent appraisal of Empire's cost of equity, and to recommend to the Missouri Public Service Commission (the

"Commission") a range of returns on equity for the Company's electric utility operations that is fair, that allows the Company to attract capital on reasonable terms, and that allows the Company to maintain its financial integrity.

II. SUMMARY OF TESTIMONY

Q. HOW DO YOU ESTIMATE EMPIRE'S COST OF EQUITY?

A. I estimate Empire's cost of equity by applying several standard cost of equity methods to market data for a large proxy group of electric utility companies.

Q. WHY DO YOU APPLY YOUR COST OF EQUITY METHODS TO A LARGE PROXY GROUP OF ELECTRIC UTILITIES RATHER THAN SOLELY TO EMPIRE?

A. I apply my cost of equity methods to a large group of comparable risk companies because standard cost of equity methods such as the discounted cash flow ("DCF"), risk premium, and capital asset pricing model ("CAPM") require inputs of quantities that are not easily measured. Since these inputs can only be estimated, there is naturally some degree of uncertainty surrounding the estimate of the cost of equity for each company. However, the uncertainty in the estimate of the cost of equity for an individual company can be greatly reduced by applying cost of equity methods to a large sample of comparable companies; and thus, unusually high estimates for some individual companies are offset by unusually low estimates for other individual companies. Thus, financial economists invariably apply cost of equity

methods to one or more groups of comparable companies. In utility regulation, the practice of using comparable companies, called the comparable company approach, is further supported by the principle enunciated by the United States Supreme Court that the utility should be allowed to earn a return on its investment that is commensurate with returns being earned on other investments of the same risk (s*ee Bluefield Water Works and Improvement Co. v. Public Service Comm'n.* 262 U.S. 679, 692 (1923) and *Federal Power Comm'n v. Hope Natural Gas Co*., 320 U.S. 561, 603 (1944)).

Q. WHAT COST OF EQUITY DO YOU FIND FOR YOUR PROXY COMPANIES IN THIS PROCEEDING?

A. On the basis of my studies, I find that the cost of equity for my proxy companies is in the range 9.9 percent to 10.6 percent. This conclusion is based on my application of standard cost of equity estimation techniques, including the DCF model, the ex ante risk premium approach, the ex post risk premium approach, and the CAPM, to a broad group of electric utilities, and on the evidence I present in this testimony that the CAPM, as typically applied, significantly underestimates the cost of equity for companies such as my proxy companies with betas significantly less than 1.0.

Q. WHAT IS YOUR RECOMMENDATION REGARDING EMPIRE'S ALLOWED RATE OF RETURN ON EQUITY?

A. I conservatively recommend that Empire be authorized a rate of return on equity in the range 9.9 percent to 10.6 percent.

Q. WHY IS YOUR RECOMMENDED RANGE OF RATES OF RETURN ON EQUITY CONSERVATIVE?

A. My recommended range of returns on equity is conservative because it does not reflect the higher financial risk implicit in the Company's rate making capital structure compared to the average financial risk of the proxy companies' market value capital structure. As I discuss below, the financial risk of the proxy companies depends on the market values of the debt and equity in the companies' capital structures.

Q. DO YOU HAVE SCHEDULES AND APPENDICES ACCOMPANYING YOUR TESTIMONY?

A. Yes. I have prepared, or supervised the preparation of, nine schedules and four appendices that accompany my testimony.

III. ECONOMIC AND LEGAL PRINCIPLES

Q. WHAT IS THE ECONOMIC DEFINITION OF THE COST OF CAPITAL?

A. Economists define the cost of capital as the return investors expect to receive on alternative investments of comparable risk.

Q. WHAT ROLE DOES THE COST OF CAPITAL PLAY IN THE ALLOCATION OF CAPITAL IN THE CAPITAL MARKETS?

A. The cost of capital is a hurdle rate, or cut-off rate, for investment in a company or project. If investors do not expect to earn a return on their

investment in a company or project that is at least as large as the return they expect to receive on other investments of comparable risk, rational investors will not invest in the company or project.

Q. DO ALL INVESTORS HAVE THE SAME POSITION IN THE FIRM?

A. No. Debt investors have a fixed claim on a firm's assets and income that must be paid prior to any payment to the firm's equity investors. Since the firm's equity investors have only a residual claim on the firm's assets and income, equity investments are riskier than debt investments. Thus, the cost of equity exceeds the cost of debt.

Q. WHAT IS THE OVERALL OR AVERAGE COST OF CAPITAL?

A. The overall or average cost of capital is a weighted average of the cost of debt and cost of equity, where the weights are the percentages of debt and equity in a firm's capital structure.

Q. CAN YOU ILLUSTRATE THE CALCULATION OF THE OVERALL OR WEIGHTED AVERAGE COST OF CAPITAL?

A. Yes. Assume that the cost of debt is 7 percent, the cost of equity is 13 percent, and the percentages of debt and equity in the firm's capital structure are 50 percent and 50 percent, respectively. Then the weighted average cost of capital is expressed by .50 times 7 percent plus .50 times 13 percent, or 10.0 percent.

Q. HOW DO ECONOMISTS DEFINE THE COST OF EQUITY?

A. Economists define the cost of equity as the return investors expect to receive on alternative equity investments of comparable risk. Since the return on an equity investment of comparable risk is not a contractual return, the cost of equity is more difficult to measure than the cost of debt. However, as I have already noted, there is agreement among economists that the cost of equity is greater than the cost of debt. There is also agreement among economists that the cost of equity, like the cost of debt, is both forward looking and market based.

Q. HOW DO ECONOMISTS MEASURE THE PERCENTAGES OF DEBT AND EQUITY IN A FIRM'S CAPITAL STRUCTURE?

A. Economists measure the percentages of debt and equity in a firm's capital structure by first calculating the market value of the firm's debt and the market value of its equity. Economists then calculate the percentage of debt by the ratio of the market value of debt to the combined market values of debt and equity, and the percentage of equity by the ratio of the market value of equity to the combined market values of debt and equity. For example, if a firm's debt has a market value of $25 million and its equity has a market value of $75 million, then its total market capitalization is $100 million, and its capital structure contains 25 percent debt and 75 percent equity.

Q. WHY DO ECONOMISTS MEASURE A FIRM'S CAPITAL STRUCTURE IN TERMS OF THE MARKET VALUES OF ITS DEBT AND EQUITY?

A. Economists measure a firm's capital structure in terms of the market values of its debt and equity because: (1) the weighted average cost of capital is defined as the return investors expect to earn on a portfolio of the company's debt and equity securities; (2) investors measure the expected return and risk on their portfolios using market value weights, not book value weights; and (3) market values are the best measures of the amounts of debt and equity investors have invested in the company on a going forward basis.

Q. WHY DO INVESTORS MEASURE THE EXPECTED RETURN AND RISK ON THEIR INVESTMENT PORTFOLIOS USING MARKET VALUE WEIGHTS RATHER THAN BOOK VALUE WEIGHTS?

A. Investors measure the expected return and risk on their investment portfolios using market value weights because: (1) the expected return on a portfolio is calculated by comparing the expected value of the portfolio at the end of the investment period to its current value; (2) the risk on a portfolio is calculated by examining the variability of the return on the portfolio around its expected value; and (3) market values are the best measure of the current value of the portfolio. From the investor's point of view, the historical cost, or book value of the investment, is generally a poor indicator of the portfolio's current value.

Q. IS THE ECONOMIC DEFINITION OF THE WEIGHTED AVERAGE COST OF CAPITAL CONSISTENT WITH REGULATORS' TRADITIONAL DEFINITION OF THE WEIGHTED AVERAGE COST OF CAPITAL?

A. No. The economic definition of the weighted average cost of capital is based on the market costs of debt and equity, the market value percentages of debt and equity in a company's capital structure, and the future expected risk of investing in the company. In contrast, regulators have traditionally defined the weighted average cost of capital using the embedded cost of debt and the book values of debt and equity in a company's capital structure.

Q. WILL INVESTORS HAVE AN OPPORTUNITY TO EARN A FAIR RETURN ON THE VALUE OF THEIR EQUITY INVESTMENT IN THE COMPANY IF REGULATORS CALCULATE THE WEIGHTED AVERAGE COST OF CAPITAL USING THE BOOK VALUE OF EQUITY IN THE COMPANY'S CAPITAL STRUCTURE?

A. No. Investors will only have an opportunity to earn a fair return on the value of their equity investment if regulators either calculate the weighted average cost of capital using the market value of equity in the company's capital structure or adjust the cost of equity for the difference in the financial risk reflected in the market value capital structures of the proxy companies and the financial risk reflected in the company's ratemaking capital structure.

Q. ARE THESE ECONOMIC PRINCIPLES REGARDING THE FAIR RETURN FOR CAPITAL RECOGNIZED IN ANY UNITED STATES SUPREME COURT CASES?

A. Yes. These economic principles, relating to the supply of and demand for capital, are recognized in two United States Supreme Court cases:

(1) *Bluefield Water Works and Improvement Co. v. Public Service Comm'n*.; and (2) *Federal Power Comm'n v. Hope Natural Gas Co*. In the *Bluefield Water Works* case, the Court stated:

> A public utility is entitled to such rates as will permit it to earn a return upon the value of the property which it employs for the convenience of the public equal to that generally being made at the same time and in the same general part of the country on investments in other business undertakings which are attended by corresponding risks and uncertainties; but it has no constitutional right to profits such as are realized or anticipated in highly profitable enterprises or speculative ventures. The return should be reasonably sufficient to assure confidence in the financial soundness of the utility, and should be adequate, under efficient and economical management, to maintain and support its credit, and enable it to raise the money necessary for the proper discharge of its public duties. [*Bluefield Water Works and Improvement Co. v. Public Service Comm'n.* 262 U.S. 679, 692 (1923)].

The Court clearly recognizes here that: (1) a regulated firm cannot remain financially sound unless the return it is allowed to earn on the value of its property is at least equal to the cost of capital (the principle relating to the demand for capital); and (2) a regulated firm will not be able to attract capital if it does not offer investors an opportunity to earn a return on their investment equal to the return they expect to earn on other investments of the same risk (the principle relating to the supply of capital).

In the *Hope Natural Gas* case, the Court reiterates the financial soundness and capital attraction principles of the *Bluefield* case:

> From the investor or company point of view it is important that there be enough revenue not only for operating expenses but also for the capital costs of the business. These include service on the debt and dividends on the stock... By that standard the return to the equity owner should be commensurate with returns

> on investments in other enterprises having corresponding risks. That return, moreover, should be sufficient to assure confidence in the financial integrity of the enterprise, so as to maintain its credit and to attract capital. [*Federal Power Comm'n v. Hope Natural Gas Co*., 320 U.S. 591, 603 (1944)].

The Court clearly recognizes that the fair rate of return on equity should be: (1) comparable to returns investors expect to earn on other investments of similar risk; (2) sufficient to assure confidence in the company's financial integrity; and (3) adequate to maintain and support the company's credit and to attract capital.

IV. BUSINESS AND FINANCIAL RISKS

Q. HOW DO INVESTORS ESTIMATE THE EXPECTED RATE OF RETURN ON SPECIFIC INVESTMENTS, SUCH AS AN INVESTMENT IN EMPIRE?

A. Investors estimate the expected rate of return in several steps. First, they estimate the amount of their investment in the company. Second, they estimate the timing and amounts of the cash flows they expect to receive from their investment over the life of the investment. Third, they determine the return, or discount rate, that equates the present value of the expected cash receipts from their investment in the company to the current value of their investment in the company.

Q. ARE THE RETURNS ON INVESTMENT OPPORTUNITIES, SUCH AS AN INVESTMENT IN EMPIRE, KNOWN WITH CERTAINTY AT THE TIME THE INVESTMENT IS MADE?

A. No. As discussed above, the return on an investment in Empire depends on the Company's expected future cash flows over the life of the investment. Since the Company's expected future cash flows are uncertain at the time the investment is made, the return on the investment is also uncertain.

Q. YOU MENTION THAT INVESTORS REQUIRE A RETURN ON INVESTMENT THAT IS EQUAL TO THE RETURN THEY EXPECT TO RECEIVE ON OTHER INVESTMENTS OF SIMILAR RISK. DOES THE REQUIRED RETURN ON AN INVESTMENT DEPEND ON THE RISK OF THAT INVESTMENT?

A. Yes. Since investors are averse to risk, they require a higher rate of return on investments with greater risk.

Q. WHAT FUNDAMENTAL RISK DO INVESTORS FACE WHEN THEY INVEST IN A COMPANY SUCH AS EMPIRE?

A. Investors face the fundamental risk that their realized, or actual, return on investment, will be less than their required return on investment.

Q. HOW DO INVESTORS MEASURE INVESTMENT RISK?

A. Investors generally measure investment risk by estimating the probability, or likelihood, of earning less than the required return on investment. For investments with potential returns distributed symmetrically about the expected, or mean, return, investors can also measure investment risk by estimating the variance, or volatility, of the potential return on investment.

Q. DO INVESTORS DISTINGUISH BETWEEN BUSINESS AND FINANCIAL RISK?

A. Yes. Business risk is the underlying risk that investors will earn less than their required return on investment when the investment is financed entirely with equity. Financial risk is the additional risk of earning less than the required return when the investment is financed with both fixed-cost debt and equity.

Q. WHAT ARE THE PRIMARY DETERMINANTS OF AN ELECTRIC UTILITY'S BUSINESS RISK?

A. The business risk of investing in electric utility companies such as Empire is caused by: (1) demand uncertainty; (2) operating expense uncertainty; (3) investment cost uncertainty; (4) high operating leverage; and (5) regulatory uncertainty.

Q. WHAT CAUSES THE DEMAND FOR ELECTRICITY TO BE UNCERTAIN?

A. Electric utilities experience demand uncertainty in both the short run and the long run. Short-run demand uncertainty is caused by the strong dependence of electric demand on the state of the economy and weather patterns. Long-run demand uncertainty is caused by: (a) the sensitivity of demand to changes in rates; (b) the efforts of customers to conserve energy; and (c) the potential development of new energy efficient technologies and appliances. For electric utilities, long-run demand uncertainty is also caused by the improved economics of distributed generation and the ability of some

customers to co-generate their own electricity or purchase electricity from competitors.

Q. HOW DOES SHORT-RUN DEMAND UNCERTAINTY AFFECT AN ELECTRIC UTILITY'S BUSINESS RISK?

A. Short-run demand uncertainty affects an electric utility's business risk through its impact on the variability of the company's revenues and its return on investment. The greater the short-run uncertainty in demand the greater is the uncertainty in the company's yearly revenues and return on investment.

Q. HOW DOES LONG-RUN DEMAND UNCERTAINTY AFFECT AN ELECTRIC UTILITY'S BUSINESS RISK?

A. Long-run demand uncertainty affects an electric utility's business risk through its impact on the utility's revenues over the life of its plant investments. Long-run demand uncertainty creates greater risk for electric utilities because investments in electric utility infrastructure are long-lived and irreversible. If demand turns out to be less than expected over the life of the investment, the utility may not be able to generate sufficient revenues over the life of the investment to cover its operating expenses and earn a fair return on its investment.

Q. DOES EMPIRE EXPERIENCE DEMAND UNCERTAINTY?

A. Yes. Empire experiences demand uncertainty in both the short run and the long run. The Company experiences short-run demand uncertainty as a result of economic cycles, such as during a recession, when fewer homes are built,

fewer new businesses are started, and factories are running at less than full capacity; and as a result of weather patterns, such as unusually warm winters and/or cool summers. Empire experiences long-run demand uncertainty when it invests in major long-lived plant additions or replacements that are expected to operate over the next thirty or forty years. If future actual demand turns out to be less than forecast demand, the Company may not generate sufficient revenues to recover its investment and earn a fair return on its investment.

Q. WHY ARE AN ELECTRIC UTILITY'S OPERATING EXPENSES UNCERTAIN?

A. Some of the factors that create operating expense uncertainty for electric utilities include: (a) high volatility in fuel prices or interruptions in fuel supply; (b) variability in maintenance costs and the costs of materials; (c) uncertainty over outages of the company's generation, transmission, and distribution systems, as well as storm-related expenses; (d) uncertainty regarding the cost of purchased power and the revenues achieved from off-system sales; (e) the prospect of increasing employee health care and pension expenses; and (f) the prospect of increased expenses for security.

Q. DOES EMPIRE EXPERIENCE OPERATING EXPENSE UNCERTAINTY?

A. Yes. Empire experiences both the typical operating expense uncertainty associated with its existing operations and the operating expense uncertainty associated with the future operations of major plant additions.

Q. WHY ARE UTILITY INVESTMENT COSTS UNCERTAIN?

A. The electric utility business requires large investments in the plant and equipment needed to deliver electricity to customers. The future amounts of required investments in plant and equipment are uncertain as a result of: (a) demand uncertainty; (b) the changing economics of alternative generation and distribution technologies; (c) uncertainty in environmental regulations and clean air requirements; (d) uncertainty in the costs of construction materials and labor; and (e) uncertainty in the amount of additional investments required to ensure the reliability of the company's transmission and distribution networks. Furthermore, the risk of investing in electric utility facilities is increased by the irreversible nature of the company's investments in utility plant and equipment. For example, if an electric utility decides to invest in building a new generation plant, and, as a result of new environmental regulations, energy produced by the plant becomes uneconomic, the company may not be able to earn a fair return on equity, including both a return of and a return on its investment.

Q. YOU NOTE ABOVE THAT HIGH OPERATING LEVERAGE CONTRIBUTES TO THE BUSINESS RISK OF ELECTRIC UTILITIES. WHAT IS OPERATING LEVERAGE?

A. Operating leverage is the increased sensitivity of a company's earnings to sales variability that arises when some of the company's costs are fixed.

Q. HOW DO ECONOMISTS MEASURE OPERATING LEVERAGE?

A. Economists typically measure operating leverage by the ratio of a company's fixed expenses to its operating margin (revenues minus variable expenses).

Q. WHAT IS THE DIFFERENCE BETWEEN FIXED AND VARIABLE EXPENSES?

A. Fixed expenses are expenses that do not vary with output (that is, Kwh sold), and variable expenses are expenses that vary directly with output. For electric utilities, fixed expenses include the capacity component of purchased power costs, the fixed component of operating and maintenance costs, depreciation and amortization, and taxes. Fuel expenses are the primary variable cost for electric utilities.

Q. DO ELECTRIC UTILITIES EXPERIENCE HIGH OPERATING LEVERAGE?

A. Yes. As noted above, operating leverage increases when a firm's commitment to fixed costs rises in relation to its operating margin on sales. The relatively high degree of fixed costs in the electric utility business arises primarily from: (1) the average electric utility's large investment in fixed plant and equipment; and (2) the relative "fixity" of an electric utility's operating and maintenance costs. High operating leverage causes the average electric utility's operating income to be highly sensitive to demand and revenue fluctuations.

Q. CAN AN ELECTRIC UTILITY REDUCE ITS OPERATING LEVERAGE BY PURCHASING, RATHER THAN GENERATING, ELECTRICITY?

A. No. Electric utilities generally purchase power under long-term contracts that include both a fixed capacity charge and a variable charge that depends on the amount of electricity purchased. Since the fixed capacity charge is designed to recover the seller's fixed costs of generating electricity, electric utilities generally experience the same degree of operating leverage when they purchase power as when they generate power.

Q. HOW DOES OPERATING LEVERAGE AFFECT A COMPANY'S BUSINESS RISK?

A. Operating leverage affects a company's business risk through its impact on the variability of the company's profits or income. Generally speaking, the higher a company's operating leverage, the higher is the variability of the company's operating profits.

Q. WHY DOES AN ELECTRIC UTILITY'S LARGE INVESTMENT IN FIXED PLANT AND EQUIPMENT INCREASE OPERATING LEVERAGE?

A. Operating leverage increases when a company's fixed costs are high relative to its variable costs. A large investment in fixed plant and equipment increases an electric utility's operating leverage during a construction phase because investment costs are fixed, the investment period is relatively long, and the company does not generate revenues from its new plant until the plant is placed in service. Large investments in fixed plant and equipment also increase operating leverage for a time after new plant is placed in service because revenues do not generally increase in line with investment costs for

several years after the plant is placed in service. Thus, the ratio of fixed costs to operating margin increases as result of an electric utility's large investment in fixed plant and equipment.

Q. DOES REGULATION CREATE UNCERTAINTY FOR ELECTRIC UTILITIES?

A. Yes. Investors' perceptions of the business and financial risks of electric utilities are strongly influenced by their views of the quality of regulation. Investors are keenly aware that regulators in some jurisdictions have been unwilling at times to set rates that allow companies an opportunity to recover their cost of service in a timely manner and earn a fair and reasonable return on investment. As a result of the perceived increase in regulatory risk, investors will demand a higher rate of return for electric utilities operating in those jurisdictions. On the other hand, if investors perceive that regulators will provide a reasonable opportunity for the company to maintain its financial integrity and earn a fair rate of return on its investment, investors will view regulatory risk as minimal.

Q. ARE YOU FAMILIAR WITH THE CONCEPT OF "REGULATORY LAG?"

A. Yes. "Regulatory lag" refers to the delay between the time a utility's return on investment either exceeds or falls short of its cost of capital and the time rates are adjusted to narrow the gap between the utility's return on investment and its cost of capital.

Q. HOW IS A COMPANY'S RETURN ON INVESTMENT MEASURED?

A. A company's return on investment is equal to the ratio of its operating profits (that is, revenues minus operating expenses) to its investment in plant and equipment.

Q. WHAT WOULD CAUSE A UTILITY'S RETURN ON INVESTMENT TO BE LESS THAN ITS COST OF CAPITAL?

A. A utility's return on investment will be less than its cost of capital if either: (1) its operating expenses and investment in plant and equipment are increasing faster than its revenues; or (2) its cost of capital is increasing.

Q. DOES REGULATORY LAG INCREASE A UTILITY'S RISK?

A. Yes. When a utility invests in new plant and equipment, it incurs the risk that its return on investment will be less than its cost of capital. Regulatory lag increases a utility's risk because it increases the likelihood that the company's return on investment will be less than its cost of capital.

Q. HOW CAN REGULATORS REDUCE THE RISK OF REGULATORY LAG?

A. Regulators can reduce the risk of regulatory lag by various means, such as employing fuel adjustment clauses, using forward-looking test years, and including construction-work-in-progress in rate base.

Q. DOES THE COMMISSION SET RATES BASED ON A FORWARD-LOOKING TEST YEAR?

A. No. Rates in Missouri are based on an historical test period, adjusted for known and measurable changes. Typically, the Commission provides for an update period beyond the end of the historical test year.

Q. YOU NOTE THAT FINANCIAL LEVERAGE INCREASES THE RISK OF INVESTING IN ELECTRIC UTILITIES SUCH AS EMPIRE. HOW DO ECONOMISTS MEASURE FINANCIAL LEVERAGE?

A. Economists generally measure financial leverage by the percentages of debt and equity in a company's market value capital structure. Companies with a high percentage of debt compared to equity are considered to have high financial leverage.

Q. WHY DOES FINANCIAL LEVERAGE AFFECT THE RISK OF INVESTING IN AN ELECTRIC UTILITY'S STOCK?

A. High debt leverage is a source of additional risk to utility stock investors because it increases the percentage of the firm's costs that are fixed, and the presence of higher fixed costs increases the variability of the equity investors' return on investment.

Q. CAN THE RISKS FACING ELECTRIC UTILITIES SUCH AS EMPIRE BE DISTINGUISHED FROM THE RISKS OF INVESTING IN COMPANIES IN OTHER INDUSTRIES?

A. Yes. The risks of investing in electric utilities such as Empire can be distinguished from the risks of investing in companies in many other industries in several ways. First, the risks of investing in electric utilities are increased because of the greater capital intensity of the electric energy business and the fact that most investments in electric energy facilities are largely irreversible once they are made. Second, unlike returns in competitive

industries, the returns from investment in electric utilities such as Empire are largely asymmetric. That is, there is little opportunity for the utility to earn more than its required return, but a significant chance that the utility will earn less than its required return.

V. COST OF EQUITY ESTIMATION METHODS

Q. WHAT METHODS DO YOU USE TO ESTIMATE EMPIRE'S FAIR RATE OF RETURN ON EQUITY?

A. I use several generally accepted methods for estimating the cost of equity for Empire. These are the Discounted Cash Flow (DCF), the ex ante risk premium, the ex post risk premium, and the capital asset pricing model (CAPM). The DCF method assumes that the current market price of a firm's stock is equal to the discounted value of all expected future cash flows. The ex ante risk premium method assumes that an investor's current expectations regarding the equity risk premium can be estimated from data on the DCF expected rate of return on equity compared to the interest rate on long-term bonds. The ex post risk premium method assumes that an investor's current expectations regarding the equity-debt return differential is equal to the historical record of comparable returns on stock and bond investments. The cost of equity under both risk premium methods is then equal to the interest rate on bond investments plus the risk premium. The CAPM assumes that the investor's required rate of return on equity is equal to a risk-free rate of

interest plus the product of a company-specific risk factor, beta, and the expected risk premium on the market portfolio.

A. DISCOUNTED CASH FLOW METHOD

Q. PLEASE DESCRIBE THE DCF MODEL.

A. The DCF model is derived from the assumption that investors value an asset on the basis of the future cash flows they expect to receive from owning the asset. Thus, investors value an investment in a bond because they expect to receive a sequence of semi-annual coupon payments over the life of the bond and a terminal payment equal to the bond's face value at the time the bond matures. Likewise, investors value an investment in a firm's stock because they expect to receive a sequence of dividend payments and, perhaps, expect to sell the stock at a higher price sometime in the future.

A second fundamental principle of the DCF method is that investors value a dollar received in the future less than a dollar received today. A future dollar is valued less than a current dollar because investors could invest a current dollar in an interest earning account and increase their wealth. This principle is called the time value of money.

Applying the two fundamental DCF principles noted above to an investment in a bond leads to the conclusion that investors value their investment in the bond on the basis of the present value of the bond's future cash flows. Thus, the price of the bond should be equal to:

EQUATION 1

$$P_B = \frac{C}{(1+i)} + \frac{C}{(1+i)^2} + \ldots + \frac{C+F}{(1+i)^n}$$

where:

P_B = Bond price;

C = Cash value of the coupon payment (assumed for notational convenience to occur annually rather than semi-annually);

F = Face value of the bond;

i = The rate of interest the investor could earn by investing his money in an alternative bond of equal risk; and

n = The number of periods before the bond matures.

Applying these same principles to an investment in a firm's stock suggests that the price of the stock should be equal to:

EQUATION 2

$$P_s = \frac{D_1}{(1+k)} + \frac{D_2}{(1+k)^2} + \ldots + \frac{D_n + P_n}{(1+k)^n}$$

where:

P_S = Current price of the firm's stock;

$D_1, D_2 \ldots D_n$ = Expected annual dividend per share on the firm's stock;

P_n = Price per share of stock at the time the investor expects to sell the stock; and

k = Return the investor expects to earn on alternative investments of the same risk, i.e., the investor's required rate of return.

Equation (2) is frequently called the annual discounted cash flow model of stock valuation. Assuming that dividends grow at a constant annual rate, *g*, this equation can be solved for *k*, the cost of equity. The resulting cost of equity equation is $k = D_1/P_s + g$, where *k* is the cost of equity, D_1 is the expected next period annual dividend, P_s is the current price of the stock, and *g* is the constant annual growth rate in earnings, dividends, and book value per share. The term D_1/P_s is called the expected dividend yield component of the annual DCF model, and the term *g* is called the expected growth component of the annual DCF model.

Q. ARE YOU RECOMMENDING THAT THE ANNUAL DCF MODEL BE USED TO ESTIMATE EMPIRE'S COST OF EQUITY?

A. No. The DCF model assumes that a company's stock price is equal to the present discounted value of all expected future dividends. The annual DCF model is only a correct expression of the present value of future dividends if dividends are paid annually at the end of each year. Since the companies in my proxy group all pay dividends quarterly, the current market price that investors are willing to pay reflects the expected quarterly receipt of

dividends. Therefore, a quarterly DCF model should be used to estimate the cost of equity for these firms. The quarterly DCF model differs from the annual DCF model in that it expresses a company's price as the present value of a quarterly stream of dividend payments. A complete analysis of the implications of the quarterly payment of dividends on the DCF model is provided in Appendix 2. For the reasons cited there, I employ the quarterly DCF model throughout my calculations.

Q. PLEASE DESCRIBE THE QUARTERLY DCF MODEL YOU USE.

A. The quarterly DCF model I use is described on Schedule JVW-1 and in Appendix 2. The quarterly DCF equation shows that the cost of equity is the sum of the future expected dividend yield and the growth rate, where the dividend in the dividend yield is the equivalent future value of the four quarterly dividends at the end of the year, and the growth rate is the expected growth in dividends or earnings per share.

Q. HOW DO YOU ESTIMATE THE QUARTERLY DIVIDEND PAYMENTS IN YOUR QUARTERLY DCF MODEL?

A. The quarterly DCF model requires an estimate of the dividends, d_1, d_2, d_3, and d_4, investors expect to receive over the next four quarters. I estimate the next four quarterly dividends by multiplying the previous four quarterly dividends by the factor, *(1 + the growth rate, g)*.

Q. CAN YOU ILLUSTRATE HOW YOU ESTIMATE THE NEXT FOUR QUARTERLY DIVIDENDS WITH DATA FOR A SPECIFIC COMPANY?

A. Yes. In the case of ALLETE, the first company shown in Schedule JVW-1, the last four quarterly dividends are equal to 0.49, 0.49, 0.505, and 0.505; and the growth rate is 6.0 percent. Thus dividends d_1, d_2, d_3 and d_4 are equal to 0.519, 0.519, 0.535, and 0.535, respectively [.49 x (1 + .06 = 0.519], and [.505 x (1 + .06) = 0.535]. As noted previously, the logic underlying this procedure is described in Appendix 2.

Q. HOW DO YOU ESTIMATE THE GROWTH COMPONENT OF THE QUARTERLY DCF MODEL?

A. I use the analysts' estimates of future earnings per share ("EPS") growth reported by I/B/E/S Thomson Reuters.

Q. WHAT ARE THE ANALYSTS' ESTIMATES OF FUTURE EPS GROWTH?

A. As part of their research, financial analysts working at Wall Street firms periodically estimate EPS growth for each firm they follow. The EPS forecasts for each firm are then published. Investors who are contemplating purchasing or selling shares in individual companies review the forecasts. These estimates represent three- to five-year forecasts of EPS growth.

Q. WHAT IS I/B/E/S?

A. I/B/E/S is a division of Thomson Reuters that reports analysts' EPS growth forecasts for a broad group of companies. The forecasts are expressed in terms of a mean forecast and a standard deviation of forecast for each firm. Investors use the mean forecast as an estimate of future firm performance.

Q. WHY DO YOU USE THE I/B/E/S GROWTH ESTIMATES?

A. The I/B/E/S growth rates: (1) are widely circulated in the financial community, (2) include the projections of reputable financial analysts who develop estimates of future EPS growth, (3) are reported on a timely basis to investors, and (4) are widely used by institutional and other investors.

Q. WHY DO YOU RELY ON ANALYSTS' PROJECTIONS OF FUTURE EPS GROWTH IN ESTIMATING THE INVESTORS' EXPECTED GROWTH RATE RATHER THAN RELYING ON HISTORICAL OR RETENTION GROWTH RATES?

A. I rely on analysts' projections of future EPS growth rather than historical or retention growth rates because there is considerable empirical evidence that analysts' forecasts are the best estimate of investors' expectation of future long-term growth. The evidence that analysts' forecasts are the best estimate of investors' expectation of future long-term growth is important because the DCF model requires the growth expectations of investors.

Q. HAVE YOU PERFORMED ANY STUDIES CONCERNING THE USE OF ANALYSTS' FORECASTS AS AN ESTIMATE OF INVESTORS' EXPECTED GROWTH RATE, G?

A. Yes, I prepared a study in conjunction with Willard T. Carleton, Professor of Finance Emeritus at the University of Arizona, on why analysts' forecasts are the best estimate of investors' expectation of future long-term growth. This study is described in a paper entitled "Investor Growth Expectations and

Stock Prices: the Analysts versus History," published in *The Journal of Portfolio Management*.

Q. PLEASE SUMMARIZE THE RESULTS OF YOUR STUDY.

A. First, we performed a correlation analysis to identify the historically oriented growth rates which best described a firm's stock price. Then we did a regression study comparing the historical growth rates with the average I/B/E/S analysts' forecasts. In every case, the regression equations containing the average of analysts' forecasts statistically outperformed the regression equations containing the historical growth estimates. These results are consistent with those found by Cragg and Malkiel, the early major research in this area (John G. Cragg and Burton G. Malkiel, *Expectations and the Structure of Share Prices*, University of Chicago Press, 1982). These results are also consistent with the hypothesis that investors use analysts' forecasts, rather than historically oriented growth calculations, in making stock buy and sell decisions. They provide overwhelming evidence that the analysts' forecasts of future growth are superior to historically-oriented growth measures in predicting a firm's stock price.

Q. HAS YOUR STUDY BEEN UPDATED TO INCLUDE MORE RECENT DATA?

A. Yes. Researchers at State Street Financial Advisors updated my study using data through year-end 2003. Their results continue to confirm that analysts'

growth forecasts are superior to historically-oriented growth measures in predicting a firm's stock price.

Q. WHAT PRICE DO YOU USE IN YOUR DCF MODEL?

A. I use a simple average of the monthly high and low stock prices for each firm for the three-month period ending July 2015. These high and low stock prices were obtained from Thomson Reuters.

Q. WHY DO YOU USE THE THREE-MONTH AVERAGE STOCK PRICE IN APPLYING THE DCF METHOD?

A. I use the three-month average stock price in applying the DCF method because stock prices fluctuate daily, while financial analysts' forecasts for a given company are generally changed less frequently, often on a quarterly basis. Thus, to match the stock price with an earnings forecast, it is appropriate to average stock prices over a three-month period.

Q. DO YOU INCLUDE AN ALLOWANCE FOR FLOTATION COSTS IN YOUR DCF ANALYSIS?

A. No. Since Empire is seeking to recover its equity flotation costs as an expense over a five-year period, I have not included an allowance for flotation costs in my cost of equity calculations.

Q. HOW DO YOU APPLY THE DCF APPROACH TO OBTAIN THE COST OF EQUITY CAPITAL FOR EMPIRE?

A. I apply the DCF approach to the Value Line electric companies shown in Schedule JVW-1.

Q. HOW DO YOU SELECT YOUR PROXY GROUP OF ELECTRIC COMPANIES?

A. I select all the companies in Value Line's groups of electric companies that: (1) paid dividends during every quarter of the last two years; (2) did not decrease dividends during any quarter of the past two years; (3) have an I/B/E/S long-term growth forecast; and (4) are not the subject of a merger offer that has not been completed. In addition, each of the utilities included in my comparable groups has an investment grade bond rating and a Value Line Safety Rank of 1, 2, or 3.

Q. WHY DO YOU ELIMINATE COMPANIES THAT HAVE EITHER DECREASED OR ELIMINATED THEIR DIVIDEND IN THE PAST TWO YEARS?

A. The DCF model requires the assumption that dividends will grow at a constant rate into the indefinite future. If a company has either decreased or eliminated its dividend in recent years, an assumption that the company's dividend will grow at the same rate into the indefinite future is questionable.

Q. WHY DO YOU ELIMINATE COMPANIES THAT ARE BEING ACQUIRED IN TRANSACTIONS THAT ARE NOT YET COMPLETED?

A. A merger announcement can sometimes have a significant impact on a company's stock price because of anticipated merger-related cost savings and new market opportunities. Analysts' growth forecasts, on the other hand, are necessarily related to companies as they currently exist, and do not

reflect investors' views of the potential cost savings and new market opportunities associated with mergers. The use of a stock price that includes the value of potential mergers in conjunction with growth forecasts that do not include the growth enhancing prospects of potential mergers produces DCF results that tend to distort a company's cost of equity.

Q. PLEASE SUMMARIZE THE RESULTS OF YOUR APPLICATION OF THE DCF MODEL TO YOUR PROXY COMPANY GROUP.

A. As shown on Schedule JVW-1, I obtain an average result of 9.9 percent for my proxy company group.

B. RISK PREMIUM METHOD

Q. PLEASE DESCRIBE THE RISK PREMIUM METHOD OF ESTIMATING EMPIRE'S COST OF EQUITY.

A. The risk premium method is based on the principle that investors expect to earn a return on an equity investment in Empire that reflects a "premium" over and above the return they expect to earn on an investment in a portfolio of bonds. This equity risk premium compensates equity investors for the additional risk they bear in making equity investments versus bond investments.

Q. DOES THE RISK PREMIUM APPROACH SPECIFY WHAT DEBT INSTRUMENT SHOULD BE USED TO ESTIMATE THE INTEREST RATE COMPONENT IN THE METHODOLOGY?

A. No. The risk premium approach can be implemented using virtually any debt instrument. However, the risk premium approach does require that the debt instrument used to estimate the risk premium be the same as the debt instrument used to calculate the interest rate component of the risk premium approach. For example, if the risk premium on equity is calculated by comparing the returns on stocks and the returns on A-rated utility bonds, then the interest rate on A-rated utility bonds must be used to estimate the interest rate component of the risk premium approach.

Q. HOW DO YOU MEASURE THE REQUIRED RISK PREMIUM ON AN EQUITY INVESTMENT IN EMPIRE?

A. I use two methods to estimate the required risk premium on an equity investment in Empire. The first is called the ex ante risk premium method and the second is called the ex post risk premium method.

1. EX ANTE RISK PREMIUM METHOD

Q. PLEASE DESCRIBE YOUR EX ANTE RISK PREMIUM APPROACH FOR MEASURING THE REQUIRED RISK PREMIUM ON AN EQUITY INVESTMENT IN EMPIRE.

A. My ex ante risk premium method is based on studies of the DCF expected return on a proxy group of electric companies compared to the interest rate on Moody's A-rated utility bonds. Specifically, for each month in my study period, I calculate the risk premium using the equation,

$$RP_{PROXY} = DCF_{PROXY} - I_A$$

where:

RP_{PROXY} = the required risk premium on an equity investment in the proxy group of companies;

DCF_{PROXY} = average DCF estimated cost of equity on a portfolio of proxy companies; and

I_A = the yield to maturity on an investment in A-rated utility bonds.

I then perform a regression analysis to determine if there is a relationship between the calculated risk premium and interest rates. Finally, I use the results of the regression analysis to estimate the investors' required risk premium. To estimate the cost of equity, I then add the required risk premium to the forecasted interest rate on A-rated utility bonds. A detailed description of my ex ante risk premium studies is contained in Appendix 3, and the underlying DCF results and interest rates are displayed in Schedule JVW-2.

Q. WHAT COST OF EQUITY DO YOU OBTAIN FROM YOUR EX ANTE RISK PREMIUM METHOD?

A. As discussed above, to estimate the cost of equity using the ex ante risk premium method, one may add the estimated risk premium over the yield on A-rated utility bonds to the forecasted yield to maturity on A-rated utility bonds. I obtain the expected yield to maturity on A-rated utility bonds, 5.93 percent, by averaging the most recent forecast data from Value Line and the U.S. Energy Information Administration ("EIA"). For my electric utility

sample, my analyses produce an estimated risk premium over the yield on A-rated utility bonds equal to 4.62 percent. Adding an estimated risk premium of 4.62 percent to the expected 5.93 percent yield to maturity on A-rated utility bonds produces a cost of equity estimate of 10.6 percent using the ex ante risk premium method.

Q. HOW DO YOU OBTAIN THE EXPECTED YIELD ON A-RATED UTILITY BONDS?

A. As noted above, I obtain the expected yield to maturity on A-rated utility bonds, 5.9 percent, by averaging forecast data from Value Line and the EIA. Value Line Selection & Opinion (May 22, 2015) projects a AAA-rated Corporate bond yield equal to 5.3 percent. The average spread between A-rated utility bonds and Aaa-rated Corporate bonds at June 2015 is 24 basis points (A-rated utility, 4.39 percent, less Aaa-rated Corporate, 4.15 percent, equals 24 basis points). Adding 24 basis points to the 5.3 percent Value Line Aaa Corporate bond yield forecast equals a forecast yield of 5.54 percent for the A-rated utility bonds.

The EIA forecasts a AA-rated utility bond yield equal to 6.21 percent. The average spread between AA-rated utility and A-rated utility bonds is ten basis points (4.39 percent less 4.29 percent). Adding ten basis points to EIA's 6.21 percent AA-utility bond yield forecast equals a forecast yield for A-rated utility bonds equal to 6.31 percent. The average of the forecasts is

5.9 percent (5.5 percent using Value Line data and 6.3 percent using EIA data).

Q. WHY DO YOU USE A FORECASTED YIELD TO MATURITY ON A-RATED UTILITY BONDS RATHER THAN A CURRENT YIELD TO MATURITY?

A. I use a forecasted yield to maturity on A-rated utility bonds rather than a current yield to maturity because the fair rate of return standard requires that a company have an opportunity to earn its required return on its investment during the forward-looking period during which rates will be in effect. In addition, because current interest rates are artificially depressed as a result of the Federal Reserve's extraordinary efforts to keep interest rates low in order to stimulate the economy, current interest rates at this time are a poor indicator of expected future interest rates. Economists project that future interest rates will be higher than current interest rates as the Federal Reserve allows interest rates to rise in order to prevent inflation. Thus, the use of forecasted interest rates is consistent with the fair rate of return standard, whereas the use of current interest rates at this time is not.

2. EX POST RISK PREMIUM METHOD

Q. PLEASE DESCRIBE YOUR EX POST RISK PREMIUM METHOD FOR MEASURING THE REQUIRED RISK PREMIUM ON AN EQUITY INVESTMENT IN EMPIRE.

A. I first perform a study of the comparable returns received by bond and stock investors over the seventy-seven years of my study. I estimate the returns on

stock and bond portfolios, using stock price and dividend yield data on the S&P 500 and bond yield data on Moody's A-rated Utility Bonds. My study consists of making an investment of one dollar in the S&P 500 and Moody's A-rated utility bonds at the beginning of 1937, and reinvesting the principal plus return each year to 2015. The return associated with each stock portfolio is the sum of the annual dividend yield and capital gain (or loss) which accrued to this portfolio during the year(s) in which it was held. The return associated with the bond portfolio, on the other hand, is the sum of the annual coupon yield and capital gain (or loss) which accrued to the bond portfolio during the year(s) in which it was held. The resulting annual returns on the stock and bond portfolios purchased in each year from 1937 to 2015 are shown on Schedule JVW-3. The average annual return on an investment in the S&P 500 stock portfolio is 11.3 percent, while the average annual return on an investment in the Moody's A-rated utility bond portfolio is 6.8 percent. The risk premium on the S&P 500 stock portfolio is, therefore, 4.5 percent.

I also conduct a second study using stock data on the S&P Utilities rather than the S&P 500. As shown on Schedule JVW-4, the S&P Utility stock portfolio shows an average annual return of 10.7 percent per year. Thus, the return on the S&P Utility stock portfolio exceeds the return on the Moody's A–rated utility bond portfolio by 3.9 percent.

Q. WHY IS IT APPROPRIATE TO PERFORM YOUR EX POST RISK PREMIUM ANALYSIS USING BOTH THE S&P 500 AND THE S&P UTILITIES STOCK INDICES?

A. I perform my ex post risk premium analysis on both the S&P 500 and the S&P Utilities Stock Indices because I believe electric utilities today face risks that are somewhere in between the average risk of the S&P Utilities and the S&P 500 Stock Indices over the years 1937 to 2015. Thus, I use the average of the two historically-based risk premiums as my estimate of the required risk premium for Empire in my ex post risk premium method.

Q. WHY DO YOU ANALYZE INVESTORS' EXPERIENCES OVER SUCH A LONG TIME FRAME?

A. Because day-to-day stock price movements can be somewhat random, it is inappropriate to rely on short-run movements in stock prices in order to derive a reliable risk premium. Rather than buying and selling frequently in anticipation of highly volatile price movements, most investors employ a strategy of buying and holding a diversified portfolio of stocks. This buy-and-hold strategy will allow an investor to achieve a much more predictable long-run return on stock investments and at the same time will minimize transaction costs. The situation is very similar to the problem of predicting the results of coin tosses. I cannot predict with any reasonable degree of accuracy the result of a single, or even a few, flips of a balanced coin; but I can predict with a good deal of confidence that approximately fifty heads will

appear in one hundred tosses of this coin. Under these circumstances, it is most appropriate to estimate future experience from long-run evidence of investment performance.

Q. WOULD YOUR STUDY PROVIDE A DIFFERENT RISK PREMIUM IF YOU WERE TO BEGIN WITH A DIFFERENT TIME PERIOD?

A. Yes. Risk premium results vary somewhat depending on the historical time period chosen. My policy is to go back as far as it is possible to obtain reliable data. I believe it to be most meaningful to begin after the passage and implementation of the Public Utility Holding Company Act of 1935, which significantly changed the structure of the public utility industry. Since the Public Utility Holding Company Act of 1935 was not implemented until the beginning of 1937, I believe that numbers taken from before this date are not comparable to those taken after. (The repeal of the 1935 Act has not materially impacted the structure of the public utility industry; thus, the Act's repeal does not have any impact on my choice of time period.)

Q. WHY IS IT NECESSARY TO EXAMINE THE YIELD FROM DEBT INVESTMENTS IN ORDER TO DETERMINE THE INVESTORS' REQUIRED RATE OF RETURN ON EQUITY CAPITAL?

A. As previously explained, investors expect to earn a return on their equity investment that exceeds currently available bond yields because the return on equity, as a residual return, is less certain than the yield on bonds; and investors must be compensated for this uncertainty. Second, investors'

current expectations concerning the amount by which the return on equity will exceed the bond yield will be strongly influenced by historical differences in returns to bond and stock investors. For these reasons, we can estimate investors' current expected returns on equity investments from knowledge of current bond yields and past differences between returns on stocks and bonds.

Q. WHAT CONCLUSIONS DO YOU DRAW FROM YOUR EX POST RISK PREMIUM ANALYSES ABOUT THE REQUIRED RETURN ON AN EQUITY INVESTMENT IN EMPIRE?

A. My ex post risk premium analyses suggest that investors require an equity return at least 3.9 to 4.5 percentage points above the expected yield on A-rated utility bonds. The forecast yield on A-rated utility bonds is 5.9 percent. Adding a 3.9 to 4.5 percentage point risk premium to a yield of 5.9 percent on A-rated utility bonds, I obtain an expected return on equity in the range 9.8 percent to 10.4 percent, with a midpoint estimate of the ex post risk premium cost of equity equal to 10.1 percent.

C. CAPITAL ASSET PRICING MODEL

Q. WHAT IS THE CAPM?

A. The CAPM is an equilibrium model of the security markets in which the expected or required return on a given security is equal to the risk-free rate of interest, plus the company equity "beta," times the market risk premium:

Cost of equity = Risk-free rate + Equity beta x Market risk premium

The risk-free rate in this equation is the expected rate of return on a risk-free government security, the equity beta is a measure of the company's risk relative to the market as a whole, and the market risk premium is the premium investors require to invest in the market basket of all securities compared to the risk-free security.

Q. HOW DO YOU USE THE CAPM TO ESTIMATE THE COST OF EQUITY FOR YOUR PROXY COMPANIES?

A. The CAPM requires an estimate of the risk-free rate, the company-specific risk factor or beta, and the expected return on the market portfolio. For my estimate of the risk-free rate, I use the forecasted yield to maturity on 20-year Treasury bonds of 4.45 percent, using forecast data from Value Line and EIA.[1] I use the 20-year Treasury bond to estimate the risk-free rate because SBBI estimates the risk premium using 20-year Treasury bonds, and one should use the same maturity to estimate the risk-free rate as is used to estimate the risk premium on the market portfolio.

For my estimate of the company-specific risk, or beta, I use the average 0.70 Value Line beta for my proxy electric companies. For my estimate of the expected risk premium on the market portfolio, I use two

[1] Value Line forecasts a yield on 10-year Treasury notes equal to 3.8 percent. The spread between the average June 2015 yield on 10-year Treasury notes (2.36 percent) and 20-year Treasury bonds (2.85 percent) is 49 basis points. Adding 49 basis points to Value Line's 3.8 percent forecasted yield on 10-year Treasury notes produces a forecasted yield of 4.29 percent for 20-year Treasury bonds (see Value Line Investment Survey, Selection & Opinion, May 22, 2015). EIA forecasts a yield of 4.11 percent on 10-year Treasury notes. Adding the 49 basis point spread between 10-year Treasury notes and 20-year Treasury bonds to the EIA forecast of 4.11 percent for 10-year Treasury notes produces an EIA forecast for 20-year Treasury bonds equal to 4.60 percent. The average of the forecasts is 4.45 percent (4.29 percent using Value Line data and 4.6 percent using EIA data).

approaches. First, I estimate the risk premium on the market portfolio using historical risk premium data reported by SBBI. Second, I estimate the risk premium on the market portfolio from the difference between the DCF cost of equity for the S&P 500 and the forecasted yield to maturity on 20-year Treasury bonds.

1. HISTORICAL CAPM

Q. HOW DO YOU ESTIMATE THE EXPECTED RISK PREMIUM ON THE MARKET PORTFOLIO USING HISTORICAL RISK PREMIUM DATA REPORTED BY SBBI?

A. I estimate the expected risk premium on the market portfolio by calculating the difference between the arithmetic mean return on the S&P 500 from 1926 through 2014 (12.1 percent) and the average income return on 20-year U.S. Treasury bonds over the same period (5.1 percent) (*see* Ibbotson® SBBI® 2015 Yearbook, published by Morningstar®). Thus, my historical risk premium method produces a risk premium of 7.0 percent (12.1 – 5.1 = 7.0).

Q. WHY DO YOU RECOMMEND THAT THE RISK PREMIUM ON THE MARKET PORTFOLIO BE ESTIMATED USING THE ARITHMETIC MEAN RETURN ON THE S&P 500?

A. As explained in SBBI, the arithmetic mean return is the best approach for calculating the return investors expect to receive in the future:

> The equity risk premium data presented in this book are arithmetic average risk premia as opposed to geometric average risk premia. The arithmetic average equity risk premium can be demonstrated to be most appropriate when

> discounting future cash flows. For use as the expected equity risk premium in either the CAPM or the building block approach, the arithmetic mean or the simple difference of the arithmetic means of stock market returns and riskless rates is the relevant number. This is because both the CAPM and the building block approach are additive models, in which the cost of capital is the sum of its parts. The geometric average is more appropriate for reporting past performance, since it represents the compound average return. [Ibbotson® SBBI® 2014 Valuation Yearbook, published by Morningstar®, p. 56.]

A discussion of the importance of using arithmetic mean returns in the context of CAPM or risk premium studies is contained in Schedule JVW- 5.

Q. WHY DO YOU RECOMMEND THAT THE RISK PREMIUM ON THE MARKET PORTFOLIO BE MEASURED USING THE INCOME RETURN ON 20-YEAR TREASURY BONDS RATHER THAN THE TOTAL RETURN ON THESE BONDS?

A. As discussed above, the CAPM requires an estimate of the risk-free rate of interest. When Treasury bonds are issued, the income return on the bond is risk free, but the total return, which includes both income and capital gains or losses, is not. Thus, the income return should be used in the CAPM because it is only the income return that is risk free.

Q. WHAT CAPM RESULT DO YOU OBTAIN WHEN YOU ESTIMATE THE EXPECTED RISK PREMIUM ON THE MARKET PORTFOLIO FROM THE ARITHMETIC MEAN DIFFERENCE BETWEEN THE RETURN ON THE MARKET AND THE YIELD ON 20-YEAR TREASURY BONDS?

A. Using a risk-free rate equal to 4.45 percent, a beta equal to 0.70, and a risk premium on the market portfolio equal to 7.0 percent, I obtain an historical

CAPM estimate of the cost of equity equal to 9.4 percent (4.45 + 0.70 x 7.0 = 9.4), see Schedule JVW-6.

Q. IS THERE ANY EVIDENCE FROM THE FINANCE LITERATURE THAT THE APPLICATION OF THE HISTORICAL CAPM MAY UNDERESTIMATE THE COST OF EQUITY?

A. Yes. There is substantial evidence that: (1) the historical CAPM tends to underestimate the cost of equity for companies whose equity beta is less than 1.0; and (2) the CAPM is less reliable the further the estimated beta is from 1.0.

Q. WHAT IS THE EVIDENCE THAT THE CAPM TENDS TO UNDERESTIMATE THE COST OF EQUITY FOR COMPANIES WITH BETAS LESS THAN 1.0 AND IS LESS RELIABLE THE FURTHER THE ESTIMATED BETA IS FROM 1.0?

A. The original evidence that the unadjusted CAPM tends to underestimate the cost of equity for companies whose equity beta is less than 1.0 and is less reliable the further the estimated beta is from 1.0 was presented in a paper by Black, Jensen, and Scholes (1972), “The Capital Asset Pricing Model: Some Empirical Tests.” Numerous subsequent papers have validated the Black, Jensen, and Scholes findings, including those by Litzenberger and Ramaswamy (1979), Banz (1981), Fama and French (1992), Fama and

French (2004), Fama and MacBeth (1973), and Jegadeesh and Titman (1993).[2]

Q. CAN YOU BRIEFLY SUMMARIZE THESE ARTICLES?

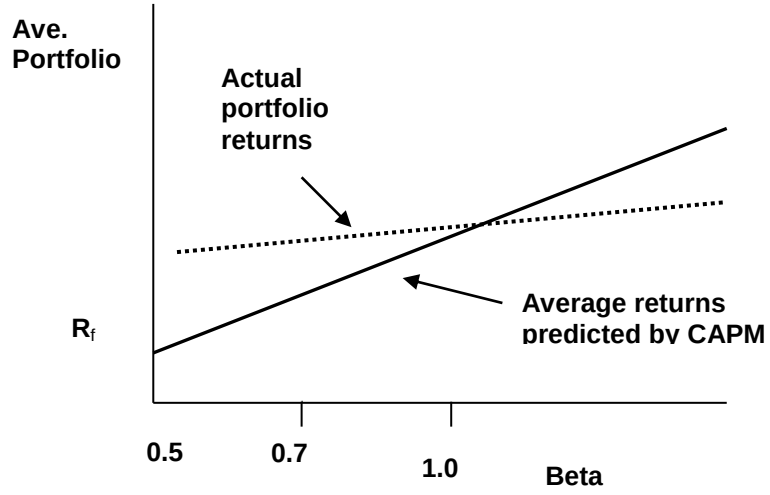
A. Yes. The CAPM conjectures that security returns increase with increases in security betas in line with the equation

$$ER_i = R_f + \beta_i \left[ER_m - R_f \right],$$

where ER_i is the expected return on security or portfolio *i*, R_f is the risk-free rate, $ER_m - R_f$ is the expected risk premium on the market portfolio, and β_i is a measure of the risk of investing in security or portfolio *i* (see Figure 1 below).

[2] Fischer Black, Michael C. Jensen, and Myron Scholes, "The Capital Asset Pricing Model: Some Empirical Tests," in *Studies in the Theory of Capital Markets*, M. Jensen, ed. New York: Praeger, 1972; Eugene Fama and James MacBeth, "Risk, Return, and Equilibrium: Empirical Tests," *Journal of Political Economy* 81 (1973), pp. 607-36; Robert Litzenberger and Krishna Ramaswamy, "The Effect of Personal Taxes and Dividends on Capital Asset Prices: Theory and Empirical Evidence," *Journal of Financial Economics* 7 (1979), pp. 163-95.; Rolf Banz, "The Relationship between Return and Market Value of Common Stocks," *Journal of Financial Economics* (March 1981), pp. 3-18; Eugene F. Fama and Kenneth R. French, "The Cross-Section of Expected Returns," *Journal of Finance* (June 1992), 47:2, pp. 427-465; Eugene F. Fama and Kenneth R. French, "The Capital Asset Pricing Model: Theory and Evidence," *The Journal of Economic Perspectives* (Summer 2004), 18:3, pp. 25 – 46; Narasimhan Jegadeesh and Sheridan Titman, "Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency," *The Journal of Finance*, Vol. 48, No. 1. (Mar., 1993), pp. 65-91.

FIGURE 1
AVERAGE RETURNS COMPARED TO BETA
FOR PORTFOLIOS FORMED ON PRIOR BETA



Financial scholars have studied the relationship between estimated portfolio betas and the achieved returns on the underlying portfolio of securities to test whether the CAPM correctly predicts achieved returns in the marketplace. They find that the relationship between returns and betas is inconsistent with the relationship posited by the CAPM. As described in Fama and French (1992) and Fama and French (2004), the actual relationship between portfolio betas and returns is shown by the dotted line in Figure 1 above. Although financial scholars disagree on the reasons why the return/beta relationship looks more like the dotted line in Figure 1 than the straight line, they generally agree that the dotted line lies above the straight line for portfolios with betas less than 1.0 and below the straight line for portfolios with betas greater than 1.0. Thus, in practice, scholars generally agree that the CAPM underestimates portfolio returns for companies with betas less than 1.0 and is less reliable the further the estimated beta is from 1.0.

Q. DO YOU HAVE ADDITIONAL EVIDENCE THAT THE CAPM TENDS TO UNDERESTIMATE THE COST OF EQUITY FOR UTILITY COMPANIES WITH AVERAGE BETAS LESS THAN 1.0?

A. Yes. As shown in Schedule 7, over the period 1937 to 2015, investors in the S&P Utilities Stock Index have earned a risk premium over the yield on long-term Treasury bonds equal to 5.49 percent, while investors in the S&P 500 have earned a risk premium over the yield on long-term Treasury bonds equal to 6.06 percent. According to the CAPM, investors in utility stocks should expect to earn a risk premium over the yield on long-term Treasury securities equal to the average utility beta times the expected risk premium on the S&P 500. Thus, the ratio of the risk premium on the utility portfolio to the risk premium on the S&P 500 should equal the utility beta. However, the average utility beta at the time of my studies is approximately 0.70, whereas the historical ratio of the utility risk premium to the S&P 500 risk premium is 0.90 (5.49 ÷ 6.06 = 0.90). In short, the current 0.70 measured beta for electric utilities significantly underestimates the cost of equity for the utilities, providing further support for the conclusion that the CAPM underestimates the cost of equity for utilities at this time.

Q. CAN YOU ADJUST FOR THE TENDENCY OF THE CAPM TO UNDERESTIMATE THE COST OF EQUITY FOR COMPANIES WITH BETAS SIGNIFICANTLY LESS THAN 1.0?

A. Yes. I can implement the CAPM using the 0.90 beta I discuss above, which I obtain by comparing the historical returns on utilities to historical returns on the S&P 500.

Q. WHAT CAPM RESULT DO YOU OBTAIN WHEN YOU USE A BETA EQUAL TO 0.90 RATHER THAN AN ELECTRIC UTILITY BETA EQUAL TO 0.70?

A. I obtain a CAPM result equal to 10.8 percent using a risk free rate equal to 4.45 percent, a beta equal to 0.90, and the historical market risk premium equal to 7.0 percent (4.45 + 0.90 x 7.0 = 10.8). (See Schedule JVW-8.)

2. DCF-BASED CAPM

Q. HOW DOES YOUR DCF-BASED CAPM DIFFER FROM YOUR HISTORICAL CAPM?

A. As noted above, my DCF-based CAPM differs from my historical CAPM only in the method I use to estimate the risk premium on the market portfolio. In the historical CAPM, I use historical risk premium data to estimate the risk premium on the market portfolio. In the DCF-based CAPM, I estimate the risk premium on the market portfolio from the difference between the DCF cost of equity for the S&P 500 and the forecasted yield to maturity on 20-year Treasury bonds.

Q. WHAT RISK PREMIUM DO YOU OBTAIN WHEN YOU CALCULATE THE DIFFERENCE BETWEEN THE DCF-RETURN ON THE S&P 500 AND THE RISK-FREE RATE?

A. Using this method, I obtain a risk premium on the market portfolio equal to 7.55 percent.

Q. WHAT CAPM RESULTS DO YOU OBTAIN WHEN YOU ESTIMATE THE EXPECTED RETURN ON THE MARKET PORTFOLIO BY APPLYING THE DCF MODEL TO THE S&P 500?

A. Using a risk-free rate of 4.45 percent, a beta of 0.70, and a risk premium on the market portfolio of 7.55 percent, I obtain a CAPM result of 9.7 percent. Using a risk-free rate of 4.45 percent, a beta of 0.90, and a risk premium on the market portfolio of 7.55 percent, I obtain a CAPM result of 11.2 percent (see Schedule JVW-9).

Q. WHAT CONCLUSIONS DO YOU DRAW FROM YOUR REVIEW OF THE CAPM LITERATURE AND THE EVIDENCE THAT UTILITY BETAS ARE SIGNIFICANTLY LESS THAN THE HISTORICAL RATIO OF THE UTILITY RISK PREMIUM TO THE S&P 500 RISK PREMIUM?

A. I conclude that the CAPM underestimates the cost of equity for companies with betas significantly less than 1.0 and is less reliable the further the estimated beta is from 1.0. Given that the average beta for my proxy group of electric utilities is 0.70, I conclude that the cost of equity model results from applying the CAPM based on results using a beta equal to 0.70 should be given little or no weight for the purpose of estimating Empire's cost of equity in this proceeding.

VI. FAIR RATE OF RETURN ON EQUITY

Q. BASED ON YOUR APPLICATION OF SEVERAL COST OF EQUITY METHODS TO YOUR PROXY COMPANIES, WHAT IS YOUR CONCLUSION REGARDING YOUR PROXY COMPANIES' COST OF EQUITY?

A. Based on my application of several cost of equity methods to my proxy companies, I conclude that my proxy companies' cost of equity is in the range 9.9 percent to 10.6 percent. As shown in the table below, the average result for my application of the DCF, ex ante risk premium, and ex post risk premium models is 10.2 percent (see Table 1 below).

TABLE 1
COST OF EQUITY MODEL RESULTS

METHOD	MODEL RESULT
Discounted Cash Flow	9.9%
Ex Ante Risk Premium	10.6%
Ex Post Risk Premium	10.1%
Average	10.2%

Q. DOES YOUR COST OF EQUITY CONCLUSION FOR YOUR PROXY COMPANIES DEPEND ON THE PERCENTAGES OF DEBT AND EQUITY IN THE PROXY COMPANIES' AVERAGE CAPITAL STRUCTURE?

A. Yes. My cost of equity conclusion reflects the financial risk associated with the average market value capital structure of my proxy companies, which has approximately 62 percent equity.

Q. WHAT CAPITAL STRUCTURE IS EMPIRE RECOMMENDING IN THIS PROCEEDING FOR THE PURPOSE OF RATE MAKING?

A. Empire is recommending that its consolidated capital structure containing approximately 50 percent common equity be used for rate making purposes in this proceeding.

Q. HOW DOES EMPIRE'S RECOMMENDED RATE MAKING CAPITAL STRUCTURE IN THIS PROCEEDING COMPARE TO THE AVERAGE CAPITAL STRUCTURE OF YOUR PROXY COMPANIES?

A. Although Empire's recommended capital structure contains an appropriate mix of debt and equity and is a reasonable capital structure for rate making purposes in this proceeding, this recommended rate making capital structure embodies greater financial risk than is reflected in my cost of equity estimates from my proxy companies.

Q. WHAT RETURN ON COMMON EQUITY RANGE DO YOU RECOMMEND FOR EMPIRE?

A. I conservatively recommend an ROE range from 9.9 percent to 10.6 percent. This range is conservative in that it does not reflect the higher financial risk implicit in Empire's rate making capital structure compared to the average financial risk of the proxy companies implicit in the values of debt and equity in their market value capital structures.

VII. FUEL ADJUSTMENT CLAUSE (FAC) BUSINESS RISK AND COST OF EQUITY

Q. HOW DOES A FAC GENERALLY IMPACT A REGULATED COMPANY'S BUSINESS RISK?

A. A FAC generally reduces a regulated company's business risk by allowing the company to recover a significant portion of changes in prudently incurred energy costs through timely changes in customer rates.

Q. DOES EMPIRE'S PROPOSED FAC ALLOW IT TO RECOVER ALL CHANGES IN PRUDENTLY INCURRED ENERGY COSTS THROUGH TIMELY CHANGES IN CUSTOMER RATES?

A. No. Empire's proposed FAC only allows it to recover ninety-five percent of the changes in prudently incurred costs through timely changes in customer rates.

Q. ARE FACs COMMON IN THE ELECTRIC UTILITY INDUSTRY?

A. Yes. Virtually all integrated electric utilities have FACs that allow the companies to adjust customer rates for changes in fuel and purchased power costs. (Distribution-only utilities are generally not at risk for changes in energy costs because they pass through energy costs purchased in competitive markets to customers.)

Q. IS EMPIRE'S PROPOSED FAC PATTERNED AFTER THE FAC APPROVED IN EMPIRE'S LAST MISSOURI RATE CASE?

A. Yes. The Company's proposed FAC is based upon the FAC approved for Empire in its last rate case, and contains features that are consistent with the FACs approved by the Missouri Public Service Commission for other Missouri electric utilities. The testimony of Company Witness Mr. Todd W. Tarter includes a complete description of Empire's proposed FAC.

Q. HOW DO YOU ESTIMATE EMPIRE'S COST OF EQUITY IN THIS PROCEEDING?

A. I estimate Empire's cost of equity by applying several standard cost of equity methods to market data for a large proxy group of publicly-traded electric utilities.

Q. IS THE AVERAGE REDUCTION IN BUSINESS RISK FROM THE IMPLEMENTATION OF A FAC ALREADY INCLUDED IN YOUR ESTIMATE OF EMPIRE'S COST OF EQUITY?

A. Yes. Because the utilities in my proxy group have FACs, the average reduction in business risk from the implementation of a FAC is already included in my estimate of Empire's cost of equity.

Q. RECOGNIZING THAT YOUR PROXY UTILITIES ALREADY HAVE FACS, WOULD IMPLEMENTATION OF THE COMPANY'S PROPOSED FAC REDUCE YOUR ESTIMATE OF EMPIRE'S COST OF EQUITY?

A. No. Because the impact of a FAC is already included in my estimate of Empire's cost of equity, a decision to implement the Company's proposed FAC would not reduce my estimate of Empire's cost of equity.

Q. WOULD A DECISION TO DISCONTINUE THE COMPANY'S FAC OR TO REDUCE THE PROPORTION OF PRUDENTLY-INCURRED ENERGY COSTS RECOVERED THROUGH THE FAC INCREASE EMPIRE'S COST OF EQUITY COMPARED TO THE AVERAGE COST OF EQUITY FOR THE PROXY UTILITIES?

A. Yes.

Q. DOES THIS CONCLUDE YOUR PRE-FILED DIRECT TESTIMONY?

A. Yes, it does.

LIST OF ATTACHMENTS

Schedule JVW-1	Summary of Discounted Cash Flow Analysis for Electric Utilities
Schedule JVW-2	Comparison of the DCF Expected Return on an Investment in Electric Utilities to the Interest Rate on Moody's A-Rated Utility Bonds
Schedule JVW-3	Comparative Returns on S&P 500 Stock Index and Moody's A-Rated Bonds 1937—2015
Schedule JVW-4	Comparative Returns on S&P Utility Stock Index and Moody's A-Rated Bonds 1937—2015
Schedule JVW-5	Using the Arithmetic Mean to Estimate the Cost of Equity Capital
Schedule JVW-6	Calculation of Capital Asset Pricing Model Cost of Equity Using the SBBI 7.0 Percent Risk Premium
Schedule JVW-7	Comparison of Risk Premia on S&P500 Stock Index and S&P Utilities Index 1937 – 2015
Schedule JVW-8	Calculation of Capital Asset Pricing Model Cost of Equity Using the SBBI 7.0 Percent Risk Premium and a 0.90 Utility Beta
Schedule JVW-9	Calculation of Capital Asset Pricing Model Cost of Equity Using DCF Estimate of the Expected Rate of Return on the Market Portfolio
Appendix 1	Qualifications of James H. Vander Weide
Appendix 2	Derivation of the Quarterly DCF Model
Appendix 3	Ex Ante Risk Premium Method
Appendix 4	Ex Post Risk Premium Method

SUMMARY OF DISCOUNTED CASH FLOW ANALYSIS
FOR ELECTRIC UTILITIES

	COMPANY	MOST RECENT QUARTERLY DIVIDEND (D_0)	STOCK PRICE (P_0)	FORECAST OF FUTURE EARNINGS GROWTH	DCF MODEL RESULT
1	ALLETE	0.505	48.382	6.00%	10.5%
2	Alliant Energy	0.550	60.003	5.45%	9.4%
3	Amer. Elec. Power	0.530	55.081	5.08%	9.2%
4	Ameren Corp.	0.410	39.704	5.85%	10.4%
5	Black Hills	0.405	45.925	6.19%	10.0%
6	CMS Energy Corp.	0.290	33.178	6.88%	10.6%
7	Dominion Resources	0.648	69.814	6.07%	10.0%
8	DTE Energy	0.690	77.803	4.83%	8.7%
9	Duke Energy	0.795	74.268	4.73%	9.4%
10	Empire Dist. Elec.	0.260	22.828	5.00%	9.9%
11	Eversource Energy	0.418	47.763	6.35%	10.1%
12	Exelon Corp.	0.310	33.025	6.62%	10.8%
13	G't Plains Energy	0.245	25.462	6.60%	10.8%
14	ITC Holdings	0.163	34.075	10.71%	12.9%
15	NextEra Energy	0.770	101.435	6.39%	9.6%
16	NorthWestern Corp.	0.480	51.165	5.00%	8.7%
17	OGE Energy	0.250	30.207	4.00%	7.5%
18	PG&E Corp.	0.455	51.685	6.00%	9.9%
19	Pinnacle West Capital	0.595	59.499	5.29%	9.7%
20	PNM Resources	0.200	26.126	8.56%	12.0%
21	Portland General	0.300	34.625	4.75%	8.3%
22	PPL Corp.	0.373	31.047	4.00%	9.2%
23	SCANA Corp.	0.545	52.537	4.30%	8.7%
24	Sempra Energy	0.700	103.459	7.93%	10.9%
25	Southern Co.	0.543	43.386	3.39%	8.6%
26	TECO Energy	0.225	18.973	7.68%	13.0%
27	Vectren Corp.	0.380	41.202	5.50%	9.5%
28	Westar Energy	0.360	36.108	3.40%	7.6%
29	Wisconsin Energy	0.423	47.503	7.56%	11.4%
30	Xcel Energy Inc.	0.320	33.482	4.80%	8.8%
31	Average				9.9%

Notes:

d_0	=	Most recent quarterly dividend from Yahoo.
d_1,d_2,d_3,d_4	=	Next four quarterly dividends, calculated by multiplying the last four quarterly dividends per Value Line by the factor (1 + g).
P_0	=	Average of the monthly high and low stock prices during the three months ending July 2015 per Thomson Reuters.
g	=	I/B/E/S forecast of future earnings growth July 2015 from Thomson Reuters.
k	=	Cost of equity using the quarterly version of the DCF model.

$$k = \frac{d_1(1+k)^{.75} + d_2(1+k)^{.50} + d_3(1+k)^{.25} + d_4}{P_0} + g$$

**COMPARISON OF DCF EXPECTED RETURN
ON AN INVESTMENT IN ELECTRIC UTILITIES
TO THE INTEREST RATE ON MOODY'S A-RATED UTILITY BONDS**

LINE	DATE	DCF	BOND YIELD	RISK PREMIUM
1	Sep-99	0.1124	0.0793	0.0331
2	Oct-99	0.1128	0.0806	0.0322
3	Nov-99	0.1158	0.0794	0.0364
4	Dec-99	0.1200	0.0814	0.0386
5	Jan-00	0.1186	0.0835	0.0351
6	Feb-00	0.1232	0.0825	0.0407
7	Mar-00	0.1274	0.0828	0.0446
8	Apr-00	0.1203	0.0829	0.0374
9	May-00	0.1194	0.0870	0.0324
10	Jun-00	0.1209	0.0836	0.0373
11	Jul-00	0.1213	0.0825	0.0388
12	Aug-00	0.1197	0.0813	0.0384
13	Sep-00	0.1137	0.0823	0.0314
14	Oct-00	0.1143	0.0814	0.0329
15	Nov-00	0.1164	0.0811	0.0353
16	Dec-00	0.1140	0.0784	0.0356
17	Jan-01	0.1167	0.0780	0.0387
18	Feb-01	0.1176	0.0774	0.0402
19	Mar-01	0.1180	0.0768	0.0412
20	Apr-01	0.1208	0.0794	0.0414
21	May-01	0.1254	0.0799	0.0455
22	Jun-01	0.1261	0.0785	0.0476
23	Jul-01	0.1269	0.0778	0.0491
24	Aug-01	0.1275	0.0759	0.0516
25	Sep-01	0.1294	0.0775	0.0519
26	Oct-01	0.1286	0.0763	0.0523
27	Nov-01	0.1268	0.0757	0.0511
28	Dec-01	0.1264	0.0783	0.0481
29	Jan-02	0.1246	0.0766	0.0480
30	Feb-02	0.1256	0.0754	0.0502
31	Mar-02	0.1221	0.0776	0.0445
32	Apr-02	0.1201	0.0757	0.0444
33	May-02	0.1208	0.0752	0.0456
34	Jun-02	0.1225	0.0741	0.0484
35	Jul-02	0.1305	0.0731	0.0574
36	Aug-02	0.1269	0.0717	0.0552
37	Sep-02	0.1241	0.0708	0.0533
38	Oct-02	0.1258	0.0723	0.0535
39	Nov-02	0.1210	0.0714	0.0496
40	Dec-02	0.1195	0.0707	0.0488
41	Jan-03	0.1166	0.0706	0.0460

LINE	DATE	DCF	BOND YIELD	RISK PREMIUM
42	Feb-03	0.1200	0.0693	0.0507
43	Mar-03	0.1179	0.0679	0.0500
44	Apr-03	0.1138	0.0664	0.0474
45	May-03	0.1066	0.0636	0.0430
46	Jun-03	0.1019	0.0621	0.0398
47	Jul-03	0.1043	0.0657	0.0386
48	Aug-03	0.1034	0.0678	0.0356
49	Sep-03	0.1000	0.0656	0.0344
50	Oct-03	0.0981	0.0643	0.0338
51	Nov-03	0.0957	0.0637	0.0320
52	Dec-03	0.0919	0.0627	0.0292
53	Jan-04	0.0896	0.0615	0.0281
54	Feb-04	0.0892	0.0615	0.0277
55	Mar-04	0.0888	0.0597	0.0291
56	Apr-04	0.0900	0.0635	0.0265
57	May-04	0.0935	0.0662	0.0273
58	Jun-04	0.0934	0.0646	0.0288
59	Jul-04	0.0927	0.0627	0.0300
60	Aug-04	0.0940	0.0614	0.0326
61	Sep-04	0.0925	0.0598	0.0327
62	Oct-04	0.0928	0.0594	0.0334
63	Nov-04	0.0894	0.0597	0.0297
64	Dec-04	0.0896	0.0592	0.0304
65	Jan-05	0.0900	0.0578	0.0322
66	Feb-05	0.0893	0.0561	0.0332
67	Mar-05	0.0894	0.0583	0.0311
68	Apr-05	0.0899	0.0564	0.0335
69	May-05	0.0886	0.0553	0.0333
70	Jun-05	0.0888	0.0540	0.0348
71	Jul-05	0.0877	0.0551	0.0326
72	Aug-05	0.0878	0.0550	0.0328
73	Sep-05	0.0901	0.0552	0.0349
74	Oct-05	0.0911	0.0579	0.0332
75	Nov-05	0.0957	0.0588	0.0369
76	Dec-05	0.0956	0.0580	0.0376
77	Jan-06	0.0957	0.0575	0.0382
78	Feb-06	0.1048	0.0582	0.0466
79	Mar-06	0.1031	0.0598	0.0433
80	Apr-06	0.1050	0.0629	0.0421
81	May-06	0.1063	0.0642	0.0421
82	Jun-06	0.1093	0.0640	0.0453
83	Jul-06	0.1087	0.0637	0.0450
84	Aug-06	0.1050	0.0620	0.0430
85	Sep-06	0.1088	0.0600	0.0488
86	Oct-06	0.1052	0.0598	0.0454
87	Nov-06	0.1057	0.0580	0.0477

LINE	DATE	DCF	BOND YIELD	RISK PREMIUM
88	Dec-06	0.1050	0.0581	0.0469
89	Jan-07	0.1075	0.0596	0.0479
90	Feb-07	0.1065	0.0590	0.0475
91	Mar-07	0.1073	0.0585	0.0488
92	Apr-07	0.1021	0.0597	0.0424
93	May-07	0.1047	0.0599	0.0448
94	Jun-07	0.1101	0.0630	0.0471
95	Jul-07	0.1108	0.0625	0.0483
96	Aug-07	0.1083	0.0624	0.0459
97	Sep-07	0.1056	0.0618	0.0438
98	Oct-07	0.1061	0.0611	0.0450
99	Nov-07	0.1093	0.0597	0.0496
100	Dec-07	0.1110	0.0616	0.0494
101	Jan-08	0.1171	0.0602	0.0569
102	Feb-08	0.1109	0.0621	0.0488
103	Mar-08	0.1144	0.0621	0.0523
104	Apr-08	0.1133	0.0629	0.0504
105	May-08	0.1138	0.0627	0.0511
106	Jun-08	0.1112	0.0638	0.0474
107	Jul-08	0.1147	0.0640	0.0507
108	Aug-08	0.1165	0.0637	0.0528
109	Sep-08	0.1159	0.0649	0.0510
110	Oct-08	0.1249	0.0756	0.0494
111	Nov-08	0.1280	0.0760	0.0520
112	Dec-08	0.1270	0.0654	0.0616
113	Jan-09	0.1211	0.0639	0.0572
114	Feb-09	0.1237	0.0630	0.0607
115	Mar-09	0.1250	0.0642	0.0607
116	Apr-09	0.1230	0.0648	0.0582
117	May-09	0.1206	0.0649	0.0557
118	Jun-09	0.1185	0.0620	0.0565
119	Jul-09	0.1142	0.0597	0.0544
120	Aug-09	0.1127	0.0571	0.0556
121	Sep-09	0.1122	0.0553	0.0569
122	Oct-09	0.1122	0.0555	0.0568
123	Nov-09	0.1166	0.0564	0.0602
124	Dec-09	0.1065	0.0579	0.0486
125	Jan-10	0.1082	0.0577	0.0505
126	Feb-10	0.1060	0.0587	0.0473
127	Mar-10	0.1045	0.0584	0.0461
128	Apr-10	0.1081	0.0582	0.0499
129	May-10	0.1062	0.0552	0.0510
130	Jun-10	0.1059	0.0546	0.0512
131	Jul-10	0.1049	0.0526	0.0522
132	Aug-10	0.1029	0.0501	0.0528
133	Sep-10	0.1031	0.0501	0.0530

LINE	DATE	DCF	BOND YIELD	RISK PREMIUM
134	Oct-10	0.1017	0.0510	0.0507
135	Nov-10	0.1023	0.0536	0.0487
136	Dec-10	0.1026	0.0557	0.0469
137	Jan-11	0.1018	0.0557	0.0461
138	Feb-11	0.1014	0.0568	0.0446
139	Mar-11	0.1017	0.0556	0.0461
140	Apr-11	0.0994	0.0555	0.0439
141	May-11	0.0969	0.0532	0.0437
142	Jun-11	0.1017	0.0526	0.0491
143	Jul-11	0.0993	0.0527	0.0466
144	Aug-11	0.1023	0.0469	0.0554
145	Sep-11	0.0991	0.0448	0.0543
146	Oct-11	0.1006	0.0452	0.0554
147	Nov-11	0.0989	0.0425	0.0564
148	Dec-11	0.1000	0.0435	0.0565
149	Jan-12	0.0991	0.0434	0.0557
150	Feb-12	0.0963	0.0436	0.0527
151	Mar-12	0.0960	0.0448	0.0512
152	Apr-12	0.0968	0.0440	0.0528
153	May-12	0.0967	0.0420	0.0547
154	Jun-12	0.0930	0.0408	0.0522
155	Jul-12	0.0938	0.0393	0.0545
156	Aug-12	0.0948	0.0400	0.0548
157	Sep-12	0.0963	0.0402	0.0561
158	Oct-12	0.0954	0.0391	0.0563
159	Nov-12	0.0954	0.0384	0.0570
160	Dec-12	0.0957	0.0400	0.0557
161	Jan-13	0.0944	0.0415	0.0529
162	Feb-13	0.0932	0.0418	0.0514
163	Mar-13	0.0968	0.0420	0.0548
164	Apr-13	0.0942	0.0400	0.0542
165	May-13	0.0963	0.0417	0.0546
166	Jun-13	0.0973	0.0453	0.0520
167	Jul-13	0.0978	0.0468	0.0510
168	Aug-13	0.0934	0.0473	0.0461
169	Sep-13	0.0924	4.80%	0.0444
170	Oct-13	0.0901	4.70%	0.0431
171	Nov-13	0.0908	4.77%	0.0431
172	Dec-13	0.0908	4.81%	0.0427
173	Jan-14	0.0901	4.63%	0.0438
174	Feb-14	0.0922	4.53%	0.0469
175	Mar-14	0.0960	4.51%	0.0509
176	Apr-14	0.0973	4.41%	0.0532
177	May-14	0.0988	4.26%	0.0562
178	Jun-14	0.0950	4.29%	0.0521
179	Jul-14	0.0944	4.23%	0.0521

LINE	DATE	DCF	BOND YIELD	RISK PREMIUM
180	Aug-14	0.0956	0.0413	0.0543
181	Sep-14	0.0958	0.0424	0.0534
182	Oct-14	0.0992	0.0406	0.0586
183	Nov-14	0.0975	0.0409	0.0566
184	Dec-14	0.0964	0.0395	0.0569
185	Jan-15	0.0953	0.0358	0.0595
186	Feb-15	0.0962	0.0367	0.0595
187	Mar-15	0.0963	0.0374	0.0589
188	Apr-15	0.0983	0.0375	0.0608
189	May-15	0.0988	0.0417	0.0571
190	Jun-15	0.0967	0.0439	0.0528
191	Jul-15	0.0950	0.0440	0.0510

Utility bond yield information from *Mergent Bond Record* (formerly Moody's). See Appendix 3 for a description of my ex ante risk premium approach. DCF results are calculated using a quarterly DCF model as follows:

d_0 = Latest quarterly dividend per Value Line, Thomson Reuters
P_0 = Average of the monthly high and low stock prices for each month per Thomson Reuters
g = I/B/E/S forecast of future earnings growth for each month.
k = Cost of equity using the quarterly version of the DCF model.

$$k = \left[\frac{d_0 (1+g)^{\frac{1}{4}}}{P_0} + (1+g)^{\frac{1}{4}} \right]^4 - 1$$

COMPARATIVE RETURNS ON S&P 500 STOCK INDEX
AND MOODY'S A-RATED UTILITY BONDS 1937 - 2015

LINE	YEAR	S&P 500 STOCK PRICE	STOCK DIVIDEND YIELD	STOCK RETURN	A-RATED BOND PRICE	BOND RETURN	RISK PREMIUM
1	2015	2,028.18	0.0208		$107.65		
2	2014	1,822.36	0.0210	13.39%	$89.89	24.20%	-10.81%
3	2013	1,481.11	0.0220	25.24%	$97.45	-3.65%	28.89%
4	2012	1,300.58	0.0214	16.02%	$94.36	7.52%	8.50%
5	2011	1,282.62	0.0185	3.25%	$77.36	27.14%	-23.89%
6	2010	1,123.58	0.0203	16.18%	$75.02	8.44%	7.74%
7	2009	865.58	0.0310	32.91%	$68.43	15.48%	17.43%
8	2008	1,378.76	0.0206	-35.16%	$72.25	0.24%	-35.40%
9	2007	1,424.16	0.0181	-1.38%	$72.91	4.59%	-5.97%
10	2006	1,278.72	0.0183	13.20%	$75.25	2.20%	11.01%
11	2005	1,181.41	0.0177	10.01%	$74.91	5.80%	4.21%
12	2004	1,132.52	0.0162	5.94%	$70.87	11.34%	-5.40%
13	2003	895.84	0.0180	28.22%	$62.26	20.27%	7.95%
14	2002	1,140.21	0.0138	-20.05%	$57.44	15.35%	-35.40%
15	2001	1,335.63	0.0116	-13.47%	$56.40	8.93%	-22.40%
16	2000	1,425.59	0.0118	-5.13%	$52.60	14.82%	-19.95%
17	1999	1,248.77	0.0130	15.46%	$63.03	-10.20%	25.66%
18	1998	963.35	0.0162	31.25%	$62.43	7.38%	23.87%
19	1997	766.22	0.0195	27.68%	$56.62	17.32%	10.36%
20	1996	614.42	0.0231	27.02%	$60.91	-0.48%	27.49%
21	1995	465.25	0.0287	34.93%	$50.22	29.26%	5.68%
22	1994	472.99	0.0269	1.05%	$60.01	-9.65%	10.71%
23	1993	435.23	0.0288	11.56%	$53.13	20.48%	-8.93%
24	1992	416.08	0.0290	7.50%	$49.56	15.27%	-7.77%
25	1991	325.49	0.0382	31.65%	$44.84	19.44%	12.21%
26	1990	339.97	0.0341	-0.85%	$45.60	7.11%	-7.96%
27	1989	285.41	0.0364	22.76%	$43.06	15.18%	7.58%
28	1988	250.48	0.0366	17.61%	$40.10	17.36%	0.25%
29	1987	264.51	0.0317	-2.13%	$48.92	-9.84%	7.71%
30	1986	208.19	0.0390	30.95%	$39.98	32.36%	-1.41%
31	1985	171.61	0.0451	25.83%	$32.57	35.05%	-9.22%
32	1984	166.39	0.0427	7.41%	$31.49	16.12%	-8.72%
33	1983	144.27	0.0479	20.12%	$29.41	20.65%	-0.53%
34	1982	117.28	0.0595	28.96%	$24.48	36.48%	-7.51%
35	1981	132.97	0.0480	-7.00%	$29.37	-3.01%	-3.99%
36	1980	110.87	0.0541	25.34%	$34.69	-3.81%	29.16%
37	1979	99.71	0.0533	16.52%	$43.91	-11.89%	28.41%
38	1978	90.25	0.0532	15.80%	$49.09	-2.40%	18.20%
39	1977	103.80	0.0399	-9.06%	$50.95	4.20%	-13.27%
40	1976	96.86	0.0380	10.96%	$43.91	25.13%	-14.17%
41	1975	72.56	0.0507	38.56%	$41.76	14.75%	23.81%
42	1974	96.11	0.0364	-20.86%	$52.54	-12.91%	-7.96%

LINE	YEAR	S&P 500 STOCK PRICE	STOCK DIVIDEND YIELD	STOCK RETURN	A-RATED BOND PRICE	BOND RETURN	RISK PREMIUM
43	1973	118.40	0.0269	-16.14%	$58.51	-3.37%	-12.77%
44	1972	103.30	0.0296	17.58%	$56.47	10.69%	6.89%
45	1971	93.49	0.0332	13.81%	$53.93	12.13%	1.69%
46	1970	90.31	0.0356	7.08%	$50.46	14.81%	-7.73%
47	1969	102.00	0.0306	-8.40%	$62.43	-12.76%	4.36%
48	1968	95.04	0.0313	10.45%	$66.97	-0.81%	11.26%
49	1967	84.45	0.0351	16.05%	$78.69	-9.81%	25.86%
50	1966	93.32	0.0302	-6.48%	$86.57	-4.48%	-2.00%
51	1965	86.12	0.0299	11.35%	$91.40	-0.91%	12.26%
52	1964	76.45	0.0305	15.70%	$92.01	3.68%	12.02%
53	1963	65.06	0.0331	20.82%	$93.56	2.61%	18.20%
54	1962	69.07	0.0297	-2.84%	$89.60	8.89%	-11.73%
55	1961	59.72	0.0328	18.94%	$89.74	4.29%	14.64%
56	1960	58.03	0.0327	6.18%	$84.36	11.13%	-4.95%
57	1959	55.62	0.0324	7.57%	$91.55	-3.49%	11.06%
58	1958	41.12	0.0448	39.74%	$101.22	-5.60%	45.35%
59	1957	45.43	0.0431	-5.18%	$100.70	4.49%	-9.67%
60	1956	44.15	0.0424	7.14%	$113.00	-7.35%	14.49%
61	1955	35.60	0.0438	28.40%	$116.77	0.20%	28.20%
62	1954	25.46	0.0569	45.52%	$112.79	7.07%	38.45%
63	1953	26.18	0.0545	2.70%	$114.24	2.24%	0.46%
64	1952	24.19	0.0582	14.05%	$113.41	4.26%	9.79%
65	1951	21.21	0.0634	20.39%	$123.44	-4.89%	25.28%
66	1950	16.88	0.0665	32.30%	$125.08	1.89%	30.41%
67	1949	15.36	0.0620	16.10%	$119.82	7.72%	8.37%
68	1948	14.83	0.0571	9.28%	$118.50	4.49%	4.79%
69	1947	15.21	0.0449	1.99%	$126.02	-2.79%	4.79%
70	1946	18.02	0.0356	-12.03%	$126.74	2.59%	-14.63%
71	1945	13.49	0.0460	38.18%	$119.82	9.11%	29.07%
72	1944	11.85	0.0495	18.79%	$119.82	3.34%	15.45%
73	1943	10.09	0.0554	22.98%	$118.50	4.49%	18.49%
74	1942	8.93	0.0788	20.87%	$117.63	4.14%	16.73%
75	1941	10.55	0.0638	-8.98%	$116.34	4.55%	-13.52%
76	1940	12.30	0.0458	-9.65%	$112.39	7.08%	-16.73%
77	1939	12.50	0.0349	1.89%	$105.75	10.05%	-8.16%
78	1938	11.31	0.0784	18.36%	$99.83	9.94%	8.42%
79	1937	17.59	0.0434	-31.36%	$103.18	0.63%	-31.99%
80	Average			11.3%		6.8%	4.5%

See Appendix 4 for an explanation of how stock and bond returns are derived and the source of the data presented.

COMPARATIVE RETURNS ON S&P UTILITY STOCK INDEX
AND MOODY'S A-RATED UTILITY BONDS 1937 - 2015

LINE	YEAR	S&P UTILITY STOCK PRICE	STOCK DIVIDEND YIELD	STOCK RETURN	A-RATED BOND PRICE	BOND RETURN	RISK PREMIUM
1	2015				$107.65		
2	2014			28.91%	$89.89	24.20%	4.71%
3	2013			13.01%	$97.45	-3.65%	16.66%
4	2012			2.09%	$94.36	7.52%	-5.43%
5	2011			19.99%	$77.36	27.14%	-7.15%
6	2010			7.04%	$75.02	8.44%	-1.40%
7	2009			10.71%	$68.43	15.48%	-4.77%
8	2008			-25.90%	$72.25	0.24%	-26.14%
9	2007			16.56%	$72.91	4.59%	11.96%
10	2006			20.76%	$75.25	2.20%	18.56%
11	2005			16.05%	$74.91	5.80%	10.25%
12	2004			22.84%	$70.87	11.34%	11.50%
13	2003			23.48%	$62.26	20.27%	3.21%
14	2002			-14.73%	$57.44	15.35%	-30.08%
15	2001	307.70	0.0287	-17.90%	$56.40	8.93%	-26.83%
16	2000	239.17	0.0413	32.78%	$52.60	14.82%	17.96%
17	1999	253.52	0.0394	-1.72%	$63.03	-10.20%	8.48%
18	1998	228.61	0.0457	15.47%	$62.43	7.38%	8.09%
19	1997	201.14	0.0492	18.58%	$56.62	17.32%	1.26%
20	1996	202.57	0.0454	3.83%	$60.91	-0.48%	4.31%
21	1995	153.87	0.0584	37.49%	$50.22	29.26%	8.23%
22	1994	168.70	0.0496	-3.83%	$60.01	-9.65%	5.82%
23	1993	159.79	0.0537	10.95%	$53.13	20.48%	-9.54%
24	1992	149.70	0.0572	12.46%	$49.56	15.27%	-2.81%
25	1991	138.38	0.0607	14.25%	$44.84	19.44%	-5.19%
26	1990	146.04	0.0558	0.33%	$45.60	7.11%	-6.78%
27	1989	114.37	0.0699	34.68%	$43.06	15.18%	19.51%
28	1988	106.13	0.0704	14.80%	$40.10	17.36%	-2.55%
29	1987	120.09	0.0588	-5.74%	$48.92	-9.84%	4.10%
30	1986	92.06	0.0742	37.87%	$39.98	32.36%	5.51%
31	1985	75.83	0.0860	30.00%	$32.57	35.05%	-5.04%
32	1984	68.50	0.0925	19.95%	$31.49	16.12%	3.83%
33	1983	61.89	0.0948	20.16%	$29.41	20.65%	-0.49%
34	1982	51.81	0.1074	30.20%	$24.48	36.48%	-6.28%
35	1981	52.01	0.0978	9.40%	$29.37	-3.01%	12.41%
36	1980	50.26	0.0953	13.01%	$34.69	-3.81%	16.83%
37	1979	50.33	0.0893	8.79%	$43.91	-11.89%	20.68%
38	1978	52.40	0.0791	3.96%	$49.09	-2.40%	6.36%
39	1977	54.01	0.0714	4.16%	$50.95	4.20%	-0.04%
40	1976	46.99	0.0776	22.70%	$43.91	25.13%	-2.43%
41	1975	38.19	0.0920	32.24%	$41.76	14.75%	17.49%

LINE	YEAR	S&P UTILITY STOCK PRICE	STOCK DIVIDEND YIELD	STOCK RETURN	A-RATED BOND PRICE	BOND RETURN	RISK PREMIUM
42	1974	48.60	0.0713	-14.29%	$52.54	-12.91%	-1.38%
43	1973	60.01	0.0556	-13.45%	$58.51	-3.37%	-10.08%
44	1972	60.19	0.0542	5.12%	$56.47	10.69%	-5.57%
45	1971	63.43	0.0504	-0.07%	$53.93	12.13%	-12.19%
46	1970	55.72	0.0561	19.45%	$50.46	14.81%	4.64%
47	1969	68.65	0.0445	-14.38%	$62.43	-12.76%	-1.62%
48	1968	68.02	0.0435	5.28%	$66.97	-0.81%	6.08%
49	1967	70.63	0.0392	0.22%	$78.69	-9.81%	10.03%
50	1966	74.50	0.0347	-1.72%	$86.57	-4.48%	2.76%
51	1965	75.87	0.0315	1.34%	$91.40	-0.91%	2.25%
52	1964	67.26	0.0331	16.11%	$92.01	3.68%	12.43%
53	1963	63.35	0.0330	9.47%	$93.56	2.61%	6.86%
54	1962	62.69	0.0320	4.25%	$89.60	8.89%	-4.64%
55	1961	52.73	0.0358	22.47%	$89.74	4.29%	18.18%
56	1960	44.50	0.0403	22.52%	$84.36	11.13%	11.39%
57	1959	43.96	0.0377	5.00%	$91.55	-3.49%	8.49%
58	1958	33.30	0.0487	36.88%	$101.22	-5.60%	42.48%
59	1957	32.32	0.0487	7.90%	$100.70	4.49%	3.41%
60	1956	31.55	0.0472	7.16%	$113.00	-7.35%	14.51%
61	1955	29.89	0.0461	10.16%	$116.77	0.20%	9.97%
62	1954	25.51	0.0520	22.37%	$112.79	7.07%	15.30%
63	1953	24.41	0.0511	9.62%	$114.24	2.24%	7.38%
64	1952	22.22	0.0550	15.36%	$113.41	4.26%	11.10%
65	1951	20.01	0.0606	17.10%	$123.44	-4.89%	21.99%
66	1950	20.20	0.0554	4.60%	$125.08	1.89%	2.71%
67	1949	16.54	0.0570	27.83%	$119.82	7.72%	20.10%
68	1948	16.53	0.0535	5.41%	$118.50	4.49%	0.92%
69	1947	19.21	0.0354	-10.41%	$126.02	-2.79%	-7.62%
70	1946	21.34	0.0298	-7.00%	$126.74	2.59%	-9.59%
71	1945	13.91	0.0448	57.89%	$119.82	9.11%	48.79%
72	1944	12.10	0.0569	20.65%	$119.82	3.34%	17.31%
73	1943	9.22	0.0621	37.45%	$118.50	4.49%	32.96%
74	1942	8.54	0.0940	17.36%	$117.63	4.14%	13.22%
75	1941	13.25	0.0717	-28.38%	$116.34	4.55%	-32.92%
76	1940	16.97	0.0540	-16.52%	$112.39	7.08%	-23.60%
77	1939	16.05	0.0553	11.26%	$105.75	10.05%	1.21%
78	1938	14.30	0.0730	19.54%	$99.83	9.94%	9.59%
79	1937	24.34	0.0432	-36.93%	$103.18	0.63%	-37.55%
80	Average			10.7%		6.8%	3.9%

Note: See Appendix 4 for an explanation of how stock and bond returns are derived and the source of the data presented. Standard & Poor's discontinued its S&P Utilities Index in December 2001 and replaced its utilities stock index with separate indices for electric and natural gas utilities. In this study, the stock returns beginning in 2002 are based on the total returns for the EEI Index of U.S. shareholder-owned electric utilities, as reported by EEI on its website.
http://www.eei.org/whatwedo/DataAnalysis/IndusFinanAnalysis/Pages/QtrlyFinancialUpdates.aspx

**USING THE ARITHMETIC MEAN TO ESTIMATE
THE COST OF EQUITY CAPITAL**

Consider an investment that in a given year generates a return of 30 percent with probability equal to .5 and a return of -10 percent with a probability equal to .5. For each one dollar invested, the possible outcomes of this investment at the end of year one are:

WEALTH AFTER ONE YEAR	PROBABILITY
$1.30	0.50
$0.90	0.50

At the end of year two, the possible outcomes are:

WEALTH AFTER TWO YEARS			PROBABILITY	WEALTH x PROBABILITY
(1.30) (1.30)	=	$1.69	0.25	0.4225
(1.30) (.9)	=	$1.17	0.25	0.2925
(.9) (1.30)	=	$1.17	0.25	0.2925
(.9) (.9)	=	$0.81	0.25	0.2025
Expected Wealth	=			$1.21

The expected value of this investment at the end of year two is $1.21. In a competitive capital market, the cost of equity is equal to the expected rate of return on an investment. In the above example, the cost of equity is that rate of return which will make the initial investment of one dollar grow to the expected value of $1.21 at the end of two years. Thus, the cost of equity is the solution to the equation:

$$1(1+k)^2 = 1.21 \text{ or}$$

$$k = (1.21/1)^{.5} - 1 = 10\%.$$

The arithmetic mean of this investment is:

$$(30\%)\ (.5) + (-10\%)\ (.5) = 10\%.$$

Thus, the arithmetic mean is equal to the cost of equity capital.

The geometric mean of this investment is:

$$[(1.3)\ (.9)]^{.5} - 1 = .082 = 8.2\%.$$

Thus, the geometric mean is not equal to the cost of equity capital.

The lesson is obvious: for an investment with an uncertain outcome, the arithmetic mean is the best measure of the cost of equity capital

CALCULATION OF CAPITAL ASSET PRICING MODEL COST OF EQUITY
USING SBBI® 7.0 PERCENT RISK PREMIUM

Line	FACTOR	VALUE	DESCRIPTION
1	Risk-free rate	4.45%	Forecast long-term Treasury bond yield
2	Beta	0.70	Average Beta Comparable Electric Companies
3	Risk Premium	7.0%	Long-horizon SBBI risk premium
4	Beta x Risk Premium	4.9%	
5	CAPM cost of equity	9.4%	

Forecast Treasury bond yield using forecast data from Value Line and EIA. Beta from Value Line Investment Analyzer July 2015.

PROXY COMPANY BETAS

LINE	COMPANY	VALUE LINE BETA	MARKET CAP $ (MIL)
1	ALLETE	0.80	2,350
2	Alliant Energy	0.80	6,948
3	Amer. Elec. Power	0.70	27,595
4	Ameren Corp.	0.75	9,623
5	Black Hills	0.95	1,983
6	CMS Energy Corp.	0.75	9,526
7	Dominion Resources	0.70	41,710
8	DTE Energy	0.75	14,096
9	Duke Energy	0.60	51,734
10	Empire Dist. Elec.	0.70	996
11	Eversource Energy	0.75	15,342
12	Exelon Corp.	0.70	28,942
13	G't Plains Energy	0.85	3,970
14	ITC Holdings	0.70	5,291
15	NextEra Energy	0.75	47,213
16	NorthWestern Corp.	0.75	2,424
17	OGE Energy	0.90	5,847
18	PG&E Corp.	0.65	25,088
19	Pinnacle West Capital	0.70	6,775
20	PNM Resources	0.85	2,090
21	Portland General	0.80	2,748
22	PPL Corp.	0.65	20,992
23	SCANA Corp.	0.75	7,736
24	Sempra Energy	0.80	25,724
25	Southern Co.	0.60	39,953
26	TECO Energy	0.85	5,050
27	Vectren Corp.	0.80	3,418
28	Westar Energy	0.75	4,833
29	Wisconsin Energy	0.70	15,285
30	Xcel Energy Inc.	0.65	17,296
31	Market-weighted Average	0.70	

Company betas from Value Line Investment Analyzer, July 2015; market capitalization from Thomson Reuters.

COMPARISON OF RISK PREMIA ON
S&P500 AND S&P UTILITIES 1937 – 2015

YEAR	S&P UTILITIES STOCK RETURN	SP500 STOCK RETURN	10-YR. TREASURY BOND YIELD	UTILITIES RISK PREMIUM	MARKET RISK PREMIUM
2014	0.2891	0.1339	0.0249	0.2642	0.1090
2013	0.1301	0.2524	0.0235	0.1066	0.2289
2012	0.0209	0.1602	0.0180	0.0029	0.1422
2011	0.1999	0.0325	0.0278	0.1721	0.0047
2010	0.0704	0.1618	0.0322	0.0382	0.1296
2009	0.1071	0.3291	0.0326	0.0745	0.2965
2008	-0.2590	-0.3516	0.0367	-0.2957	-0.3883
2007	0.1656	-0.0138	0.0463	0.1193	-0.0601
2006	0.2076	0.1320	0.0479	0.1597	0.0841
2005	0.1605	0.1001	0.0429	0.1176	0.0572
2004	0.2284	0.0594	0.0427	0.1857	0.0167
2003	0.2348	0.2822	0.0401	0.1947	0.2421
2002	-0.1473	-0.2005	0.0461	-0.1934	-0.2466
2001	-0.1790	-0.1347	0.0502	-0.2292	-0.1849
2000	0.3278	-0.0513	0.0603	0.2675	-0.1116
1999	-0.0172	0.1546	0.0564	-0.0736	0.0982
1998	0.1547	0.3125	0.0526	0.1021	0.2599
1997	0.1858	0.2768	0.0635	0.1223	0.2133
1996	0.0383	0.2702	0.0644	-0.0261	0.2058
1995	0.3749	0.3493	0.0658	0.3091	0.2835
1994	-0.0383	0.0105	0.0708	-0.1091	-0.0603
1993	0.1095	0.1156	0.0587	0.0508	0.0569
1992	0.1246	0.0750	0.0701	0.0545	0.0049
1991	0.1425	0.3165	0.0786	0.0639	0.2379
1990	0.0033	-0.0085	0.0855	-0.0822	-0.0940
1989	0.3468	0.2276	0.0850	0.2618	0.1426
1988	0.1480	0.1761	0.0884	0.0596	0.0877
1987	-0.0574	-0.0213	0.0838	-0.1412	-0.1051
1986	0.3787	0.3095	0.0768	0.3019	0.2327
1985	0.3000	0.2583	0.1062	0.1938	0.1521
1984	0.1995	0.0741	0.1244	0.0751	-0.0503
1983	0.2016	0.2012	0.1110	0.0906	0.0902
1982	0.3020	0.2896	0.1300	0.1720	0.1596
1981	0.0940	-0.0700	0.1391	-0.0451	-0.2091
1980	0.1301	0.2534	0.1146	0.0155	0.1388
1979	0.0879	0.1652	0.0944	-0.0065	0.0708
1978	0.0396	0.1580	0.0841	-0.0445	0.0739
1977	0.0416	-0.0906	0.0742	-0.0326	-0.1648
1976	0.2270	0.1096	0.0761	0.1509	0.0335
1975	0.3224	0.3856	0.0799	0.2425	0.3057
1974	-0.1429	-0.2086	0.0756	-0.2185	-0.2842

YEAR	S&P UTILITIES STOCK RETURN	SP500 STOCK RETURN	10-YR. TREASURY BOND YIELD	UTILITIES RISK PREMIUM	MARKET RISK PREMIUM
1973	-0.1345	-0.1614	0.0684	-0.2029	-0.2298
1972	0.0512	0.1758	0.0621	-0.0109	0.1137
1971	-0.0007	0.1381	0.0616	-0.0623	0.0765
1970	0.1945	0.0708	0.0735	0.1210	-0.0027
1969	-0.1438	-0.0840	0.0667	-0.2105	-0.1507
1968	0.0528	0.1045	0.0565	-0.0037	0.0480
1967	0.0022	0.1605	0.0507	-0.0485	0.1098
1966	-0.0172	-0.0648	0.0492	-0.0664	-0.1140
1965	0.0134	0.1135	0.0428	-0.0294	0.0707
1964	0.1611	0.1570	0.0419	0.1192	0.1151
1963	0.0947	0.2082	0.0400	0.0547	0.1682
1962	0.0425	-0.0284	0.0395	0.0030	-0.0679
1961	0.2247	0.1894	0.0388	0.1859	0.1506
1960	0.2252	0.0618	0.0412	0.1840	0.0206
1959	0.0500	0.0757	0.0433	0.0067	0.0324
1958	0.3688	0.3974	0.0332	0.3356	0.3642
1957	0.0790	-0.0518	0.0365	0.0425	-0.0883
1956	0.0716	0.0714	0.0318	0.0398	0.0396
1955	0.1016	0.2840	0.0282	0.0734	0.2558
1954	0.2237	0.4552	0.0240	0.1997	0.4312
1953	0.0962	0.0270	0.0281	0.0681	-0.0011
1952	0.1536	0.1405	0.0248	0.1288	0.1157
1951	0.1710	0.2039	0.0241	0.1469	0.1798
1950	0.0460	0.3230	0.0205	0.0255	0.3025
1949	0.2783	0.1610	0.0193	0.2590	0.1417
1948	0.0541	0.0928	0.0215	0.0326	0.0713
1947	-0.1041	0.0199	0.0185	-0.1226	0.0014
1946	-0.0700	-0.1203	0.0174	-0.0874	-0.1377
1945	0.5789	0.3818	0.0173	0.5616	0.3645
1944	0.2065	0.1879	0.0209	0.1856	0.1670
1943	0.3745	0.2298	0.0207	0.3538	0.2091
1942	0.1736	0.2087	0.0211	0.1525	0.1876
1941	-0.2838	-0.0898	0.0199	-0.3037	-0.1097
1940	-0.1652	-0.0965	0.0220	-0.1872	-0.1185
1939	0.1126	0.0189	0.0235	0.0891	-0.0046
1938	0.1954	0.1836	0.0255	0.1699	0.1581
1937	-0.3693	-0.3136	0.0269	-0.3962	-0.3405
Risk Premium 1937—2015				0.0549	0.0606
RP Utilities/RP SP500				0.90	

CALCULATION OF CAPITAL ASSET PRICING MODEL COST OF EQUITY USING SBBI® 7.0 PERCENT RISK PREMIUM AND 0.90 UTILITY BETA

Line	FACTOR	VALUE	DESCRIPTION
1	Risk-free rate	4.45%	Forecast long-term Treasury bond yield
2	Beta	0.90	Average Beta Comparable Electric Companies
3	Risk Premium	7.0%	Long-horizon SBBI risk premium
4	Beta x Risk Premium	6.3%	
5	CAPM cost of equity	10.8%	

Forecast Treasury bond yield using forecast data from Value Line and EIA. Beta from Value Line Investment Analyzer July 2015.

**CALCULATION OF CAPITAL ASSET PRICING MODEL COST OF EQUITY
USING DCF ESTIMATE OF THE EXPECTED RATE OF RETURN
ON THE MARKET PORTFOLIO**

LINE		VALUE	DESCRIPTION
1	Risk-free rate	4.45%	Forecast Long-term Treasury bond yield
2	Beta	0.70	Average Beta Comparable Electric Companies
3	DCF S&P 500	12.0%	DCF Cost of Equity S&P 500 (see following)
4	Risk Premium	7.4%	
5	Beta x Risk Premium	5.3%	
6	CAPM cost of equity	9.7%	

LINE		VALUE	DESCRIPTION
1	Risk-free rate	4.45%	Forecast Long-term Treasury bond yield
2	Beta	0.90	See Schedule JVW-8
3	DCF S&P 500	12.0%	DCF Cost of Equity S&P 500 (see following)
4	Risk Premium	7.4%	
5	Beta x Risk Premium	6.8%	
6	CAPM cost of equity	11.2%	

Forecast Treasury bond yield using forecast data from Value Line and EIA. Beta from Value Line Investment Analyzer July 2015.

**SUMMARY OF DISCOUNTED CASH FLOW ANALYSIS
FOR S&P 500 COMPANIES**

	COMPANY	STOCK PRICE (P_0)	D_0	FORECAST OF FUTURE EARNINGS GROWTH	MODEL RESULT	MARKET CAP $ (MILS)
1	3M	156.79	4.10	9.53%	12.4%	98,191
2	ABBOTT LABORATORIES	49.09	0.96	9.70%	11.9%	74,179
3	ACCENTURE CLASS A	97.59	2.04	9.28%	11.6%	63,318
4	ACE	105.65	2.68	8.77%	11.6%	34,083
5	ADV.AUTO PARTS	159.28	0.24	12.93%	13.1%	12,393
6	AETNA	118.94	1.00	10.38%	11.3%	39,360
7	AGL RESOURCES	48.68	2.04	6.00%	10.5%	5,872
8	AIRGAS	103.06	2.40	9.22%	11.8%	7,679
9	ALLSTATE	67.29	1.20	8.70%	10.7%	27,805
10	ALTERA	49.45	0.72	10.68%	12.3%	15,293
11	ALTRIA GROUP	51.03	2.08	8.27%	12.8%	104,051
12	AMERICAN AIRLINES GROUP	42.68	0.40	10.79%	11.8%	28,675
13	AMERICAN INTL.GP.	60.89	1.12	9.18%	11.2%	85,551
14	AMETEK	53.95	0.36	12.30%	13.1%	13,354
15	AMGEN	161.40	3.16	11.17%	13.4%	123,963
16	ANTHEM	161.74	2.50	10.90%	12.6%	41,226
17	AON CLASS A	101.00	1.20	11.98%	13.3%	28,971
18	ASSURANT	67.79	1.20	8.53%	10.5%	4,995
19	AUTOMATIC DATA PROC.	83.35	1.96	10.40%	13.0%	38,924
20	BECTON DICKINSON	143.01	2.40	11.34%	13.2%	31,118
21	BLACKROCK	355.79	8.72	11.22%	14.0%	58,320
22	BORGWARNER	57.33	0.52	13.23%	14.3%	11,721
23	C R BARD	175.35	0.96	10.79%	11.4%	13,256
24	CARDINAL HEALTH	85.91	1.55	10.73%	12.7%	28,789
25	CH ROBINSON WWD.	64.71	1.52	10.27%	12.9%	9,234
26	CHUBB	106.59	2.28	9.67%	12.0%	27,680
27	CIGNA	147.93	0.04	12.05%	12.1%	39,729
28	CINTAS	84.93	0.85	12.34%	13.5%	9,564
29	CISCO SYSTEMS	28.53	0.84	9.40%	12.7%	144,032
30	COLGATE-PALM.	67.20	1.52	8.03%	10.5%	60,867
31	COMERICA	49.70	0.84	10.16%	12.0%	8,984
32	COSTCO WHOLESALE	141.52	1.60	9.50%	10.7%	63,431
33	CSX	33.88	0.72	7.97%	10.3%	31,647
34	DISCOVER FINANCIAL SVS.	58.34	1.12	9.25%	11.4%	26,245
35	DOVER	72.25	1.68	9.46%	12.0%	10,377
36	DOW CHEMICAL	50.87	1.68	9.09%	12.7%	60,488
37	DR PEPPER SNAPPLE GROUP	76.07	1.92	7.70%	10.4%	15,034
38	EATON	68.44	2.20	9.07%	12.6%	30,846
39	EMC	26.48	0.46	12.00%	14.0%	48,522
40	EQUIFAX	99.23	1.16	10.18%	11.5%	11,840
41	ESTEE LAUDER COS.'A'	87.29	0.96	9.32%	10.5%	20,617
42	FIDELITY NAT.INFO.SVS.	63.76	1.04	12.00%	13.8%	18,283
43	FLUOR	54.30	0.84	10.50%	12.2%	7,439
44	GAP	38.34	0.92	9.40%	12.0%	15,897
45	GARMIN	45.10	2.04	6.57%	11.5%	8,968
46	GENERAL DYNAMICS	143.08	2.76	10.40%	12.5%	47,909
47	GENERAL ELECTRIC	26.91	0.92	7.96%	11.7%	273,007

	COMPANY	STOCK PRICE (P_0)	D_0	FORECAST OF FUTURE EARNINGS GROWTH	MODEL RESULT	MARKET CAP $ (MILS)
48	HALLIBURTON	44.52	0.72	12.18%	14.0%	34,214
49	HANESBRANDS	32.27	0.40	12.73%	14.1%	13,657
50	HERSHEY	91.89	2.33	9.23%	12.0%	14,626
51	HONEYWELL INTL.	103.76	2.07	9.68%	11.9%	80,967
52	INGERSOLL-RAND	67.29	1.16	11.79%	13.7%	17,916
53	INTEL	31.66	0.96	8.25%	11.6%	141,846
54	INTUIT	104.21	1.00	12.26%	13.3%	29,800
55	JUNIPER NETWORKS	27.18	0.40	11.74%	13.4%	10,404
56	KANSAS CITY SOUTHERN	95.64	1.32	12.53%	14.1%	10,214
57	KEYCORP	14.92	0.30	9.74%	12.0%	12,869
58	KOHL'S	65.51	1.80	9.04%	12.1%	12,611
59	KROGER	36.61	0.42	10.13%	11.4%	37,487
60	L BRANDS	86.26	2.00	10.39%	13.0%	24,671
61	LENNAR 'A'	49.53	0.16	11.60%	12.0%	9,198
62	LINCOLN NATIONAL	58.64	0.80	8.90%	10.4%	14,954
63	LINEAR TECHNOLOGY	45.02	1.20	9.00%	11.9%	10,436
64	LOCKHEED MARTIN	192.74	6.00	8.00%	11.4%	62,610
65	MACY'S	68.13	1.44	9.18%	11.5%	24,491
66	MARATHON PETROLEUM	52.95	1.28	9.82%	12.5%	31,771
67	MCDONALDS	97.41	3.40	7.19%	11.0%	92,166
68	MEAD JOHNSON NUTRITION	92.50	1.65	9.72%	11.7%	17,774
69	METLIFE	54.46	1.50	7.31%	10.3%	64,383
70	MICROSOFT	46.23	1.24	7.68%	10.6%	377,459
71	MONDELEZ INTERNATIONAL CL.A	41.26	0.68	8.70%	10.5%	68,269
72	MONSANTO	111.56	2.16	11.28%	13.5%	50,442
73	NETAPP	32.75	0.72	10.87%	13.3%	9,521
74	NEWELL RUBBERMAID	40.72	0.76	9.55%	11.6%	11,293
75	NIKE 'B'	106.76	1.12	12.36%	13.5%	76,637
76	NORTHERN TRUST	75.96	1.44	11.86%	14.0%	18,316
77	PARKER-HANNIFIN	118.22	2.52	9.34%	11.7%	15,822
78	PATTERSON COMPANIES	48.41	0.88	9.74%	11.7%	5,076
79	PAYCHEX	48.04	1.68	9.50%	13.4%	17,305
80	PENTAIR	64.21	1.28	9.07%	11.3%	11,592
81	PERRIGO	189.81	0.50	13.72%	14.0%	27,323
82	PHILIP MORRIS INTL.	83.19	4.00	6.18%	11.4%	132,127
83	PHILLIPS 66	79.68	2.24	8.50%	11.6%	44,739
84	PPG INDUSTRIES	113.02	1.44	11.22%	12.6%	30,272
85	PRAXAIR	119.34	2.86	8.17%	10.8%	33,864
86	PREC.CASTPARTS	206.11	0.12	10.91%	11.0%	26,524
87	PRINCIPAL FINL.GP.	52.34	1.52	11.02%	14.3%	15,629
88	PROGRESSIVE OHIO	28.15	0.69	9.33%	12.0%	17,683
89	PRUDENTIAL FINL.	86.46	2.32	9.36%	12.3%	40,557
90	QUEST DIAGNOSTICS	75.13	1.52	10.72%	13.0%	10,610
91	RALPH LAUREN CL.A	132.41	2.00	9.23%	10.9%	7,956
92	ROCKWELL AUTOMATION	122.69	2.60	8.37%	10.7%	16,562
93	ROCKWELL COLLINS	93.30	1.32	11.30%	12.9%	12,277
94	ROPER TECHNOLOGIES	172.00	1.00	13.30%	14.0%	17,800
95	ROSS STORES	50.16	0.47	12.13%	13.2%	21,785
96	SCHLUMBERGER	88.32	2.00	10.12%	12.6%	106,158
97	SEAGATE TECH.	52.55	2.16	7.33%	11.8%	15,203
98	SEMPRA EN.	103.46	2.80	7.93%	10.9%	25,724

	COMPANY	STOCK PRICE (P_0)	D_0	FORECAST OF FUTURE EARNINGS GROWTH	MODEL RESULT	MARKET CAP $ (MILS)
99	ST.JUDE MEDICAL	74.62	1.16	10.57%	12.3%	21,698
100	STARWOOD H&R.WORLDWIDE	83.32	1.50	9.63%	11.6%	14,500
101	STATE STREET	77.98	1.36	10.07%	12.0%	32,646
102	STRYKER	96.72	1.38	8.85%	10.4%	36,967
103	SYMANTEC	24.16	0.60	7.93%	10.6%	16,016
104	T ROWE PRICE GROUP	79.41	2.08	10.38%	13.3%	20,719
105	TEXAS INSTRUMENTS	52.95	1.36	10.00%	12.9%	51,352
106	TIFFANY & CO	92.13	1.60	10.70%	12.6%	12,140
107	TJX	67.24	0.84	11.25%	12.6%	47,198
108	TOTAL SYSTEM SERVICES	42.43	0.40	10.00%	11.0%	8,082
109	TRAVELERS COS.	101.36	2.44	7.83%	10.4%	32,918
110	UNION PACIFIC	99.67	2.20	10.55%	13.0%	84,398
111	UNITED PARCEL SER.'B'	99.47	2.92	9.46%	12.7%	68,384
112	UNITED TECHNOLOGIES	112.27	2.56	8.40%	10.9%	99,088
113	UNITEDHEALTH GROUP	119.30	2.00	10.60%	12.5%	118,921
114	UNIVERSAL HEALTH SVS.'B'	133.91	0.40	11.60%	11.9%	12,966
115	V F	71.42	1.28	11.51%	13.5%	31,040
116	VERIZON COMMUNICATIONS	48.32	2.20	5.72%	10.6%	194,462
117	WELLS FARGO & CO	56.50	1.50	9.74%	12.7%	299,529
118	WESTERN UNION	20.83	0.62	8.90%	12.2%	9,949
119	WHOLE FOODS MARKET	41.36	0.52	12.47%	13.9%	15,030
120	WW GRAINGER	238.92	4.68	11.45%	13.6%	15,330
121	XILINX	44.71	1.24	8.82%	11.9%	10,937
122	XYLEM	36.49	0.56	9.13%	10.8%	6,533
123	YUM! BRANDS	90.42	1.64	11.73%	13.8%	38,054
124	ZIMMER BIOMET HDG.	108.69	0.88	10.00%	10.9%	21,907
125	ZIONS BANCORP.	30.19	0.24	10.10%	11.0%	6,405
126	ZOETIS	48.91	0.33	11.90%	12.7%	23,998
127	Market-weighted Average				12.0%	

Notes: In applying the DCF model to the S&P 500, I include in the DCF analysis only those companies in the S&P 500 group which pay a dividend, have a positive growth rate, and have at least three analysts' long-term growth estimates. I also eliminate those twenty-five percent of companies with the highest and lowest DCF results.

D_0 = Current dividend per Thomson Reuters.
P_0 = Average of the monthly high and low stock prices during the three months ending July 2015 per Thomson Reuters.
g = I/B/E/S forecast of future earnings growth July 2015.
k = Cost of equity using the quarterly version of the DCF model shown below:

$$k = \left[\frac{d_0(1+g)^{\frac{1}{4}}}{P_0} + (1+g)^{\frac{1}{4}} \right]^4 - 1$$

QUALIFICATIONS OF JAMES H. VANDER WEIDE, PH.D.

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James H. Vander Weide is President of Financial Strategy Associates, a consulting firm that provides financial and economic consulting services, including cost of capital and valuation studies, to corporate clients. Dr. Vander Weide holds a Ph.D. in Finance from Northwestern University and a Bachelor of Arts in Economics from Cornell University. After receiving his Ph.D. in Finance, Dr. Vander Weide joined the faculty at Duke University, the Fuqua School of Business, and was named Assistant Professor, Associate Professor, Professor, and then Research Professor of Finance and Economics.

As a Professor at Duke University and the Fuqua School of Business, Dr. Vander Weide has published research in the areas of finance and economics and taught courses in corporate finance, investment management, management of financial institutions, statistics, economics, operations research, and the theory of public utility pricing. Dr. Vander Weide has been active in executive education at Duke and Duke Corporate Education, leading executive development seminars on topics including financial analysis, cost of capital, creating shareholder value, mergers and acquisitions, capital budgeting, measuring corporate performance, and valuation. In addition, Dr. Vander Weide designed and served as Program Director for several executive education programs, including the Advanced Management Program, Competitive Strategies in Telecommunications, and the Duke Program for Manager Development for managers from the former Soviet Union. He is now retired from his teaching responsibilities at Duke.

As an expert financial economist, Dr. Vander Weide has participated in more than four hundred regulatory and legal proceedings, appearing in U.S. courts and federal and state or provincial proceedings in the United States and Canada. He has testified as an expert witness on the cost of capital, competition, risk, incentive regulation, forward-looking economic cost, economic pricing guidelines, valuation, and other financial and economic issues. His clients include investor-owned electric, gas, and water utilities, natural gas pipelines, oil pipelines, telecommunications companies, and insurance companies.

Publications

Dr. Vander Weide has written research papers on such topics as portfolio management, capital budgeting, investments, the effect of regulation on the performance of public utilities, and

cash management. His articles have been published in *American Economic Review, Journal of Finance, Journal of Financial and Quantitative Analysis, Management Science, Financial Management, Journal of Portfolio Management, International Journal of Industrial Organization, Journal of Bank Research, Journal of Accounting Research, Journal of Cash Management, Atlantic Economic Journal, Journal of Economics and Business,* and *Computers and Operations Research*. He has written a book entitled *Managing Corporate Liquidity: An Introduction to Working Capital Management* published by John Wiley and Sons, Inc.; and he has written a chapter titled "Financial Management in the Short Run" for *The Handbook of Modern Finance*, and a chapter titled "Principles for Lifetime Portfolio Selection: Lessons from Portfolio Theory" for *The Handbook of Portfolio Construction: Contemporary Applications of Markowitz Techniques. The Handbook of Portfolio Construction* is a peer-reviewed collection of research papers by notable scholars on portfolio optimization, published in 2010 in honor of Nobel Prize winner Harry Markowitz.

Professional Consulting Experience

Dr. Vander Weide has provided financial and economic consulting services to firms in the electric, gas, insurance, oil and gas pipeline, telecommunications, and water industries for more than thirty years. He has testified on the cost of capital, competition, risk, incentive regulation, forward-looking economic cost, economic pricing guidelines, valuation, and other financial and economic issues in more than four hundred cases before the Federal Energy Regulatory Commission, the National Energy Board (Canada), the Federal Communications Commission, the Canadian Radio-Television and Telecommunications Commission, the National Telecommunications and Information Administration, the United States Tax Court, the public service commissions of forty-three states and the District of Columbia, four Canadian provinces, the insurance commissions of five states, the Iowa State Board of Tax Review, and the North Carolina Property Tax Commission. In addition, he has testified as an expert witness in proceedings before numerous federal district courts. Dr. Vander Weide testified in thirty states on issues relating to the pricing of unbundled network elements and universal service cost studies and consulted with Bell Canada, Deutsche Telekom, and Telefónica on similar issues. Dr. Vander Weide has provided consulting and expert witness testimony to the following companies:

ELECTRIC, GAS, PIPELINE, WATER COMPANIES	
Alcoa Power Generating, Inc.	Kinder Morgan Energy Partners
Alliant Energy and subsidiaries	Maritimes & Northeast Pipeline
AltaLink, L.P.	MidAmerican Energy and subsidiaries
Ameren	National Fuel Gas

ELECTRIC, GAS, PIPELINE, WATER COMPANIES	
American Water Works	Nevada Power Company
Atmos Energy and subsidiaries	NICOR
BP p.l.c.	North Carolina Natural Gas
Buckeye Partners, L.P.	North Shore Gas
Central Illinois Public Service	Northern Natural Gas Company
Citizens Utilities	NOVA Gas Transmission Ltd.
Consolidated Natural Gas and subsidiaries	PacifiCorp
Dominion Resources and subsidiaries	Peoples Energy and its subsidiaries
Duke Energy and subsidiaries	PG&E
Empire District Electric Company	Plains All American Pipeline, L.P.
EPCOR Distribution & Transmission Inc.	Progress Energy
EPCOR Energy Alberta Inc.	PSE&G
FortisAlberta Inc.	Public Service Company of North Carolina
FortisBC Utilities	Sempra Energy/San Diego Gas and Electric
Hope Natural Gas	South Carolina Electric and Gas
Interstate Power Company	Southern Company and subsidiaries
Iberdrola Renewables	Tennessee-American Water Company
Iowa Southern	The Peoples Gas, Light and Coke Co.
Iowa-American Water Company	TransCanada
Iowa-Illinois Gas and Electric	Trans Québec & Maritimes Pipeline Inc.
Kentucky Power Company	Union Gas
Kentucky-American Water Company	United Cities Gas Company
Newfoundland Power Inc.	Virginia-American Water Company
	Wisconsin Energy Corporation
	Xcel Energy

TELECOMMUNICATIONS COMPANIES	
ALLTEL and subsidiaries	Phillips County Cooperative Tel. Co.
Ameritech (now AT&T new)	Pine Drive Cooperative Telephone Co.
AT&T (old)	Roseville Telephone Company (SureWest)
Bell Canada/Nortel	SBC Communications (now AT&T new)
BellSouth and subsidiaries	Sherburne Telephone Company
Centel and subsidiaries	Siemens
Cincinnati Bell (Broadwing)	Southern New England Telephone
Cisco Systems	Sprint/United and subsidiaries
Citizens Telephone Company	Telefónica
Concord Telephone Company	Tellabs, Inc.
Contel and subsidiaries	The Stentor Companies
Deutsche Telekom	U S West (Qwest)
GTE and subsidiaries (now Verizon)	Union Telephone Company
Heins Telephone Company	United States Telephone Association
JDS Uniphase	Valor Telecommunications (Windstream)

TELECOMMUNICATIONS COMPANIES	
Lucent Technologies	Verizon (Bell Atlantic) and subsidiaries
Minnesota Independent Equal Access Corp.	Woodbury Telephone Company
NYNEX and subsidiaries (Verizon)	
Pacific Telesis and subsidiaries	

INSURANCE COMPANIES
Allstate
North Carolina Rate Bureau
United Services Automobile Association (USAA)
The Travelers Indemnity Company
Gulf Insurance Company

Other Professional Experience

Dr. Vander Weide has conducted in-house seminars and training sessions on topics such as creating shareholder value, financial analysis, competitive strategy, cost of capital, real options, financial strategy, managing growth, mergers and acquisitions, valuation, measuring corporate performance, capital budgeting, cash management, and financial planning. Among the firms for whom he has designed and taught tailored programs and training sessions are ABB Asea Brown Boveri, Accenture, Allstate, Ameritech, AT&T, Bell Atlantic/Verizon, BellSouth, Progress Energy/Carolina Power & Light, Contel, Fisons, GlaxoSmithKline, GTE, Lafarge, MidAmerican Energy, New Century Energies, Norfolk Southern, Pacific Bell Telephone, The Rank Group, Siemens, Southern New England Telephone, TRW, and Wolseley Plc. Dr. Vander Weide has also hosted a nationally prominent conference/workshop on estimating the cost of capital. In 1989, at the request of Mr. Fuqua, Dr. Vander Weide designed the Duke Program for Manager Development for managers from the former Soviet Union, the first in the United States designed exclusively for managers from Russia and the former Soviet republics.

Early in his career, Dr. Vander Weide helped found University Analytics, Inc., one of the fastest growing small firms in the country at that time. As an officer at University Analytics, he designed cash management models, databases, and software packages used by most major U.S. banks in consulting with their corporate clients. Having sold his interest in University Analytics, Dr. Vander Weide now concentrates on strategic and financial consulting, academic research, and executive education.

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JAMES H. VANDER WEIDE

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DERIVATION OF THE QUARTERLY DCF MODEL

The simple DCF Model assumes that a firm pays dividends only at the end of each year. Since firms in fact pay dividends quarterly and investors appreciate the time value of money, the annual version of the DCF Model generally underestimates the value investors are willing to place on the firm's expected future dividend stream. In these workpapers, we review two alternative formulations of the DCF Model that allow for the quarterly payment of dividends.

When dividends are assumed to be paid annually, the DCF Model suggests that the current price of the firm's stock is given by the expression:

$$P_0 = \frac{D_1}{(1+k)} + \frac{D_2}{(1+k)^2} + \ldots + \frac{D_n + P_n}{(1+k)^n} \quad \textbf{(1)}$$

where

P_0	=	current price per share of the firm's stock,
$D_1, D_2, \ldots, D_n$	=	expected annual dividends per share on the firm's stock,
P_n	=	price per share of stock at the time investors expect to sell the stock, and
k	=	return investors expect to earn on alternative investments of the same risk, i.e., the investors' required rate of return.

Unfortunately, expression (1) is rather difficult to analyze, especially for the purpose of estimating k. Thus, most analysts make a number of simplifying assumptions. First, they assume that dividends are expected to grow at the constant rate g into the indefinite future. Second, they assume that the stock price at time n is simply the present value of all dividends expected in periods subsequent to n. Third, they assume that the investors' required rate of return, k, exceeds the expected dividend growth rate g. Under

the above simplifying assumptions, a firm's stock price may be written as the following sum:

$$P_0 = \frac{D_0(1+g)}{(1+k)} + \frac{D_0(1+g)^2}{(1+k)^2} + \frac{D_0(1+g)^3}{(1+k)^3} + \ldots, \qquad (2)$$

where the three dots indicate that the sum continues indefinitely.

As we shall demonstrate shortly, this sum may be simplified to:

$$P_0 = \frac{D_0(1+g)}{(k-g)}$$

First, however, we need to review the very useful concept of a geometric progression.

Geometric Progression

Consider the sequence of numbers 3, 6, 12, 24,…, where each number after the first is obtained by multiplying the preceding number by the factor 2. Obviously, this sequence of numbers may also be expressed as the sequence 3, 3 x 2, 3 x 2^2, 3 x 2^3, etc. This sequence is an example of a geometric progression.

Definition: A geometric progression is a sequence in which each term after the first is obtained by multiplying some fixed number, called the common ratio, by the preceding term.

A general notation for geometric progressions is: a, the first term, r, the common ratio, and n, the number of terms. Using this notation, any geometric progression may be represented by the sequence:

$$a, ar, ar^2, ar^3, \ldots, ar^{n-1}.$$

In studying the DCF Model, we will find it useful to have an expression for the sum of n terms of a geometric progression. Call this sum S_n. Then

$$S_n = a + ar + \ldots + ar^{n-1} . \qquad (3)$$

However, this expression can be simplified by multiplying both sides of equation (3) by r and then subtracting the new equation from the old. Thus,

$$rS_n = ar + ar^2 + ar^3 + \ldots + ar^n$$

and

$$S_n - rS_n = a - ar^n \quad ,$$

or

$$(1 - r)\, S_n = a\,(1 - r^n) \ .$$

Solving for S_n, we obtain:

$$S_n = \frac{a(1 - r^n)}{(1 - r)} \qquad \textbf{(4)}$$

as a simple expression for the sum of n terms of a geometric progression. Furthermore, if $|r| < 1$, then S_n is finite, and as n approaches infinity, S_n approaches $a \div (1-r)$. Thus, for a geometric progression with an infinite number of terms and $|r| < 1$, equation (4) becomes:

$$S = \frac{a}{1 - r} \qquad \textbf{(5)}$$

Application to DCF Model

Comparing equation (2) with equation (3), we see that the firm's stock price (under the DCF assumption) is the sum of an infinite geometric progression with the first term

$$a = \frac{D_0(1 + g)}{(1 + k)}$$

and common factor

$$r = \frac{(1 + g)}{(1 + k)}$$

Applying equation (5) for the sum of such a geometric progression, we obtain

$$S = a \bullet \frac{1}{(1-r)} = \frac{D_0(1+g)}{(1+k)} \bullet \frac{1}{1-\frac{1+g}{1+k}} = \frac{D_0(1+g)}{(1+k)} \bullet \frac{1+k}{k-g} = \frac{D_0(1+g)}{k-g}$$

as we suggested earlier.

Quarterly DCF Model

The Annual DCF Model assumes that dividends grow at an annual rate of g% per year (see Figure 1).

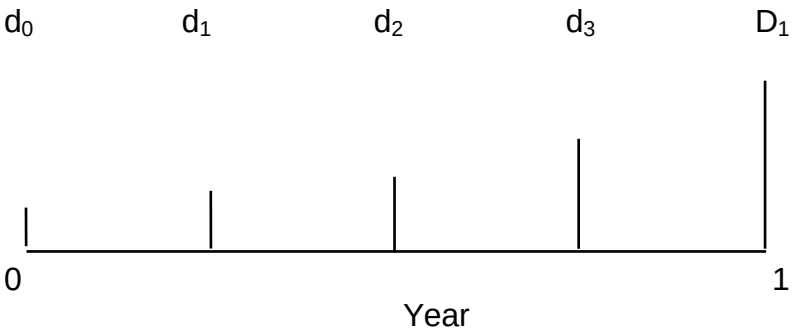
Figure 1

Annual DCF Model

$D_0 = 4d_0$ $D_1 = D_0(1 + g)$

Figure 2

Quarterly DCF Model (Constant Growth Version)



$d_1 = d_0(1+g)^{.25}$ $d_2 = d_0(1+g)^{.50}$

$d_3 = d_0(1+g)^{.75}$ $d_4 = d_0(1+g)$

In the Quarterly DCF Model, it is natural to assume that quarterly dividend payments differ from the preceding quarterly dividend by the factor $(1 + g)^{.25}$, where g is expressed in terms of percent per year and the decimal .25 indicates that the growth has

only occurred for one quarter of the year. (See Figure 2.) Using this assumption, along with the assumption of constant growth and ***k*** > ***g***, we obtain a new expression for the firm's stock price, which takes account of the quarterly payment of dividends. This expression is:

$$P_0 = \frac{d_0(1+g)^{\frac{1}{4}}}{(1+k)^{\frac{1}{4}}} + \frac{d_0(1+g)^{\frac{2}{4}}}{(1+k)^{\frac{2}{4}}} + \frac{d_0(1+g)^{\frac{3}{4}}}{(1+k)^{\frac{3}{4}}} + \ldots \qquad \textbf{(6)}$$

where d_0 is the last quarterly dividend payment, rather than the last annual dividend payment. (We use a lower case d to remind the reader that this is not the annual dividend.)

Although equation (6) looks formidable at first glance, it too can be greatly simplified using the formula [equation (4)] for the sum of an infinite geometric progression. As the reader can easily verify, equation (6) can be simplified to:

$$P_0 = \frac{d_0(1+g)^{\frac{1}{4}}}{(1+k)^{\frac{1}{4}} - (1+g)^{\frac{1}{4}}} \qquad \textbf{(7)}$$

Solving equation (7) for *k*, we obtain a DCF formula for estimating the cost of equity under the quarterly dividend assumption:

$$k = \left[\frac{d_0(1+g)^{\frac{1}{4}}}{P_0} + (1+g)^{\frac{1}{4}} \right]^4 - 1 \qquad \textbf{(8)}$$

An Alternative Quarterly DCF Model

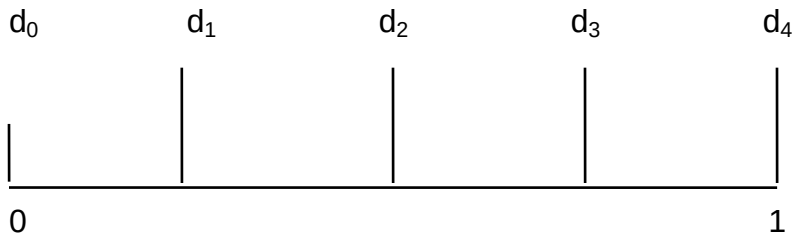
Although the constant growth Quarterly DCF Model [equation (8)] allows for the quarterly timing of dividend payments, it does require the assumption that the firm increases its dividend payments each quarter. Since this assumption is difficult for some analysts to accept, we now discuss a second Quarterly DCF Model that allows for constant quarterly dividend payments within each dividend year.

Assume then that the firm pays dividends quarterly and that each dividend payment is constant for four consecutive quarters. There are four cases to consider, with each case distinguished by varying assumptions about where we are evaluating the firm in relation to the time of its next dividend increase. (See Figure 3.)

Figure 3

Quarterly DCF Model (Constant Dividend Version)

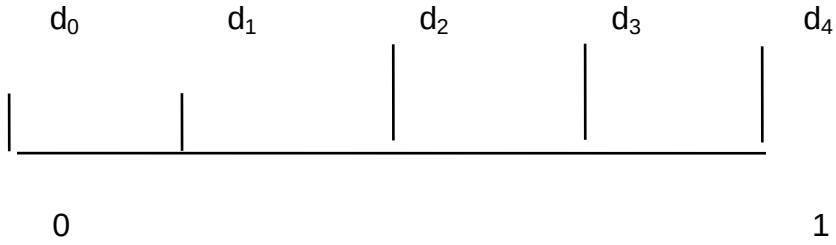
Case 1



Year

$$d_1 = d_2 = d_3 = d_4 = d_0(1+g)$$

Case 2



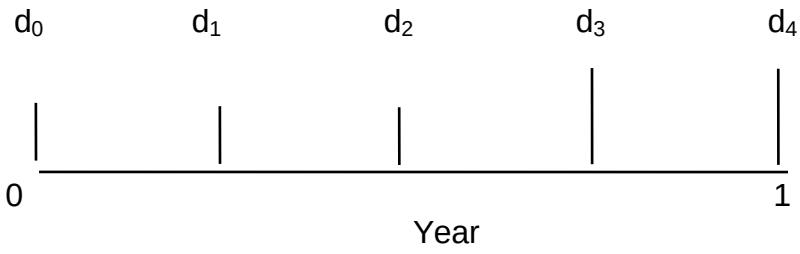
Year

$$d_1 = d_0$$

$$d_2 = d_3 = d_4 = d_0(1+g)$$

Figure 3 (continued)

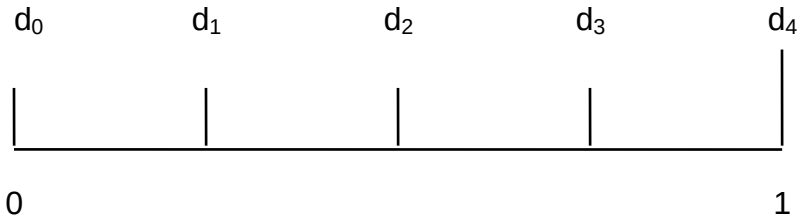
Case 3



$d_1 = d_2 = d_0$

$d_3 = d_4 = d_0(1+g)$

Case 4



$d_1 = d_2 = d_3 = d_0$

$d_4 = d_0(1+g)$

If we assume that the investor invests the quarterly dividend in an alternative investment of the same risk, then the amount accumulated by the end of the year will in all cases be given by

$$D_1^* = d_1 (1+k)^{3/4} + d_2 (1+k)^{1/2} + d_3 (1+k)^{1/4} + d_4$$

where d_1, d_2, d_3 and d_4 are the four quarterly dividends. Under these new assumptions, the firm's stock price may be expressed by an Annual DCF Model of the form (2), with the exception that

$$D_1^* = d_1 (1 + k)^{3/4} + d_2 (1 + k)^{1/2} + d_3 (1 + k)^{1/4} + d_4 \qquad \textbf{(9)}$$

is used in place of $D_0(1+g)$. But, we already know that the Annual DCF Model may be reduced to

$$P_0 = \frac{D_0 (1 + g)}{k - g}$$

Thus, under the assumptions of the second Quarterly DCF Model, the firm's cost of equity is given by

$$k = \frac{D_1^*}{P_0} + g \qquad \textbf{(10)}$$

with D_1^* given by (9).

Although equation (10) looks like the Annual DCF Model, there are at least two very important practical differences. First, since D_1^* is always greater than $D_0(1+g)$, the estimates of the cost of equity are always larger (and more accurate) in the Quarterly Model (10) than in the Annual Model. Second, since D_1^* depends on k through equation (9), the unknown "k" appears on both sides of (10), and an iterative procedure is required to solve for k.

EX ANTE RISK PREMIUM APPROACH

My ex ante risk premium method is based on studies of the DCF expected return on proxy companies compared to the interest rate on Moody's A-rated utility bonds. Specifically, for each month in my study period, I calculate the risk premium using the equation,

$$RP_{PROXY} = DCF_{PROXY} - I_A$$

where:

RP_{PROXY}	=	the required risk premium on an equity investment in the proxy group of companies,
DCF_{PROXY}	=	average DCF estimated cost of equity on a portfolio of proxy companies; and
I_A	=	the yield to maturity on an investment in A-rated utility bonds.

For my ex ante risk premium analysis, I begin with the Moody's group of twenty-four electric companies shown in Table 1. I use the Moody's group of electric companies because they are a widely followed group of electric utilities, and use of this constant group greatly simplifies the data collection task required to estimate the ex ante risk premium over the months of my study. Simplifying the data collection task is desirable because the ex ante risk premium approach requires that the DCF model be estimated for every company in every month of the study period. The Ex Ante Risk Premium Schedule in my direct testimony displays the average DCF estimated cost of equity on an investment in the portfolio of electric companies and the yield to maturity on A-rated utility bonds in each month of the study.

Previous studies have shown that the ex ante risk premium tends to vary inversely with the level of interest rates, that is, the risk premium tends to increase when interest rates decline, and decrease when interest rates go up. To test whether my studies also indicate that the ex ante risk premium varies inversely with the level of interest rates, I perform a regression analysis of the relationship between the ex ante risk premium and the yield to maturity on A-rated utility bonds, using the equation,

$$RP_{PROXY} = a + (b \times I_A) + e$$

where:

RP_{PROXY} = risk premium on proxy company group;

I_A = yield to maturity on A-rated utility bonds;

e = a random residual; and

a, b = coefficients estimated by the regression procedure.

Regression analysis assumes that the statistical residuals from the regression equation are random. My examination of the residuals revealed that there is a significant probability that the residuals are serially correlated (non-zero serial correlation indicates that the residual in one time period tends to be correlated with the residual in the previous time period). Therefore, I make adjustments to my data to correct for the possibility of serial correlation in the residuals.

The common procedure for dealing with serial correlation in the residuals is to estimate the regression coefficients in two steps. First, a multiple regression analysis is used to estimate the serial correlation coefficient, r. Second, the estimated serial correlation coefficient is used to transform the original variables into new variables whose serial correlation is approximately zero. The regression coefficients are then re-estimated using the transformed variables as inputs in the regression equation. Based on my knowledge of the statistical relationship between the yield to maturity on A-rated utility bonds and the required risk premium, my estimate of the ex ante risk premium on an investment in my proxy electric company group as compared to an investment in A-rated utility bonds is given by the equation:

8.22-(.606x5.9)=4.61

$$RP_{PROXY} = \underset{(13.16)}{8.22} - \underset{(-6.25)}{.606 \times I_A}.$$ [3]

Using the 5.9 percent forecasted yield to maturity on A-rated utility bonds,[4] the regression equation produces an ex ante risk premium equal to 4.62 percent (8.22 – 0.606 x 5.9 = 4.62).

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[3] The t-statistics are shown in parentheses.

[4] Forecasted A-rated utility bond yield determined from forecast data in Value Line Selection & Opinion, May 22, 2015, and EIA 2015, as described in the direct testimony.

To estimate the cost of equity using the ex ante risk premium method, one may add the estimated risk premium over the forecasted yield on A-rated utility bonds to the yield to maturity on A-rated utility bonds. As described above, my analyses produce an estimated risk premium over the yield on A-rated utility bonds equal to 4.6 percent. Adding an estimated risk premium of 4.62 percent to the 5.93 percent forecasted yield to maturity on A-rated utility bonds produces a cost of equity estimate of 10.6 percent for the electric company proxy group using the ex ante risk premium method.

TABLE 1
MOODY'S ELECTRIC COMPANIES

American Electric Power
Constellation Energy
Progress Energy
CH Energy Group
Cinergy Corp.
Consolidated Edison Inc.
DPL Inc.
DTE Energy Co.
Dominion Resources Inc.
Duke Energy Corp.
Energy East Corp.
FirstEnergy Corp.
Reliant Energy Inc.
IDACORP. Inc.
IPALCO Enterprises Inc.
NiSource Inc.
OGE Energy Corp.
Exelon Corp.
PPL Corp.
Potomac Electric Power Co.
Public Service Enterprise Group
Southern Company
Teco Energy Inc.
Xcel Energy Inc.

Source of data: *Mergent Public Utility Manual*, August 2002. Of these twenty-four companies, I do not include companies in my ex ante risk premium DCF analysis in months in which there are insufficient data to perform a DCF analysis. In addition, since the beginning period of my study, companies have been eliminated due to mergers and acquisitions.

EX POST RISK PREMIUM APPROACH

Source

Stock price and yield information is obtained from Standard & Poor's Security Price publication. Standard & Poor's derives the stock dividend yield by dividing the aggregate cash dividends (based on the latest known annual rate) by the aggregate market value of the stocks in the group. The bond price information is obtained by calculating the present value of a bond due in thirty years with a $4.00 coupon and a yield to maturity of a particular year's indicated Moody's A-rated utility bond yield. The values shown on schedules are the January values of the respective indices. Standard & Poor's discontinued its S&P Utilities Index in December 2001, replacing its utilities stock index with separate indices for electric and natural gas utilities. Thus, to continue my study, I base the stock returns beginning in 2002 on the total returns for the EEI Index of U.S. shareholder-owned electric utilities, as reported by EEI on its website.
http://www.eei.org/resourcesandmedia/industrydataanalysis/Pages/default.aspx

Calculation of Stock and Bond Returns

Sample calculation of "Stock Return" column:

$$\text{Stock Return (2014)} = \left[\frac{\text{Stock Price (2015)} - \text{Stock Price (2014)} + \text{Dividend (2014)}}{\text{Stock Price (2014)}} \right]$$

where Dividend (2014) = Stock Price (2014) x Stock Div. Yield (2014)

Sample calculation of "Bond Return" column:

$$\text{Bond Return (2014)} = \left[\frac{\text{Bond Price (2015)} - \text{Bond Price (2014)} + \text{Interest (2014)}}{\text{Bond Price (2014)}} \right]$$

where Interest = $4.00.

AFFIDAVIT OF JAMES H. VANDER WEIDE

STATE OF NORTH CAROLINA)
) ss
COUNTY OF DURHAM)

On the 7th day of October, 2015, before me appeared James H. Vander Weide, to me personally known, who, being by me first duly sworn, states that he is President of Financial Strategy Associates and acknowledges that he has read the above and foregoing document and believes that the statements therein are true and correct to the best of his information, knowledge and belief.

James H. Vander Weide
James H. Vander Weide

Subscribed and sworn to before me this 7th day of October, 2015.

Jochukwu Chime Ukpabi
Notary Public

My commission expires: 10-04-2016