BEFORE

THE PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of the Application of Duke Energy Ohio, Inc., for the Establishment of a Charge Pursuant to Revised Code Section 4909.18.	))))	Case No. 12-2400-EL-UNC
In the Matter of the Application of Duke Energy Ohio, Inc., for Approval to Change Accounting Methods.	)))	Case No. 12-2401-EL-AAM
In the Matter of the Application of Duke Energy Ohio, Inc., for the Approval of a Tariff for a New Service.	)))	Case No. 12-2402-EL-ATA

DIRECT TESTIMONY OF

JAMES H. VANDER WEIDE, PH.D.,

ON BEHALF OF

DUKE ENERGY OHIO, INC.

_________ Management policies, practices, and organization

_________ Operating income

_________ Rate Base

_________ Allocations

____X____ Rate of return

_________ Rates and tariffs

_________ Other: Drivers for rate request

March 1, 2013

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I. INTRODUCTION AND PURPOSE

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

A. My name is James H. Vander Weide. I am Research Professor of Finance and Economics at the Fuqua School of Business of Duke University. I am also 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 DESCRIBE YOUR EDUCATIONAL BACKGROUND AND PRIOR ACADEMIC EXPERIENCE.

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 400 regulatory and legal proceedings before the U.S. Congress, the Canadian Radio-Television and Telecommunications Commission, the Federal Communications Commission, the National Telecommunications and Information Administration, the Federal Energy Regulatory Commission, the

National Energy Board (Canada), the public service commissions of forty-three states and four Canadian provinces, the insurance commissions of five states, the Iowa State Board of Tax Review, the National Association of Securities Dealers, 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; and the U. S. District Court for the Eastern District of Michigan.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. I have been asked by Duke Energy Ohio, Inc., (Duke Energy Ohio or Company) to prepare an independent appraisal of whether the Company's requested 11.15 percent rate of return on equity for its investment in the generation assets it has committed to fulfill its capacity obligations as a Fixed Resource Requirement (FRR) entity in PJM Interconnection, L.L.C., (PJM) is fair and reasonable.

II. SUMMARY OF TESTIMONY

Q. HOW DO YOU ASSESS WHETHER THE COMPANY'S REQUESTED 11.15 PERCENT RATE OF RETURN ON EQUITY FOR ITS INVESTMENT IN THE GENERATION ASSETS IT HAS COMMITTED TO FULFILL ITS CAPACITY OBLIGATIONS AS AN FRR ENTITY IN PJM IS FAIR AND REASONABLE?

A. I assess the reasonableness of the Company's requested 11.15 percent rate of return on equity by estimating the cost of equity for two groups of publicly-traded companies with regulated operations and comparing the risk of Duke Energy Ohio's investment in its generation assets to the risk of these publicly-traded companies.

Q. WHY DO YOU ESTIMATE THE COST OF EQUITY FOR TWO GROUPS OF COMPANIES WITH REGULATED OPERATIONS?

A. I estimate the cost of equity for two groups of companies with regulated operations because my first group, which consists of market-traded regulated electric utilities, is less risky than Duke Energy Ohio's investment in its generation assets. As discussed in my testimony, many publicly-traded electric utilities have regulated generation, transmission, and distribution assets that are regulated under cost of service standards that provide some assurance that the companies will have an opportunity to earn a fair return on their investments in generation, transmission, and distribution assets, including a return on and a return of capital. In contrast, Duke Energy Ohio's generation assets, although committed to its FRR plan and used to fulfill its capacity service obligation, operate in competitive markets. As a general proposition, there is no assurance that a participant in competitive markets will have an opportunity to earn a fair return on an asset over the life of that asset. Because the publicly-traded and mostly-regulated electric utilities included in my cost of equity studies are less risky than Duke Energy Ohio's generation assets, I also apply my cost of equity methods to a group of publicly-traded pipeline companies that operate in both competitive and regulated markets.

Q. DID YOU ALSO CONSIDER APPLYING YOUR COST OF EQUITY METHODS TO A GROUP OF PUBLICLY-TRADED GENERATION COMPANIES THAT, LIKE DUKE ENERGY OHIO'S GENERATION BUSINESS, OPERATE IN DEREGULATED MARKETS?

A. Yes. However, I found that all of the publicly-traded generation companies have either experienced bankruptcy or have below-investment-grade bond ratings. It is difficult, if not impossible to reasonably apply cost of equity methods to such companies because of the high degree of uncertainty surrounding these companies' future revenues and earnings.

Q. WHAT COST OF EQUITY DO YOU FIND FOR YOUR PROXY COMPANY GROUPS IN THESE PROCEEDINGS?

A. On the basis of my studies, I find a cost of equity in the range 10.7 percent to 12.6 percent. This conclusion is based on my application of standard cost of equity estimation techniques, including the discounted cash flow (DCF), the ex ante risk premium approach, the ex post risk premium approach, and the capital asset pricing model (CAPM) to my proxy company groups, and on the evidence I present in this testimony that the CAPM significantly underestimates the cost of equity for companies such as my proxy companies with market risk factors (that is, betas) significantly less than 1.0. Because Duke Energy Ohio's requested 11.15 percent rate of return on equity for its generation assets is at the lower end of the range of cost of equity results for my two groups of companies, I conclude that the Company's requested rate of return on equity is fair and reasonable, if not conservative.

Q. ARE YOU FAMILIAR WITH THE COMPANY'S APPLICATION IN THESE PROCEEDINGS?

A. Yes. Duke Energy Ohio's application seeks an order from the Public Utilities Commission of Ohio (Commission) to: (1) establish the amount of the cost-based charge for the provision by Duke Energy Ohio of capacity services throughout its service territory; (2) authorize Duke Energy Ohio to modify its accounting practices to establish a deferral to account for the difference between the amounts being recovered by Duke Energy Ohio, from PJM, for the provision of capacity services and the Company's cost of providing capacity services; and (3) approve a new tariff to allow for the future recovery of the deferred amounts. [Application at para. 2.]

Q. ARE YOU AWARE OF OTHER LOAD SERVING ENTITIES IN OHIO HAVING A COST-BASED CHARGE FOR FRR CAPACITY SERVICES?

A. Yes. The Company has informed me that the Commission has approved a cost-based charge for the capacity services of Ohio Power Company (AEP Ohio) that incorporates a return on equity equal to 11.15 percent. Both AEP Ohio and Duke Energy Ohio are FRR entities with similar obligations to self-supply capacity for their Load Zones, and AEP Ohio and Duke Energy Ohio co-own generating assets used to fulfill their capacity commitments. Thus, the reasonableness of the Company's requested 11.15 percent return on equity is also supported by the Commission's prior decision for a similarly situated Ohio utility.

Q. DO YOU HAVE EXHIBITS ACCOMPANYING YOUR TESTIMONY?

A. Yes. I have prepared or supervised the preparation of ten schedules and five appendices that accompany my testimony.

III. ECONOMIC AND LEGAL PRINCIPLES

Q. HOW DO ECONOMISTS DEFINE THE REQUIRED RATE OF RETURN, OR COST OF CAPITAL, ASSOCIATED WITH PARTICULAR INVESTMENT DECISIONS SUCH AS THE DECISION TO INVEST IN ELECTRIC GENERATION ASSETS?

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

Q. HOW DOES THE COST OF CAPITAL AFFECT A FIRM'S INVESTMENT DECISIONS?

A. The goal of a firm is to maximize the value of the firm. This goal can be accomplished by accepting all investments in plant and equipment with an expected rate of return greater than the cost of capital. Thus, a firm should continue to invest in plant and equipment only so long as the return on its investment is greater than or equal to its cost of capital.

Q. HOW DOES THE COST OF CAPITAL AFFECT INVESTORS' WILLINGNESS TO INVEST IN A COMPANY?

A. The cost of capital measures the return investors can expect on investments of comparable risk. The cost of capital also measures the investor's required rate of return on investment because rational investors will not invest in a particular investment opportunity if the expected return on that opportunity is less than the cost of capital. Thus, the cost of capital is a hurdle rate for both investors and the firm.

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 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 0.50 times 7 percent plus 0.50 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 value 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 ON THEIR INVESTMENT PORTFOLIOS USING MARKET VALUE WEIGHTS RATHER THAN BOOK VALUE WEIGHTS?

A. Investors measure the expected return 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; and (2) 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 their 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 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. DOES THE REQUIRED RATE OF RETURN ON AN INVESTMENT VARY WITH 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. DO ECONOMISTS AND INVESTORS CONSIDER FUTURE INDUSTRY CHANGES WHEN THEY ESTIMATE THE RISK OF A PARTICULAR INVESTMENT?

A. Yes. Economists and investors consider all the risks that a firm might be exposed to over the future life of the company.

Q. ARE THESE ECONOMIC PRINCIPLES REGARDING THE FAIR RETURN FOR CAPITAL RECOGNIZED IN ANY 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. RISK ASSESSMENT OF DUKE ENERGY OHIO'S GENERATION ASSETS

Q. WHAT ELECTRICITY-RELATED SERVICES DOES DUKE ENERGY OHIO PROVIDE?

A. Duke Energy Ohio provides transmission and distribution service to retail customers in southwestern Ohio, transmission service to wholesale customers throughout the PJM footprint, and capacity service for the Duke Energy Ohio Load Zone, consistent with its obligations as an FRR entity.

Q. DOES DUKE ENERGY OHIO CONDUCT ITS GENERATION, TRANSMISSION, AND DISTRIBUTION BUSINESSES THROUGH A SINGLE BUSINESS SEGMENT?

A. No. Duke Energy Ohio conducts its generation, transmission, and distribution businesses through two business segments: U.S. Franchised Electric and Gas (USFE&G) and Commercial Power. USFE&G constructs, operates, and maintains Duke Energy Ohio's transmission and distribution networks and purchases energy from suppliers in the wholesale market on behalf of its Standard Service Offer (SSO) customers. Commercial Power operates Duke Energy Ohio's generation assets, which consist primarily of coal-fired generation assets in Ohio that are dispatched exclusively into the PJM wholesale market.

Q. DOES THE USFE&G BUSINESS SEGMENT OF DUKE ENERGY OHIO RECEIVE ANY MARGIN ON THE ENERGY IT PURCHASES FOR ITS SSO CUSTOMERS?

A. No. The costs of USFE&G's energy purchases are simply passed through to Duke Energy Ohio's SSO customers.

Q. WHAT PRODUCTS AND SERVICES DOES DUKE ENERGY OHIO'S COMMERCIAL POWER SEGMENT PROVIDE?

A. Duke Energy Ohio's Commercial Power segment provides: (1) energy, capacity, and ancillary services to the PJM wholesale market; and (2) capacity services as part of the Company's FRR obligations.

Q. CAN YOU BRIEFLY DEFINE ENERGY SERVICES, CAPACITY SERVICES, AND ANCILLARY SERVICES?

A. Yes. Energy service is the electrical output produced by generation plants; capacity service is a commitment that a particular generation unit will be available for dispatch to an independent system operator; and ancillary services are activities required to ensure the safe and reliable operation of the bulk power system.

Q. IS DUKE ENERGY OHIO A MEMBER OF A REGIONAL TRANSMISSION ORGANIZATION?

A. Yes. Duke Energy Ohio is a member of PJM.

Q. HOW ARE ENERGY SERVICES PRICED IN PJM MARKETS?

A. Generation plant owners specify marginal-cost-based offers to generate and sell energy from each generation plant at specific prices. After receiving offers from generators, PJM clears generation in the day-ahead market and then dispatches the plants in real time in the order of the offer price, or marginal cost per unit of energy produced by each plant, starting with the lowest and continuing to higher priced plants until the entire system demand is satisfied. The price of the last plant dispatched is called the market-clearing price (MCP) because, at this price, system energy demand is equal to system energy supply. PJM pays all generation plants dispatched at the MCP for each megawatt-hour (MWh) of energy produced. The final price paid to generators is the MCP adjusted for congestion and losses.

Q. ARE ENERGY SERVICE PRICES NECESSARILY SUFFICIENT TO PROVIDE A FAIR RETURN ON A COMPANY'S INVESTMENT IN GENERATION ASSETS?

A. No. Because companies generally submit prices based on short-run variable costs, but their total costs include both short-run variable costs and the fixed costs of owning plants, energy service prices may not be sufficient to earn a fair return on the companies' investments in generation assets.

Q. WHAT IS THE PURPOSE OF CAPACITY PAYMENTS?

A. Capacity payments are intended to cover generators' fixed capital costs not recovered through electricity sales in energy and other markets. Capacity markets were also initiated to create incentives for new generation and to provide incentives for existing generation to remain or expand in the market.

Q. IS DUKE ENERGY OHIO THE ONLY COMPANY THAT PROVIDES ENERGY SERVICES IN PJM?

A. No. Energy services are provided by all Load Serving Entities (LSEs), defined by PJM as:

> any entity (or the duly designated agent of such an entity), including a load aggregator or power marketer that (a) serves end-users within the PJM Control Area, and (b) is granted the authority or has an obligation pursuant to state or local law, regulation or franchise to sell electric energy to end-users located within the PJM Control Area.

Q. HOW DOES PJM ENSURE THAT SUFFICIENT CAPACITY RESOURCES ARE AVAILABLE ON A FORWARD-LOOKING BASIS TO MEET THE DEMAND FOR ENERGY UNDER ALL CONDITIONS?

A. PJM ensures that sufficient capacity resources are available by requiring LSEs, other than FRR entities, to participate in PJM's Reliability Pricing Model (RPM). The RPM includes a mechanism for offering capacity in a three-year-forward auction process called the Base Residual Auction (BRA). The RPM includes additional components that attempt to ensure that capacity prices are sufficient to: (1) encourage investment in new capacity resources; (2) encourage investment in the maintenance of existing capacity resources; and (3) discourage existing capacity resources from leaving the market.

Q. HOW ARE CAPACITY PAYMENTS DETERMINED IN PJM?

A. For generators that are not FRR entities, capacity prices are determined through PJM's RPM. The clearing price is set at the intersection of the supply curve and the administratively-determined demand curve, and prices may vary depending upon zone. As part of the RPM process, the PJM Independent Market Monitor calculates offer caps based on the fixed costs a generation owner would avoid if it shut a unit down, offset by expected net revenues from energy and ancillary service markets. I discuss the compensation for FRR entities below.

Q. CAN YOU ILLUSTRATE HOW THE RPM ATTEMPTS TO ENSURE THAT CAPACITY PRICES ARE SUFFICIENT TO ENCOURAGE NEW INVESTMENT?

A. Yes. If a 100 megawatt (MW) generating unit has fixed costs of $10 million per year, its avoidable costs would be calculated at $10 million, or $100,000 per megawatt-year (MW-year), which equates to $274 per megawatt-day (MW-day). If that same unit is used for energy only, does not supply ancillary services in PJM, generates 100 MWs on peak, sixteen hours per day, five days per week, fifty weeks per year, and earns a margin of $10 per MWh on that energy, the generator would earn $4 million per year in operating profit. However, because the unit's fixed costs are $10 million, the generator would lose $6 million per year. In this case, the remaining capacity cost would be $6 million, and the offer cap would include the $6 million capacity cost. If the clearing price is not sufficient for this generator to recover its entire costs with a return, then this would indicate that the generator should not build, if it is a new plant, or should consider retiring the plant, if it is an existing one.

Q. DO LSEs HAVE AN ALTERNATIVE TO RPM PARTICIPATION?

A. Yes. LSEs can opt out of the RPM by becoming an FRR entity. The FRR entity can avoid direct participation in the RPM by providing an FRR Capacity Plan that satisfies the capacity obligation of the entire FRR Service Area, plus a Threshold Quantity if selling excess into RPM. However, the FRR election can also be mandatory, as opposed to elective. Given the timing of its realignment to PJM relative to the completion of BRAs, Duke Energy Ohio was required to become an FRR entity.

Q. AS AN FRR ENTITY, HOW ARE DUKE ENERGY OHIO'S CAPACITY PAYMENTS DETERMINED?

A. The Company has informed me that PJM charges all LSEs in the Duke Energy Ohio Load Zone at the final zonal capacity price, which is a market-based rate. However, as provided under PJM's Reliability Assurance Agreement, Duke Energy Ohio may be compensated for the capacity it supplies based on one of three methods in a specific order of priority: (1) a state compensation mechanism; (2) the RPM rate; or (3) a cost-based rate approved by the Federal Energy Regulatory Commission (FERC). The state compensation mechanism is the proper rate if a state mechanism exists; in the absence of a state compensation mechanism, an FRR entity such as Duke Energy Ohio may elect to use the RPM rate; and if the entity deems the RPM rate to be insufficient, the FRR entity may file at FERC for cost recovery.

Q. DOES THE RPM RATE ENABLE DUKE ENERGY OHIO TO EARN A REASONABLE RETURN ON ITS INVESTMENT IN ITS CAPACITY ASSETS AS A UTILITY WITH FRR OBLIGATIONS IN PJM?

A. No. Duke Energy Ohio states in its Application in these proceedings:

> The Commission recently found that Reliability Pricing Model-based capacity pricing would be insufficient to yield reasonable compensation for an Ohio FRR entity's provision of capacity in fulfillment of its FRR capacity obligations. Similarly, absent sufficient capacity compensation for rendering service as an FRR entity, Duke Energy Ohio will be operating at a significant loss, with an estimated average annualized ROE of negative 8.90 percent, for the period August 1, 2012, through May 31, 2015. Indeed, Duke Energy Ohio currently requires at least $122 million on an annualized basis through May 31, 2015, to earn even 0 percent on its equity investment. See Attachment C. It is undeniable that Duke Energy Ohio is not earning fair and reasonable compensation for its services. [Application at ¶15.]

Q. DOES DUKE ENERGY OHIO EXPERIENCE ANY RISKS AS A RESULT OF THE PJM PRICING MECHANISM?

A. Yes. Duke Energy Ohio faces the risk that its financial integrity may decline as a result of: (1) weakness in overall price and demand for energy; (2) excess availability of dispatchable generation plants; (3) changing commodity prices, especially natural gas prices; (4) increased costs of meeting more stringent clean air requirements; (5) costs of meeting renewable energy requirements; and (6) uncertainties relating to changes in PJM's cost allocation and operating procedures.

Q. DOES DUKE ENERGY OHIO FACE ADDITIONAL RISKS AS AN FRR ENTITY IN PJM THAT OTHER GENERATORS DO NOT FACE?

A. Yes. First, an FRR entity is subject to significant fines if PJM's Office of Interconnection determines that the FRR's Capacity Plan is insufficient and the insufficiency is not resolved. The amount of these fines or penalties is two times the net cost of new entry per MW of the insufficiency.

Second, while most generators can resolve capacity resource deficiency by buying capacity in an incremental auction, an FRR entity must self supply capacity resources either through owned generation capacity or by purchasing additional capacity. In other words, the FRR entity is required to meet the reliability needs of its region. Conversely, generation owners in PJM only supply capacity if their generation clears the market. Thus, unlike in the broader auction-based process, there is no one else to backstop the requirement of the FRR entity to provide capacity. As an FRR entity, Duke Energy Ohio has a combined wholesale and retail capacity service obligation similar to its pre-restructuring obligation to provide reliable service. While another LSE may provide the energy to a retail customer, Duke Energy Ohio is responsible to provide the capacity in its footprint.

Third, as noted above, an FRR entity is required to maintain a Threshold Quantity, which is the lesser of an additional three percent in reserves beyond its FRR reliability requirement or 450 MW before it is permitted to sell any excess. The Threshold Quantity cannot be sold in an auction or bilaterally until after the Third Incremental Auction, which is typically the last opportunity to liquidate capacity. If the FRR entity has capacity committed to the FRR Plan and the FRR obligation is subsequently reduced, the ability to sell that capacity is limited, becoming "orphaned capacity."

Fourth, the Company faces additional risk arising from its joint ownership of generation assets. To the extent that Duke Energy Ohio has different compensation mechanisms and is subject to different cost structures than its joint owners, the Company may not earn a reasonable return on its investment. For example, if the operating owner upgrades a jointly-owned unit based on a cost-of-service rate embedded in its base rates, while Duke Energy Ohio is relying completely on the market rate in RPM, then Duke Energy Ohio would not recover its share of the cost of service.

Q. DOES THE PJM CAPACITY MARKET PROVIDE ANY ASSURANCE THAT DUKE ENERGY OHIO WILL BE ABLE TO EARN A FAIR RETURN ON ITS GENERATION ASSETS?

A. PJM capacity auctions do not. If the Company's generation assets become less economical to dispatch, or if the cost of meeting new environmental standards causes the actual cost of the Company's capacity obligations to exceed its capacity bids submitted in the three-year-ahead capacity auction, then the Company may not be able to earn a fair return on its investment. However, as I note above, FRR entities may be compensated for their capacity obligations under one of three methods, which may include the opportunity to earn a fair return.

V. COST OF EQUITY ESTIMATION METHODS

Q. WHAT COST OF EQUITY METHODS DO YOU USE TO ASSESS WHETHER DUKE ENERGY OHIO'S REQUESTED 11.15 PERCENT RATE OF RETURN ON EQUITY FOR ITS INVESTMENT IN ITS GENERATION ASSETS IS FAIR AND REASONABLE?

A. I use several generally accepted cost of equity methods to estimate the reasonableness of the Company's requested rate of return on equity for its investment in its generation assets. These are the DCF, the ex ante risk premium, the ex post risk premium, and the 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 recent 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 based on 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

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

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 ASSESS THE REASONABLENESS OF DUKE ENERGY OHIO'S REQUESTED 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 comparable 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 employed the quarterly DCF model throughout my calculations, even though the results of the quarterly DCF model for my companies are approximately equal to the results of a properly applied annual DCF model.

Q. PLEASE DESCRIBE THE QUARTERLY DCF MODEL YOU USE.

A. The quarterly DCF model I use is described on Schedule 2 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 2, the last four quarterly dividends are equal to 0.46. Thus dividends d_1, d_2, d_3 and d_4 are equal to 0.488 [.46 x (1 + .06) = 0.488]. (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 LOOKING AT PAST HISTORICAL GROWTH RATES?

A. I rely on analysts' projections of future EPS growth because there is considerable empirical evidence that investors use analysts' forecasts to estimate future earnings growth.

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

A. Yes. My study is described in a paper entitled "Investor Growth Expectations and Stock Prices: the Analysts versus History," published in the Spring 1988 edition of *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 December 2012. 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. Yes. I include a five percent allowance for flotation costs in my DCF calculations. A complete explanation of the need for flotation costs is contained in Appendix 3.

Q. PLEASE EXPLAIN YOUR INCLUSION OF FLOTATION COSTS.

A. All firms that have sold securities in the capital markets have incurred some level of flotation costs, including underwriters' commissions, legal fees, printing expense, etc. These costs are withheld from the proceeds of the stock sale or are paid separately, and must be recovered over the life of the equity issue. Costs vary depending upon the size of the issue, the type of registration method used and other factors, but in general these costs range between three and five percent of the proceeds from the issue [see Lee, Inmoo, Scott Lochhead, Jay Ritter, and Quanshui Zhao, "The Costs of Raising Capital," *The Journal of Financial Research,* Vol. XIX No 1 (Spring 1996), 59-74, and Clifford W. Smith, "Alternative Methods for Raising Capital," *Journal of Financial Economics* 5 (1977) 273-307]. In addition to these costs, for large equity issues (in relation to outstanding equity shares), there is likely to be a decline in price associated with the sale of shares to the public. On average, the decline due to market pressure has been estimated at two to three percent [see Richard H. Pettway, "The Effects of New Equity Sales upon Utility Share Prices," *Public Utilities Fortnightly*, May 10, 1984, 35—39]. Thus, the total flotation cost, including both issuance expense and market pressure, could range anywhere from five to eight percent of the proceeds of an equity issue. I believe a combined five percent allowance for flotation costs is a conservative estimate that should be used in applying the DCF model in these proceedings.

Q. HOW DO YOU APPLY THE DCF APPROACH TO OBTAIN THE COST OF EQUITY CAPITAL FOR DUKE ENERGY OHIO'S INVESTMENT IN ITS GENERATION ASSETS?

A. I apply the DCF approach to the Value Line electric utilities shown in Schedule 2 and to a set of Value Line publicly-traded pipeline companies shown in Schedule 3.

Q. HOW DO YOU SELECT YOUR ELECTRIC UTILITY AND PIPELINE COMPANY GROUPS?

A. I select all the electric utilities and pipeline companies followed by Value Line 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; (4) have an investment grade bond rating and a Value Line Safety Rank of 1, 2, or 3; and (5) are not the subject of a merger offer that has not been completed.

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 THE SUBJECT OF A MERGER OFFER THAT HAS NOT BEEN 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. WHY DO YOU USE A GROUP OF PIPELINE COMPANIES AS AN ADDITIONAL PROXY GROUP TO ESTIMATE THE COST OF EQUITY FOR DUKE ENERGY OHIO'S GENERATION ASSETS?

A. I use a group of pipeline companies as an additional proxy group to estimate the cost of equity for Duke Energy Ohio's investment in its generation assets because my first group, which consists of market-traded regulated electric utilities, is less risky than Duke Energy Ohio's investment in its generation assets. As discussed in my testimony, many publicly-traded electric utilities have regulated generation, transmission, and distribution assets that are regulated under cost of service standards that provide some assurance that the companies will have an opportunity to earn a fair return on their investments in generation, transmission, and distribution assets, including a return on and a return of capital. In contrast, Duke Energy Ohio's generation assets, although committed to the Company's FRR Plan and used to fulfill its capacity service obligation, support energy and capacity services in competitive markets. As I previously testified, these markets generally do not provide an assurance over the life of the assets that the Company will have an opportunity to earn a fair return on the assets. Because the publicly-traded electric utilities are less risky than Duke Energy Ohio's generation assets, I also apply my cost of equity methods to a group of publicly-traded pipeline companies that operate in both competitive and regulated markets.

Q. DO YOU HAVE ANY EVIDENCE THAT AN INVESTMENT IN GENERATION ASSETS IS MORE RISKY THAN AN INVESTMENT IN MARKET-TRADED REGULATED ELECTRIC UTILITIES?

A. Yes. One indicator that an investment in unregulated generation assets is more risky than an investment in regulated utilities is that many unregulated generation companies have gone bankrupt, including companies such as Calpine Corporation, AES Corporation subsidiary AES Eastern Energy, Dynegy, Inc., Midwest Generation, LLC, and NRG Energy, Inc. Another indicator is that unregulated generation companies generally have bond ratings that are below investment grade, and these below-investment grade bond ratings suggest that these companies have greater business risks than regulated electric utilities (see Schedule 1).

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

A. As shown on Schedule 2, I obtain an average DCF result of 10.6 percent for my electric utility group. For my pipeline company group, I obtain an average DCF result equal to 12.6 percent (see Schedule 3).

B. RISK PREMIUM METHOD

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

A. The risk premium method is based on the principle that investors expect to earn a return on an equity investment 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. DOES THE RISK PREMIUM APPROACH REQUIRE THAT THE SAME COMPANIES BE USED TO ESTIMATE THE STOCK RETURN AS ARE USED TO ESTIMATE THE BOND RETURN?

A. No. For example, many analysts apply the risk premium approach by comparing the return on a portfolio of stocks to the income return on Treasury securities such as long-term Treasury bonds. Clearly, in this widely accepted application of the risk premium approach, the same companies are not used to estimate the stock return as are used to estimate the bond return, since the U.S. government is not a company.

Q. DO YOU APPLY THE RISK PREMIUM APPROACH TO BOTH YOUR ELECTRIC UTILITY AND YOUR PIPELINE COMPANY GROUPS?

A. No. I apply my risk premium approach only to my electric utility group because there is not sufficient data to apply the risk premium approach to the pipeline companies.

Q. HOW DO YOU MEASURE THE REQUIRED RISK PREMIUM ON AN EQUITY INVESTMENT IN YOUR GROUPS OF PUBLICLY-TRADED ELECTRIC UTILITIES?

A. I use two methods to estimate the required risk premium on an equity investment in electric utilities. 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 ELECTRIC UTILITIES.

A. My ex ante risk premium method is based on studies of the DCF expected return on a 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 calculated 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 was 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 4, and the underlying DCF results and interest rates are displayed in Schedule 4.

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

A. 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.[1] I obtain the forecasted yield to maturity on A-rated utility bonds, 6.54 percent, by averaging forecast data from

[1] As noted above, one could use the yield to maturity on other debt investments to measure the interest rate component of the risk premium approach as long as one uses the yield on the same debt investment to measure the expected risk premium component of the risk premium approach. I chose to use the yield on A-rated utility bonds because it is a frequently-used benchmark for utility bond yields.

Value Line and the U.S. Energy Information Administration (EIA).[2] My analyses produce an estimated risk premium over the yield on A-rated utility bonds equal to 4.64 percent. Adding an estimated risk premium of 4.64 percent to the 6.54 percent yield to maturity on A-rated utility bonds produces a cost of equity estimate of 11.2 percent using the ex ante risk premium method.

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 ELECTRIC UTILITIES.

A. I first perform a study of the comparable returns received by bond and stock investors over the 75 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 2012. 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

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[2] Value Line Selection & Opinion (November 23, 2012) projects a AAA-rated Corporate bond yield equal to 5.7 percent. The December 2012 average spread between A-rated utility bonds and Aaa-rated Corporate bonds is thirty-five basis points (A-rated utility, 4.0 percent, less Aaa-rated Corporate, 3.65 percent, equals thirty-five basis points). Adding thirty-five basis points to the 5.70 percent Value Line forecast equals a forecast yield of 6.05 percent. The U.S. Energy Information Administration (EIA) at January 2013 forecasts an AA-rated utility bond yield equal to 6.78 percent. The average spread between AA-rated utility and A-rated utility bonds at December 2012 is twenty-five basis points (4.0 percent less 3.75 percent). Adding twenty-five basis points to the 6.78 percent forecast equals a forecast yield for A-rated utility bonds equal to 7.03 percent. The average of the forecasts (6.05 percent using Value Line data and 7.03 percent using EIA data) is 6.54 percent.

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 between 1937 and 2012 are shown on Schedule 5. The average annual return on an investment in the S&P 500 stock portfolio is 11.0 percent, while the average annual return on an investment in the Moody's A-rated utility bond portfolio was 6.7 percent. The risk premium on the S&P 500 stock portfolio is, therefore, 4.3 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 6, the S&P Utility stock portfolio showed an average annual return of 10.6 percent per year. Thus, the return on the S&P Utility stock portfolio exceeded the return on the Moody's A-rated utility bond portfolio by 3.8 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 because I believe electric energy companies today face risks that are somewhere in between the average risk of the S&P Utilities and the S&P 500 over the years 1937 to 2011. Thus, I use the average of the two historically-based risk premiums as my estimate of the required risk premium for Duke Energy Ohio 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 STARTED WITH A DIFFERENT TIME PERIOD?

A. Yes. The risk premium results vary somewhat depending on the historical time period chosen. My policy was to go back as far in history as I could get reliable data. I thought it would be most meaningful to begin after the passage and implementation of the Public Utility Holding Company Act of 1935. This Act 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 felt that numbers taken from before this date would not be 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. This is because the return on equity, being a residual return, is less certain than the yield on bonds and investors must be compensated for this uncertainty. Second, the 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 from an equity investment from knowledge of current bond yields and past differences between returns on stocks and bonds.

Q. IS THERE ANY SIGNIFICANT TREND IN THE EQUITY RISK PREMIUM OVER THE 1937 TO 2012 TIME PERIOD OF YOUR RISK PREMIUM STUDY?

A. No. Statisticians test for trends in data series by regressing the data observations against time. I perform such a time series regression on my two data sets of historical risk premiums. As shown below, there is no statistically significant trend in my risk premium data. Indeed, the coefficient on the time variable is insignificantly different from zero (if there were a trend, the coefficient on the time variable should be significantly different from zero).

TABLE 1
REGRESSION OUTPUT FOR RISK PREMIUM ON S&P 500

LINE NO.		INTERCEPT	TIME	ADJUSTED R SQUARE	F
1	Coefficient	2.5199	(0.001)	0.0123	1.9093
2	T Statistic	1.4079	(1.382)		

TABLE 2
REGRESSION OUTPUT FOR RISK PREMIUM ON S&P UTILITIES

LINE NO.		INTERCEPT	TIME	ADJUSTED R SQUARE	F
1	Coefficient	1.8303	(0.0009)	0.0034	1.2520
2	T Statistic	1.1438	(1.119)		

Q. DO YOU HAVE ANY OTHER EVIDENCE THAT THERE HAS BEEN NO SIGNIFICANT TREND IN RISK PREMIUM RESULTS OVER TIME?

A. Yes. Ibbotson® SBBI® 2012 Valuation Edition Yearbook Stocks, Bonds, Bills, and Inflation® (Ibbotson® SBBI®) published by Morningstar, Inc., contains an analysis of "trends" in historical risk premium data. Ibbotson® SBBI® uses correlation analysis to determine if there is any pattern or "trend" in risk premiums over time. This analysis also demonstrates that there are no trends in risk premiums over time.

Q. WHAT IS THE SIGNIFICANCE OF THE EVIDENCE THAT HISTORICAL RISK PREMIUMS HAVE NO TREND OR OTHER STATISTICAL PATTERN OVER TIME?

A. The significance of this evidence is that the average historical risk premium is a reasonable estimate of the future expected risk premium. As noted in Ibbotson® SBBI®:

> The significance of this evidence is that the realized equity risk premium next year will not be dependent on the realized equity risk premium from this year. That is, there is no discernable pattern

> in the realized equity risk premium—it is virtually impossible to forecast next year's realized risk premium based on the premium of the previous year. For example, if this year's difference between the riskless rate and the return on the stock market is higher than last year's, that does not imply that next year's will be higher than this year's. It is as likely to be higher as it is lower. The best estimate of the expected value of a variable that has behaved randomly in the past is the average (or arithmetic mean) of its past values. [Ibbotson® SBBI® at 58.]

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

A. My studies provide strong evidence that investors today require an equity return of approximately 3.8 to 4.3 percentage points above the expected yield on A-rated utility bonds. As discussed above, the forecast yield on A-rated utility bonds is 6.5 percent. Adding a 3.8 to 4.3 percentage point risk premium to a yield of 6.5 percent on A-rated utility bonds, I obtain an expected return on equity in the range 10.3 percent to 10.8 percent, with a midpoint of 10.6 percent. Adding a twenty-four-basis-point allowance for flotation costs, I obtain an estimate of 10.8 percent as the ex post risk premium cost of equity for Duke Energy Ohio. (I determine the flotation cost allowance by calculating the difference in my DCF results with and without a flotation cost allowance.)

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 TWO GROUPS OF 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[3] of 5.1 percent, using data from Value Line and EIA.[4] For my estimate of the company-specific risk, or beta, I use the average 0.73 Value Line beta for my group of electric utilities and the average 0.85 Value Line beta for my pipeline companies group. For my estimate of the expected risk premium on the market portfolio, I use two approaches. First, I estimate the risk premium on the market portfolio using historical risk premium data reported by Ibbotson® SBBI®. Second, I estimate the risk premium on the market portfolio from the difference

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3 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 the analyst should use the same maturity to estimate the risk-free rate as is used to estimate the risk premium on the market portfolio.

4 Value Line forecasts a yield on 10-year Treasury notes equal to 4.0 percent. The current spread between the average December 2012 yield on 10-year Treasury notes (1.72 percent) and 20-year Treasury bonds (2.47 percent) is seventy-five basis points. Adding seventy-five basis points to Value Line's 4.0 percent forecast produces a forecasted yield of 4.75 percent for 20-year Treasury bonds (see Value Line Investment Survey, Selection & Opinion, Nov. 23, 2012). The EIA forecasts a yield of 4.7 percent on 10-year Treasury notes. Adding the seventy-five basis point spread between 10-year Treasury notes and 20-year Treasury bonds to the EIA forecast of 4.7 percent equals a EIA forecast for 20-year Treasury bonds equal to 5.45 percent. The average of the forecasts is 5.1 percent (4.75 percent using Value Line data and 5.45 percent using EIA data).

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 total return on the S&P 500 from 1926 through 2011 (11.77 percent) and the average income return on 20-year U.S. Treasury bonds over the same period (5.15 percent) (see Ibbotson® SBBI® 2012 Valuation Yearbook, published by Morningstar®). Thus, my historical risk premium method produces a risk premium of 6.6 percent (11.77 – 5.15 = 6.62).

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 Ibbotson® 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® at 56.]

A discussion of the importance of using arithmetic mean returns in the context of CAPM or risk premium studies is contained in Schedule 7.

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 5.1 percent, an electric utility beta equal to 0.73 and a pipeline beta equal to 0.85, a risk premium on the market portfolio equal to 6.6 percent, and a flotation cost allowance equal to twenty-four basis points, I obtain an historical CAPM estimate cost of equity equal to 10.2 percent for my electric utility group and equal to 11.0 percent for my pipeline companies group (5.1 + 0.73 x 6.6 + 0.24= 10.2) and (5.1 + 0.85 x 6.6 + 0.24= 11.0) (see Schedule 8).

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, "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 Sheridan Titman (1993).[5]

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5 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.

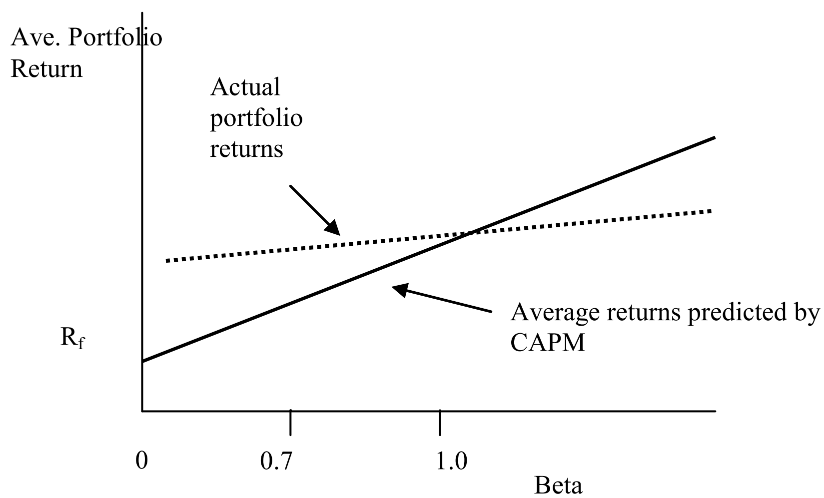
Q. CAN YOU BRIEFLY SUMMARIZE THESE ARTICLES?

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

$$ER_i = R_f + \beta_i \lfloor ER_m - R_f \rfloor,$$

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 βi is a measure of the risk of investing in security or portfolio i (see Figure 1 below).

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 2 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 overestimates portfolio returns for portfolios with betas greater than 1.0.

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

A. Yes. As shown in Schedule 9, over the period 1937 to 2012, investors in the S&P Utilities Stock Index have earned a risk premium over the yield on long-term Treasury bonds equal to 5.04 percent, while investors in the S&P 500 have earned a risk premium over the yield on long-term Treasury bonds equal to 5.74 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 0.73, whereas the historical ratio of the utility risk premium to the S&P 500 risk premium is 0.92 (5.21 ÷ 5.67 = 0.92). In short, the current 0.73 measured beta for electric utilities significantly underestimates the cost of equity for electric utilities, providing further support for the conclusion that the CAPM underestimates the cost of equity for electric utilities at this time.

Q. WHAT CONCLUSIONS DO YOU DRAW FROM YOUR OBSERVATION THAT THE CAPM TENDS TO UNDERESTIMATE THE COST OF EQUITY FOR COMPANIES WITH BETAS LESS THAN 1.0?

A. The observation that the average utility beta is significantly less than 1.0 at this time and that the historical CAPM underestimates the cost of equity for companies with betas significantly less than 1.0 causes me to conclude that the cost of equity results from applying the CAPM should be given little or no weight.

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 7.4 percent (see Schedule 10).

Q. WHAT CAPM RESULT 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 5.1 percent, an electric utility beta of 0.73 and a pipeline company beta of 0.85, a risk premium on the market portfolio of 7.4 percent, and a flotation cost allowance equal to twenty-four basis points, I obtain a CAPM result of 10.7 percent for my electric utility group and a result of 11.6 percent for my pipeline company group.

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. I also conclude that stock market activity can greatly affect betas. The significant volatility in the stock market in the last two years has led to a steep drop in utility betas. The drop in utility betas is important because the further the beta is from 1.0, the less reliable are the results of applying the CAPM to low beta companies such as utilities. Given that the average betas for my groups of electric utilities and pipelines are 0.73 and 0.85, I conclude that the cost of equity model results from applying the CAPM should be given less weight for the purpose of estimating the cost of equity for Duke Energy Ohio's generation assets.

VI. CONCLUSION REGARDING THE FAIR RATE OF RETURN ON EQUITY

Q. BASED ON YOUR APPLICATION OF SEVERAL COST OF EQUITY METHODS TO YOUR PROXY COMPANY GROUPS, WHAT IS YOUR CONCLUSION REGARDING THE COST OF EQUITY FOR DUKE ENERGY OHIO'S INVESTMENT IN ITS GENERATION ASSETS?

A. Based on my application of several cost of equity methods to my proxy company groups, I conclude that the cost of equity for Duke Energy Ohio's generation assets as determined by my proxy companies' cost of equity is in the range 10.7 percent to 12.6 percent (see TABLE 3).

TABLE 3
COST OF EQUITY MODEL RESULTS

MODEL	ELECTRIC UTILITIES	PIPELINE COMPANIES
Discounted Cash Flow	10.6%	12.6%
Ex Ante Risk Premium	11.2%	
Ex Post Risk Premium	10.8%	
CAPM – Historical	10.2%	11.0%
CAPM - DCF Based	10.7%	11.6%
Average	10.7%	11.7%
Average w/o CAPM	10.9%	12.6%

Q. BASED ON YOUR COST OF EQUITY RESULTS, WHAT IS YOUR CONCLUSION REGARDING THE FAIRNESS OF THE COMPANY'S REQUESTED 11.15 PERCENT COST OF EQUITY FOR ITS GENERATION ASSETS?

A. Because the Company's requested 11.15 percent rate of return on equity is at the lower end of the range of cost of equity estimates for my proxy companies, I conclude that the Company's requested 11.15 percent rate of return on equity for its generation assets is fair and reasonable, if not conservative.

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

A. Yes, it does.

LIST OF SCHEDULES

SCHEDULE 1
BOND RATINGS OF GENERATION COMPANIES
OPERATING IN COMPETITIVE MARKETS

Line	Company	S&P LT Issuer Rating	Moody's LT Issuer Rating	Fitch LT Issuer Rating
1	AES Corporation	BB-		BB-
2	Ameren Energy Generating Company	CCC+		CC
3	Calpine Corporation	B+		B
4	Dynegy Inc.		B2	
5	Edison Mission Energy	D		
6	Energy Future Competitive Holdings Company	CCC		C
7	Energy Future Holdings Corp.	CCC		CCC
8	GenOn Americas Generation, LLC	B		
9	GenOn Energy Inc.	B		B-
10	GenOn Energy, Inc.	B		
11	GenOn REMA, LLC	B		
12	Midwest Generation, LLC	D		
13	NRG Energy, Inc.	BB-		B+
14	RRI Energy Mid-Atlantic Power Holdings, LLC	B		
15	Texas Competitive Electric Holdings Company LLC	CCC		C

Data from Moody’s, Standard & Poor’s, and SNL Financial at February 10, 2013.

SCHEDULE 2
SUMMARY OF DISCOUNTED CASH FLOW ANALYSIS
FOR ELECTRIC UTILITIES

Line	Company	d_0	P_0	Growth	Model Result
1	ALLETE	0.460	40.360	6.00%	11.3%
2	Alliant Energy	0.450	44.063	4.60%	9.3%
3	CenterPoint Energy	0.203	20.387	5.53%	10.1%
4	CMS Energy Corp.	0.240	23.922	6.19%	10.9%
5	Dominion Resources	0.528	51.587	5.15%	9.8%
6	DTE Energy	0.620	60.557	5.04%	9.6%
7	Duke Energy	0.765	63.922	2.95%	8.2%
8	FirstEnergy Corp.	0.550	43.342	4.00%	9.8%
9	G't Plains Energy	0.217	21.319	9.40%	14.3%
10	Hawaiian Elec.	0.310	25.423	7.70%	13.5%
11	Integrys Energy	0.680	53.402	5.50%	11.4%
12	NextEra Energy	0.600	69.402	5.92%	9.9%
13	Northeast Utilities	0.343	39.001	5.90%	9.8%
14	NorthWestern Corp.	0.370	35.065	6.67%	11.6%
15	OGE Energy	0.393	56.703	5.37%	8.5%
16	Otter Tail Corp.	0.298	24.182	5.00%	10.7%
17	Pepco Holdings	0.270	19.465	5.23%	11.6%
18	Pinnacle West Capital	0.545	51.869	6.30%	11.1%
19	PNM Resources	0.145	21.148	9.30%	12.5%
20	SCANA Corp.	0.495	47.168	5.60%	10.4%
21	Sempra Energy	0.600	68.366	7.00%	11.1%
22	Southern Co.	0.490	44.505	4.94%	9.9%
23	TECO Energy	0.220	17.195	4.00%	9.8%
24	Vectren Corp.	0.355	29.065	5.00%	10.5%
25	Westar Energy	0.330	29.038	6.80%	12.1%
26	Wisconsin Energy	0.300	37.549	5.70%	9.4%
27	Xcel Energy Inc.	0.270	27.277	4.88%	9.4%
28	Average				10.6%

Notes:

d_0	=	Most recent quarterly dividend.
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 December 2012 per Thomson Reuters.
FC	=	Flotation cost allowance (5%) as a percent of stock price.
g	=	I/B/E/S forecast of future earnings growth December 2012 from Thomson Reuters.
k	=	Cost of equity using the quarterly version of the DCF model.

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

SCHEDULE 3
SUMMARY OF DISCOUNTED CASH FLOW ANALYSIS
FOR PIPELINE COMPANIES

Line	Company	d_0	P_0	Growth	Model Result
1	Buckeye Partners, L.P.	1.038	47.768	4.55%	14.6%
2	El Paso Pipeline Partners, L.P.	0.580	36.472	6.24%	13.1%
3	Enbridge Energy Partners, L.P.	0.544	29.018	5.61%	14.3%
4	Enterprise Products Partners, L.P.	0.650	51.752	7.14%	12.9%
5	Plains All American Pipeline, L.P.	0.543	45.228	7.15%	12.7%
6	Sunoco Logistics Partners, L.P.	0.518	48.929	8.65%	13.1%
7	Williams Partners L.P.	0.808	50.338	0.50%	7.3%
8	Average				12.6%

Notes: Outlier results of 21.8%, 33.3%, 22.6%, and 1.2% for Boardwalk Pipeline Partners, L.P., Energy Transfer Partners, L.P., Kinder Morgan Energy Partners, L.P., and Magellan Midstream Partners, L.P., respectively, are excluded.

d_0	=	Most recent quarterly dividend.
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 December 2012 per Thomson Reuters.
FC	=	Flotation cost allowance (5%) as a percent of stock price.
g	=	I/B/E/S forecast of future earnings growth December 2012 from Thomson Reuters.
k	=	Cost of equity using the quarterly version of the DCF model.

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

SCHEDULE 3 (CONTINUED)
VALUE LINE SAFETY RANK, BETA, AND STANDARD & POOR'S BOND RATING FOR PIPELINE COMPANIES

Line	Company	Safety Rank	S&P BOND RATING	S&P BOND RATING (Numerical)	Value Line Beta
1	Buckeye Partners, L.P.	3	BBB	7	0.80
2	El Paso Pipeline Partners, L.P.	3	BBB-	8	0.70
3	Enbridge Energy Partners, L.P.	2	BBB	7	0.90
4	Enterprise Products Partners, L.P.	3	BBB	7	0.85
5	Plains All American Pipeline, L.P.	3	BBB	7	0.80
6	Sunoco Logistics Partners, L.P.	2	BBB-	8	0.85
7	Williams Partners L.P.	3	BBB	7	1.05
8	Average	3	BBB	7	0.85

Source of data: The Value Line Investment Survey, Standard & Poor's

SCHEDULE 4
COMPARISON OF DCF EXPECTED RETURN ON AN INVESTMENT IN ELECTRIC UTILITIES TO THE INTEREST RATE ON MOODY'S A-RATED UTILITY BONDS

Line No.	Date	DCF	Bond Yield	Risk Premium
1	Sep-99	0.1157	0.0793	0.0364
2	Oct-99	0.1161	0.0806	0.0355
3	Nov-99	0.1192	0.0794	0.0398
4	Dec-99	0.1236	0.0814	0.0422
5	Jan-00	0.1221	0.0835	0.0386
6	Feb-00	0.1269	0.0825	0.0444
7	Mar-00	0.1313	0.0828	0.0485
8	Apr-00	0.1237	0.0829	0.0408
9	May-00	0.1227	0.0870	0.0357
10	Jun-00	0.1242	0.0836	0.0406
11	Jul-00	0.1247	0.0825	0.0422
12	Aug-00	0.1228	0.0813	0.0415
13	Sep-00	0.1164	0.0823	0.0341
14	Oct-00	0.1170	0.0814	0.0356
15	Nov-00	0.1191	0.0811	0.0380
16	Dec-00	0.1166	0.0784	0.0382
17	Jan-01	0.1194	0.0780	0.0414
18	Feb-01	0.1203	0.0774	0.0429
19	Mar-01	0.1207	0.0768	0.0439
20	Apr-01	0.1233	0.0794	0.0439
21	May-01	0.1279	0.0799	0.0480
22	Jun-01	0.1285	0.0785	0.0500
23	Jul-01	0.1295	0.0778	0.0517
24	Aug-01	0.1302	0.0759	0.0543
25	Sep-01	0.1321	0.0775	0.0546
26	Oct-01	0.1313	0.0763	0.0550
27	Nov-01	0.1296	0.0757	0.0539
28	Dec-01	0.1292	0.0783	0.0509
29	Jan-02	0.1274	0.0766	0.0508
30	Feb-02	0.1285	0.0754	0.0531
31	Mar-02	0.1248	0.0776	0.0472
32	Apr-02	0.1227	0.0757	0.0470
33	May-02	0.1236	0.0752	0.0484
34	Jun-02	0.1254	0.0741	0.0513
35	Jul-02	0.1337	0.0731	0.0606
36	Aug-02	0.1300	0.0717	0.0583
37	Sep-02	0.1272	0.0708	0.0564
38	Oct-02	0.1291	0.0723	0.0568
39	Nov-02	0.1242	0.0714	0.0528
40	Dec-02	0.1226	0.0707	0.0519
41	Jan-03	0.1195	0.0706	0.0489
42	Feb-03	0.1233	0.0693	0.0540
43	Mar-03	0.1212	0.0679	0.0533

Line No.	Date	DCF	Bond Yield	Risk Premium
44	Apr-03	0.1170	0.0664	0.0506
45	May-03	0.1095	0.0636	0.0459
46	Jun-03	0.1047	0.0621	0.0426
47	Jul-03	0.1072	0.0657	0.0415
48	Aug-03	0.1064	0.0678	0.0386
49	Sep-03	0.1029	0.0656	0.0373
50	Oct-03	0.1009	0.0643	0.0366
51	Nov-03	0.0985	0.0637	0.0348
52	Dec-03	0.0946	0.0627	0.0319
53	Jan-04	0.0921	0.0615	0.0306
54	Feb-04	0.0916	0.0615	0.0301
55	Mar-04	0.0912	0.0597	0.0315
56	Apr-04	0.0925	0.0635	0.0290
57	May-04	0.0962	0.0662	0.0300
58	Jun-04	0.0961	0.0646	0.0315
59	Jul-04	0.0953	0.0627	0.0326
60	Aug-04	0.0966	0.0614	0.0352
61	Sep-04	0.0951	0.0598	0.0353
62	Oct-04	0.0953	0.0594	0.0359
63	Nov-04	0.0918	0.0597	0.0321
64	Dec-04	0.0920	0.0592	0.0328
65	Jan-05	0.0925	0.0578	0.0347
66	Feb-05	0.0917	0.0561	0.0356
67	Mar-05	0.0918	0.0583	0.0335
68	Apr-05	0.0924	0.0564	0.0360
69	May-05	0.0910	0.0553	0.0356
70	Jun-05	0.0911	0.0540	0.0371
71	Jul-05	0.0899	0.0551	0.0348
72	Aug-05	0.0900	0.0550	0.0350
73	Sep-05	0.0923	0.0552	0.0371
74	Oct-05	0.0934	0.0579	0.0355
75	Nov-05	0.0981	0.0588	0.0393
76	Dec-05	0.0980	0.0580	0.0400
77	Jan-06	0.0980	0.0575	0.0405
78	Feb-06	0.1071	0.0582	0.0489
79	Mar-06	0.1055	0.0598	0.0457
80	Apr-06	0.1075	0.0629	0.0446
81	May-06	0.1087	0.0642	0.0445
82	Jun-06	0.1117	0.0640	0.0477
83	Jul-06	0.1110	0.0637	0.0473
84	Aug-06	0.1072	0.0620	0.0452
85	Sep-06	0.1111	0.0600	0.0511
86	Oct-06	0.1074	0.0598	0.0476
87	Nov-06	0.1078	0.0580	0.0498
88	Dec-06	0.1071	0.0581	0.0490
89	Jan-07	0.1096	0.0596	0.0500
90	Feb-07	0.1085	0.0590	0.0495
91	Mar-07	0.1094	0.0585	0.0509

Line No.	Date	DCF	Bond Yield	Risk Premium
92	Apr-07	0.1042	0.0597	0.0445
93	May-07	0.1068	0.0599	0.0469
94	Jun-07	0.1123	0.0630	0.0493
95	Jul-07	0.1130	0.0625	0.0505
96	Aug-07	0.1104	0.0624	0.0480
97	Sep-07	0.1078	0.0618	0.0460
98	Oct-07	0.1084	0.0611	0.0473
99	Nov-07	0.1116	0.0597	0.0519
100	Dec-07	0.1132	0.0616	0.0516
101	Jan-08	0.1193	0.0602	0.0591
102	Feb-08	0.1133	0.0621	0.0512
103	Mar-08	0.1170	0.0621	0.0549
104	Apr-08	0.1159	0.0629	0.0530
105	May-08	0.1162	0.0627	0.0535
106	Jun-08	0.1136	0.0638	0.0499
107	Jul-08	0.1172	0.0640	0.0532
108	Aug-08	0.1191	0.0637	0.0554
109	Sep-08	0.1185	0.0649	0.0536
110	Oct-08	0.1280	0.0756	0.0524
111	Nov-08	0.1312	0.0760	0.0552
112	Dec-08	0.1301	0.0654	0.0647
113	Jan-09	0.1241	0.0639	0.0602
114	Feb-09	0.1269	0.0630	0.0639
115	Mar-09	0.1286	0.0642	0.0644
116	Apr-09	0.1266	0.0648	0.0617
117	May-09	0.1242	0.0649	0.0593
118	Jun-09	0.1220	0.0620	0.0600
119	Jul-09	0.1174	0.0597	0.0577
120	Aug-09	0.1158	0.0571	0.0587
121	Sep-09	0.1152	0.0553	0.0599
122	Oct-09	0.1153	0.0555	0.0598
123	Nov-09	0.1196	0.0564	0.0633
124	Dec-09	0.1095	0.0579	0.0516
125	Jan-10	0.1112	0.0577	0.0535
126	Feb-10	0.1091	0.0587	0.0504
127	Mar-10	0.1076	0.0584	0.0492
128	Apr-10	0.1111	0.0582	0.0529
129	May-10	0.1093	0.0552	0.0541
130	Jun-10	0.1088	0.0546	0.0541
131	Jul-10	0.1078	0.0526	0.0552
132	Aug-10	0.1057	0.0501	0.0557
133	Sep-10	0.1059	0.0501	0.0558
134	Oct-10	0.1044	0.0510	0.0534
135	Nov-10	0.1051	0.0536	0.0514
136	Dec-10	0.1053	0.0557	0.0497
137	Jan-11	0.1044	0.0557	0.0487
138	Feb-11	0.1041	0.0568	0.0473
139	Mar-11	0.1044	0.0556	0.0488

Line No.	Date	DCF	Bond Yield	Risk Premium
140	Apr-11	0.1020	0.0555	0.0465
141	May-11	0.0994	0.0532	0.0462
142	Jun-11	0.1043	0.0526	0.0517
143	Jul-11	0.1019	0.0527	0.0492
144	Aug-11	0.1050	0.0469	0.0581
145	Sep-11	0.1016	0.0448	0.0568
146	Oct-11	0.1032	0.0452	0.0580
147	Nov-11	0.1014	0.0425	0.0589
148	Dec-11	0.1024	0.0435	0.0589
149	Jan-12	0.1016	0.0434	0.0582
150	Feb-12	0.0974	0.0436	0.0538
151	Mar-12	0.0971	0.0448	0.0523
152	Apr-12	0.0994	0.0440	0.0554
153	May-12	0.0981	0.0420	0.0561
154	Jun-12	0.0962	0.0408	0.0554
155	Jul-12	0.0963	0.0393	0.0570
156	Aug-12	0.0972	0.0400	0.0572
157	Sep-12	0.0968	0.0402	0.0566
158	Oct-12	0.0978	0.0391	0.0587
159	Nov-12	0.0935	0.0384	0.0551
160	Dec-12	0.0962	0.0400	0.0562

Notes: Utility bond yield information from *Mergent Bond Record* (formerly Moody's). See Appendix 4 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
FC	=	Flotation cost allowance (5%) as a percentage of stock price
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.

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

SCHEDULE 5
COMPARATIVE RETURNS ON S&P 500 STOCK INDEX
AND MOODY'S A-RATED UTILITY BONDS 1937 – 2012

Line No.	Year	S&P 500 Stock Price	Stock Dividend Yield	Stock Return	A-rated Bond Price	Bond Return	Risk Premium
1	2012	1,300.58	0.0214		$94.36		
2	2011	1,282.62	0.0185	3.25%	$77.36	27.14%	-23.89%
3	2010	1,123.58	0.0203	16.18%	$75.02	8.44%	7.74%
4	2009	865.58	0.0310	32.91%	$68.43	15.48%	17.43%
5	2008	1,378.76	0.0206	-35.16%	$72.25	0.24%	-35.40%
6	2007	1,424.16	0.0181	-1.38%	$72.91	4.59%	-5.97%
7	2006	1,278.72	0.0183	13.20%	$75.25	2.20%	11.01%
8	2005	1,181.41	0.0177	10.01%	$74.91	5.80%	4.21%
9	2004	1,132.52	0.0162	5.94%	$70.87	11.34%	-5.40%
10	2003	895.84	0.0180	28.22%	$62.26	20.27%	7.95%
11	2002	1,140.21	0.0138	-20.05%	$57.44	15.35%	-35.40%
12	2001	1,335.63	0.0116	-13.47%	$56.40	8.93%	-22.40%
13	2000	1,425.59	0.0118	-5.13%	$52.60	14.82%	-19.95%
14	1999	1,248.77	0.0130	15.46%	$63.03	-10.20%	25.66%
15	1998	963.35	0.0162	31.25%	$62.43	7.38%	23.87%
16	1997	766.22	0.0195	27.68%	$56.62	17.32%	10.36%
17	1996	614.42	0.0231	27.02%	$60.91	-0.48%	27.49%
18	1995	465.25	0.0287	34.93%	$50.22	29.26%	5.68%
19	1994	472.99	0.0269	1.05%	$60.01	-9.65%	10.71%
20	1993	435.23	0.0288	11.56%	$53.13	20.48%	-8.93%
21	1992	416.08	0.0290	7.50%	$49.56	15.27%	-7.77%
22	1991	325.49	0.0382	31.65%	$44.84	19.44%	12.21%
23	1990	339.97	0.0341	-0.85%	$45.60	7.11%	-7.96%
24	1989	285.41	0.0364	22.76%	$43.06	15.18%	7.58%
25	1988	250.48	0.0366	17.61%	$40.10	17.36%	0.25%
26	1987	264.51	0.0317	-2.13%	$48.92	-9.84%	7.71%
27	1986	208.19	0.0390	30.95%	$39.98	32.36%	-1.41%
28	1985	171.61	0.0451	25.83%	$32.57	35.05%	-9.22%
29	1984	166.39	0.0427	7.41%	$31.49	16.12%	-8.72%
30	1983	144.27	0.0479	20.12%	$29.41	20.65%	-0.53%
31	1982	117.28	0.0595	28.96%	$24.48	36.48%	-7.51%
32	1981	132.97	0.0480	-7.00%	$29.37	-3.01%	-3.99%
33	1980	110.87	0.0541	25.34%	$34.69	-3.81%	29.16%
34	1979	99.71	0.0533	16.52%	$43.91	-11.89%	28.41%
35	1978	90.25	0.0532	15.80%	$49.09	-2.40%	18.20%
36	1977	103.80	0.0399	-9.06%	$50.95	4.20%	-13.27%
37	1976	96.86	0.0380	10.96%	$43.91	25.13%	-14.17%
38	1975	72.56	0.0507	38.56%	$41.76	14.75%	23.81%
39	1974	96.11	0.0364	-20.86%	$52.54	-12.91%	-7.96%

Line No.	Year	S&P 500 Stock Price	Stock Dividend Yield	Stock Return	A-rated Bond Price	Bond Return	Risk Premium
40	1973	118.40	0.0269	-16.14%	$58.51	-3.37%	-12.77%
41	1972	103.30	0.0296	17.58%	$56.47	10.69%	6.89%
42	1971	93.49	0.0332	13.81%	$53.93	12.13%	1.69%
43	1970	90.31	0.0356	7.08%	$50.46	14.81%	-7.73%
44	1969	102.00	0.0306	-8.40%	$62.43	-12.76%	4.36%
45	1968	95.04	0.0313	10.45%	$66.97	-0.81%	11.26%
46	1967	84.45	0.0351	16.05%	$78.69	-9.81%	25.86%
47	1966	93.32	0.0302	-6.48%	$86.57	-4.48%	-2.00%
48	1965	86.12	0.0299	11.35%	$91.40	-0.91%	12.26%
49	1964	76.45	0.0305	15.70%	$92.01	3.68%	12.02%
50	1963	65.06	0.0331	20.82%	$93.56	2.61%	18.20%
51	1962	69.07	0.0297	-2.84%	$89.60	8.89%	-11.73%
52	1961	59.72	0.0328	18.94%	$89.74	4.29%	14.64%
53	1960	58.03	0.0327	6.18%	$84.36	11.13%	-4.95%
54	1959	55.62	0.0324	7.57%	$91.55	-3.49%	11.06%
55	1958	41.12	0.0448	39.74%	$101.22	-5.60%	45.35%
56	1957	45.43	0.0431	-5.18%	$100.70	4.49%	-9.67%
57	1956	44.15	0.0424	7.14%	$113.00	-7.35%	14.49%
58	1955	35.60	0.0438	28.40%	$116.77	0.20%	28.20%
59	1954	25.46	0.0569	45.52%	$112.79	7.07%	38.45%
60	1953	26.18	0.0545	2.70%	$114.24	2.24%	0.46%
61	1952	24.19	0.0582	14.05%	$113.41	4.26%	9.79%
62	1951	21.21	0.0634	20.39%	$123.44	-4.89%	25.28%
63	1950	16.88	0.0665	32.30%	$125.08	1.89%	30.41%
64	1949	15.36	0.0620	16.10%	$119.82	7.72%	8.37%
65	1948	14.83	0.0571	9.28%	$118.50	4.49%	4.79%
66	1947	15.21	0.0449	1.99%	$126.02	-2.79%	4.79%
67	1946	18.02	0.0356	-12.03%	$126.74	2.59%	-14.63%
68	1945	13.49	0.0460	38.18%	$119.82	9.11%	29.07%
69	1944	11.85	0.0495	18.79%	$119.82	3.34%	15.45%
70	1943	10.09	0.0554	22.98%	$118.50	4.49%	18.49%
71	1942	8.93	0.0788	20.87%	$117.63	4.14%	16.73%
72	1941	10.55	0.0638	-8.98%	$116.34	4.55%	-13.52%
73	1940	12.30	0.0458	-9.65%	$112.39	7.08%	-16.73%
74	1939	12.50	0.0349	1.89%	$105.75	10.05%	-8.16%
75	1938	11.31	0.0784	18.36%	$99.83	9.94%	8.42%
76	1937	17.59	0.0434	-31.36%	$103.18	0.63%	-31.99%
77	Average			11.0%		6.7%	4.3%

Note: See Appendix 5 for an explanation of how stock and bond returns are derived and the source of the data presented.

SCHEDULE 6
COMPARATIVE RETURNS ON S&P UTILITY STOCK INDEX AND MOODY'S A-RATED UTILITY BONDS 1937 – 2012

Line No.	Year	S&P Utility Stock Price	Stock Dividend Yield	Stock Return	A-rated Bond Price	Bond Return	Risk Premium
1	2012				$94.36		
2	2011			19.99%	$77.36	27.14%	-7.15%
3	2010			7.04%	$75.02	8.44%	-1.40%
4	2009			10.71%	$68.43	15.48%	-4.77%
5	2008			-25.90%	$72.25	0.24%	-26.14%
6	2007			16.56%	$72.91	4.59%	11.96%
7	2006			20.76%	$75.25	2.20%	18.56%
8	2005			16.05%	$74.91	5.80%	10.25%
9	2004			22.84%	$70.87	11.34%	11.50%
10	2003			23.48%	$62.26	20.27%	3.21%
11	2002			-14.73%	$57.44	15.35%	-30.08%
11	2001	307.70	0.0287	-17.90%	$56.40	8.93%	-26.83%
12	2000	239.17	0.0413	32.78%	$52.60	14.82%	17.96%
13	1999	253.52	0.0394	-1.72%	$63.03	-10.20%	8.48%
14	1998	228.61	0.0457	15.47%	$62.43	7.38%	8.09%
15	1997	201.14	0.0492	18.58%	$56.62	17.32%	1.26%
16	1996	202.57	0.0454	3.83%	$60.91	-0.48%	4.31%
17	1995	153.87	0.0584	37.49%	$50.22	29.26%	8.23%
18	1994	168.70	0.0496	-3.83%	$60.01	-9.65%	5.82%
19	1993	159.79	0.0537	10.95%	$53.13	20.48%	-9.54%
20	1992	149.70	0.0572	12.46%	$49.56	15.27%	-2.81%
21	1991	138.38	0.0607	14.25%	$44.84	19.44%	-5.19%
22	1990	146.04	0.0558	0.33%	$45.60	7.11%	-6.78%
23	1989	114.37	0.0699	34.68%	$43.06	15.18%	19.51%
24	1988	106.13	0.0704	14.80%	$40.10	17.36%	-2.55%
25	1987	120.09	0.0588	-5.74%	$48.92	-9.84%	4.10%
26	1986	92.06	0.0742	37.87%	$39.98	32.36%	5.51%
27	1985	75.83	0.0860	30.00%	$32.57	35.05%	-5.04%
28	1984	68.50	0.0925	19.95%	$31.49	16.12%	3.83%
29	1983	61.89	0.0948	20.16%	$29.41	20.65%	-0.49%
30	1982	51.81	0.1074	30.20%	$24.48	36.48%	-6.28%
31	1981	52.01	0.0978	9.40%	$29.37	-3.01%	12.41%
32	1980	50.26	0.0953	13.01%	$34.69	-3.81%	16.83%
33	1979	50.33	0.0893	8.79%	$43.91	-11.89%	20.68%
34	1978	52.40	0.0791	3.96%	$49.09	-2.40%	6.36%
35	1977	54.01	0.0714	4.16%	$50.95	4.20%	-0.04%
36	1976	46.99	0.0776	22.70%	$43.91	25.13%	-2.43%
37	1975	38.19	0.0920	32.24%	$41.76	14.75%	17.49%
38	1974	48.60	0.0713	-14.29%	$52.54	-12.91%	-1.38%
39	1973	60.01	0.0556	-13.45%	$58.51	-3.37%	-10.08%
40	1972	60.19	0.0542	5.12%	$56.47	10.69%	-5.57%
41	1971	63.43	0.0504	-0.07%	$53.93	12.13%	-12.19%
42	1970	55.72	0.0561	19.45%	$50.46	14.81%	4.64%

Line No.	Year	S&P Utility Stock Price	Stock Dividend Yield	Stock Return	A-rated Bond Price	Bond Return	Risk Premium
43	1969	68.65	0.0445	-14.38%	$62.43	-12.76%	-1.62%
44	1968	68.02	0.0435	5.28%	$66.97	-0.81%	6.08%
45	1967	70.63	0.0392	0.22%	$78.69	-9.81%	10.03%
46	1966	74.50	0.0347	-1.72%	$86.57	-4.48%	2.76%
47	1965	75.87	0.0315	1.34%	$91.40	-0.91%	2.25%
48	1964	67.26	0.0331	16.11%	$92.01	3.68%	12.43%
49	1963	63.35	0.0330	9.47%	$93.56	2.61%	6.86%
50	1962	62.69	0.0320	4.25%	$89.60	8.89%	-4.64%
51	1961	52.73	0.0358	22.47%	$89.74	4.29%	18.18%
52	1960	44.50	0.0403	22.52%	$84.36	11.13%	11.39%
53	1959	43.96	0.0377	5.00%	$91.55	-3.49%	8.49%
54	1958	33.30	0.0487	36.88%	$101.22	-5.60%	42.48%
55	1957	32.32	0.0487	7.90%	$100.70	4.49%	3.41%
56	1956	31.55	0.0472	7.16%	$113.00	-7.35%	14.51%
57	1955	29.89	0.0461	10.16%	$116.77	0.20%	9.97%
58	1954	25.51	0.0520	22.37%	$112.79	7.07%	15.30%
59	1953	24.41	0.0511	9.62%	$114.24	2.24%	7.38%
60	1952	22.22	0.0550	15.36%	$113.41	4.26%	11.10%
61	1951	20.01	0.0606	17.10%	$123.44	-4.89%	21.99%
62	1950	20.20	0.0554	4.60%	$125.08	1.89%	2.71%
63	1949	16.54	0.0570	27.83%	$119.82	7.72%	20.10%
64	1948	16.53	0.0535	5.41%	$118.50	4.49%	0.92%
65	1947	19.21	0.0354	-10.41%	$126.02	-2.79%	-7.62%
66	1946	21.34	0.0298	-7.00%	$126.74	2.59%	-9.59%
67	1945	13.91	0.0448	57.89%	$119.82	9.11%	48.79%
68	1944	12.10	0.0569	20.65%	$119.82	3.34%	17.31%
69	1943	9.22	0.0621	37.45%	$118.50	4.49%	32.96%
70	1942	8.54	0.0940	17.36%	$117.63	4.14%	13.22%
71	1941	13.25	0.0717	-28.38%	$116.34	4.55%	-32.92%
72	1940	16.97	0.0540	-16.52%	$112.39	7.08%	-23.60%
73	1939	16.05	0.0553	11.26%	$105.75	10.05%	1.21%
74	1938	14.30	0.0730	19.54%	$99.83	9.94%	9.59%
75	1937	24.34	0.0432	-36.93%	$103.18	0.63%	-37.55%
76	Average			10.6%		6.7%	3.8%

Note: See Appendix 5 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

SCHEDULE 7
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:

Ending Wealth	Probability
$1.30	0.50
$0.90	0.50

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

Ending Wealth			Probability	Value x Probability
(1.30) (1.30)	=	$1.69	0.25	0.4225
(1.30) (.9)	=	$1.17	0.50	0.5850
(.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.

SCHEDULE 8
CALCULATION OF CAPITAL ASSET PRICING MODEL COST OF EQUITY
USING SBBI 6.6 PERCENT RISK PREMIUM
ELECTRIC UTILITIES AND VALUE LINE PIPELINE COMPANIES

Line		Value	Description
1	Risk-free Rate	5.1%	Long-term Treasury bond yield forecast
2	Beta	0.73	Average Beta Electric Utilities
3	Risk Premium	6.6%	Long-horizon SBBI risk premium
4	Beta x Risk Premium	4.8%	
5	Flotation	0.24%	
6	Model Result	10.2%	

Line			Description
1	Risk-free Rate	5.1%	Long-term Treasury bond yield forecast
2	Beta	0.85	Average Beta Pipeline companies
3	Risk Premium	6.6%	Long-horizon SBBI risk premium
4	Beta x Risk Premium	5.6%	
5	Flotation	0.24%	
6	Model Result	11.0%	

Risk premium from 2012 Ibbotson® SBBI®. Value Line beta for comparable companies from Value Line Investment Analyzer January 2012. Treasury bond yield forecast from data in Value Line Selection & Opinion, November 23, 2012, and Energy Information Administration, January 2013, determined as follows. Value Line forecasts a yield on 10-year Treasury notes equal to 4.0 percent. The current spread between the average December 2012 yield on 10-year Treasury notes (1.72 percent) and 20-year Treasury bonds (2.47 percent) is seventy-five basis points. Adding seventy-five basis points to Value Line's 4.0 percent forecast produces a forecasted yield of 4.75 percent for 20-year Treasury bonds (see Value Line Investment Survey, Selection & Opinion, Nov. 23, 2012). The EIA forecasts a yield of 4.7 percent on 10-year Treasury notes. Adding the seventy-five basis point spread between 10-year Treasury notes and 20-year Treasury bonds to the EIA forecast of 4.7 percent equals a EIA forecast for 20-year Treasury bonds equal to 5.45 percent. The average of the forecasts is 5.1 percent (4.75 percent using Value Line data and 5.45 percent using EIA data).

PROXY COMPANY INFORMATION

Line	Company	Safety Rank	S&P BOND RATING	S&P BOND RATING (Numerical)	Value Line Beta
1	ALLETE	2	BBB+	6	0.70
2	Alliant Energy	2	A-	5	0.70
3	CenterPoint Energy	2	BBB+	6	0.75
4	CMS Energy Corp.	**3**	BBB-	8	0.75
5	Dominion Resources	2	A-	5	0.70
6	DTE Energy	2	BBB+	6	0.75
7	Duke Energy	2	BBB+	6	0.60
8	FirstEnergy Corp.	2	BBB-	8	0.75
9	G't Plains Energy	**3**	BBB	7	0.75
10	Hawaiian Elec.	2	BBB-	8	0.70
11	Integrys Energy	2	A-	5	0.90
12	NextEra Energy	2	A-	5	0.70
13	Northeast Utilities	2	A-	5	0.70
14	NorthWestern Corp.	**3**	BBB	7	0.70
15	OGE Energy	2	BBB+	6	0.75
16	Otter Tail Corp.	**3**	BBB-	8	0.90
17	Pepco Holdings	**3**	BBB+	6	0.75
18	Pinnacle West Capital	2	BBB	7	0.70
19	PNM Resources	**3**	BBB-	8	0.90
20	SCANA Corp.	2	BBB+	6	0.65
21	Sempra Energy	2	BBB+	6	0.80
22	Southern Co.	1	A	4	0.55
23	TECO Energy	2	BBB+	6	0.85
24	Vectren Corp.	2	A-	5	0.70
25	Westar Energy	2	BBB	7	0.70
26	Wisconsin Energy	1	A-	5	0.60
27	Xcel Energy Inc.	2	A-	5	0.60
	Average	2	BBB+	6	0.73

Line	Company	Safety Rank	S&P BOND RATING	S&P BOND RATING (Numerical)	Value Line Beta
1	Buckeye Partners, L.P.	3	BBB	7	0.80
2	El Paso Pipeline Partners, L.P.	3	BBB-	8	0.70
3	Enbridge Energy Partners, L.P.	2	BBB	7	0.90
4	Enterprise Products Partners, L.P.	3	BBB	7	0.85
5	Plains All American Pipeline, L.P.	3	BBB	7	0.80
6	Sunoco Logistics Partners, L.P.	2	BBB-	8	0.85
7	Williams Partners L.P.	3	BBB	7	1.05
8	Average	3	BBB	7	0.85

Data from Standard & Poor's, Value Line Investment Analyzer.

SCHEDULE 9
COMPARISON OF RISK PREMIA ON S&P500 AND S&P UTILITIES 1937 – 2012

Year	S&P Utilities Stock Return	Sp500 Stock Return	10-Yr. Treasury Bond Yield	Utilities Risk Premium	Market Risk Premium
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	-0.3519	0.0367	-0.2957	-0.3886
2007	0.1656	-0.0127	0.0463	0.1193	-0.0590
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
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

Year	S&P Utilities Stock Return	Sp500 Stock Return	10-Yr. Treasury Bond Yield	Utilities Risk Premium	Market Risk Premium
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—2012				0.0521	0.0567
RP Utilities/RP SP500				0.92	

SCHEDULE 10
CALCULATION OF CAPITAL ASSET PRICING MODEL COST OF EQUITY
USING DCF ESTIMATE OF THE EXPECTED RATE OF RETURN
ON THE MARKET PORTFOLIO

Line			
1	Risk-free Rate	5.1%	Forecast 20-year Treasury Bond Yield
2	Beta	0.73	Average Beta Electric Utilities
3	DCF S&P 500	12.5%	DCF Cost of Equity S&P 500 (see following)
4	Risk Premium	7.4%	
5	Beta x Risk Premium	5.4%	
6	Flotation cost	0.24%	
7	Model Result	10.7%	

Line			Description
1	Risk-free Rate	5.1%	Long-term Treasury bond yield forecast
2	Beta	0.85	Average Beta Pipeline companies
3	DCF S&P 500	12.5%	DCF Cost of Equity S&P 500 (see following)
4	Risk Premium	7.40%	
5	Beta * Risk Premium	6.29%	
6	Flotation cost	0.24%	
7	Model Result	11.6%	

Value Line forecasts a yield on 10-year Treasury notes equal to 4.0 percent. The current spread between the average December 2012 yield on 10-year Treasury notes (1.72 percent) and 20-year Treasury bonds (2.47 percent) is seventy-five basis points. Adding seventy-five basis points to Value Line's 4.0 percent forecast produces a forecasted yield of 4.75 percent for 20-year Treasury bonds (see Value Line Investment Survey, Selection & Opinion, Nov. 23, 2012). The EIA forecasts a yield of 4.7 percent on 10-year Treasury notes. Adding the seventy-five basis point spread between 10-year Treasury notes and 20-year Treasury bonds to the EIA forecast of 4.7 percent equals a EIA forecast for 20-year Treasury bonds equal to 5.45 percent. The average of the forecasts is 5.1 percent (4.75 percent using Value Line data and 5.45 percent using EIA data).

SCHEDULE 10 (CONTINUED)
SUMMARY OF DISCOUNTED CASH FLOW ANALYSIS
FOR S&P 500 COMPANIES

Line	Company	P_0	D_0	Growth	Cost of Equity
1	3M	90.89	2.36	9.73%	12.6%
2	ACCENTURE	68.04	1.62	10.99%	13.7%
3	AETNA	43.24	0.80	10.50%	12.6%
4	AFLAC	51.12	1.40	10.20%	13.2%
5	AGILENT TECHS.	38.08	0.40	9.92%	11.1%
6	AIR PRDS.& CHEMS.	81.76	2.56	8.52%	12.0%
7	ALCOA	8.66	0.12	10.37%	11.9%
8	ALLERGAN	91.18	0.20	12.69%	12.9%
9	ALLSTATE	40.41	0.88	9.00%	11.4%
10	ALTRIA GROUP	32.45	1.76	7.63%	13.6%
11	AMERICAN EXPRESS	56.45	0.80	11.13%	12.7%
12	AMERISOURCEBERGEN	41.24	0.84	11.90%	14.2%
13	AMGEN	86.88	1.88	10.64%	13.1%
14	ASSURANT	36.66	0.84	10.33%	12.9%
15	AT&T	34.55	1.80	6.41%	12.1%
16	AUTOMATIC DATA PROC.	57.60	1.74	8.88%	12.2%
17	BAKER HUGHES	42.62	0.60	12.17%	13.8%
18	BALL	43.51	0.40	10.58%	11.6%
19	BAXTER INTL.	64.32	1.80	8.49%	11.6%
20	BB&T	29.37	0.80	10.94%	14.0%
21	BEAM	57.45	0.82	12.13%	13.7%
22	BEMIS	32.93	1.00	7.10%	10.4%
23	BOEING	72.97	1.94	11.94%	14.9%
24	BROADCOM ‘A’	32.54	0.40	12.52%	13.9%
25	CARDINAL HEALTH	40.76	1.10	8.10%	11.0%
26	CARNIVAL	37.94	1.00	11.77%	14.7%
27	CH ROBINSON WWD.	61.12	1.40	11.75%	14.3%
28	CHARLES SCHWAB	13.39	0.24	11.57%	13.6%
29	CHUBB	76.97	1.64	8.78%	11.1%
30	CINTAS	41.93	0.64	10.30%	12.0%
31	CISCO SYSTEMS	18.62	0.56	8.40%	11.7%
32	CITIGROUP	36.37	0.04	11.09%	11.2%
33	CLOROX	74.06	2.56	8.04%	11.8%
34	CME GROUP	54.78	1.80	10.63%	14.3%
35	CMS ENERGY	23.92	0.96	6.19%	10.5%
36	COCA COLA	37.13	1.02	7.94%	10.9%
37	COCA COLA ENTS.	31.26	0.64	8.57%	10.8%
38	COLGATE-PALM.	106.29	2.48	8.53%	11.1%
39	COMERICA	29.76	0.60	11.54%	13.8%
40	CONAGRA FOODS	28.96	1.00	6.77%	10.5%
41	COSTCO WHOLESALE	99.79	1.10	12.66%	13.9%
42	COVIDIEN	57.03	1.04	8.63%	10.6%
43	DANAHER	53.76	0.10	12.87%	13.1%
44	DARDEN RESTAURANTS	51.60	2.00	10.67%	15.0%
45	DEERE	84.43	1.84	10.00%	12.4%
46	DENTSPLY INTL.	38.43	0.22	11.63%	12.3%
47	DIAMOND OFFS.DRL.	68.13	0.50	13.97%	14.8%
48	DISCOVER FINANCIAL SVS.	39.82	0.56	10.67%	12.2%
49	DOW CHEMICAL	29.85	1.28	6.52%	11.2%
50	EASTMAN CHEMICAL	59.60	1.20	9.19%	11.4%
51	EMERSON ELECTRIC	50.07	1.64	9.33%	13.0%

Line	Company	P_0	D_0	Growth	Cost of Equity
52	EQUIFAX	51.23	0.72	12.65%	14.2%
53	ESTEE LAUDER COS.'A'	60.37	0.72	12.55%	13.9%
54	FAMILY DOLLAR STORES	67.44	0.84	11.68%	13.1%
55	FEDEX	90.17	0.56	12.66%	13.4%
56	FLUOR	55.97	0.64	11.85%	13.1%
57	FMC	54.54	0.54	11.02%	12.1%
58	FRANKLIN RESOURCES	129.24	1.16	12.10%	13.1%
59	FRONTIER COMMUNICATIONS	4.57	0.40	3.83%	13.2%
60	GAP	34.27	0.50	8.88%	10.5%
61	GENERAL MILLS	40.24	1.32	8.06%	11.6%
62	HASBRO	37.36	1.44	7.40%	11.6%
63	HJ HEINZ	57.82	2.06	7.18%	11.1%
64	HONEYWELL INTL.	61.74	1.64	10.52%	13.5%
65	ILLINOIS TOOL WORKS	60.64	1.52	8.97%	11.7%
66	INGERSOLL-RAND	46.93	0.84	11.27%	13.3%
67	INTEL	21.16	0.90	8.63%	13.3%
68	INTERNATIONAL BUS.MCHS.	194.75	3.40	9.84%	11.8%
69	INTERPUBLIC GP.	10.66	0.24	9.08%	11.6%
70	INTL.GAME TECH.	13.49	0.28	11.93%	14.3%
71	J M SMUCKER	85.64	2.08	8.28%	10.9%
72	KOHL'S	48.45	1.28	7.52%	10.4%
73	KROGER	25.30	0.60	9.80%	12.4%
74	LEGG MASON	25.34	0.44	13.00%	15.0%
75	LIMITED BRANDS	48.85	1.00	11.46%	13.8%
76	LINCOLN NAT.	24.90	0.48	8.93%	11.0%
77	M&T BANK	99.72	2.80	8.86%	11.9%
78	MACY'S	39.16	0.80	12.68%	15.0%
79	MARATHON PETROLEUM	57.64	1.40	12.33%	15.1%
80	MARSH & MCLENNAN	34.56	0.92	11.67%	14.7%
81	MATTEL	36.49	1.24	9.05%	12.8%
82	MCDONALDS	88.18	3.08	8.59%	12.4%
83	MEAD JOHNSON NUTRITION	66.59	1.20	11.35%	13.4%
84	METLIFE	33.95	0.74	8.97%	11.4%
85	MICROSOFT	28.09	0.92	8.90%	12.5%
86	MONDELEZ INTERNATIONAL CL.A	26.21	0.52	12.14%	14.4%
87	MONSANTO	89.46	1.50	9.23%	11.1%
88	MURPHY OIL	58.66	1.25	11.98%	14.4%
89	NASDAQ OMX GROUP	24.17	0.52	10.25%	12.6%
90	NOBLE ENERGY	95.85	1.00	10.93%	12.1%
91	NORDSTROM	54.90	1.08	12.34%	14.6%
92	NUCOR	40.70	1.47	7.13%	11.1%
93	NVIDIA	12.40	0.30	10.75%	13.5%
94	OMNICOM GP.	49.16	1.20	8.91%	11.6%
95	ORACLE	31.64	0.24	12.64%	13.5%
96	PEPCO HOLDINGS	19.47	1.08	5.23%	11.2%
97	PERKINELMER	30.64	0.28	11.90%	12.9%
98	PERRIGO	110.15	0.36	11.86%	12.2%
99	PHILIP MORRIS INTL.	87.90	3.40	10.63%	15.0%
100	PPG INDUSTRIES	121.86	2.36	9.93%	12.1%
101	PRAXAIR	107.01	2.20	10.78%	13.1%
102	PREC.CASTPARTS	176.47	0.12	14.25%	14.3%
103	PROCTER & GAMBLE	68.61	2.25	8.04%	11.6%
104	QUEST DIAGNOSTICS	59.26	1.20	10.97%	13.2%
105	RALPH LAUREN CL.A	155.44	1.60	13.56%	14.7%
106	RAYTHEON 'B'	56.29	2.00	7.77%	11.7%

Line	Company	P_0	D_0	Growth	Cost of Equity
107	REYNOLDS AMERICAN	42.27	2.36	6.87%	13.0%
108	ROCKWELL AUTOMATION	75.58	1.88	10.56%	13.3%
109	ROCKWELL COLLINS	55.49	1.20	9.65%	12.0%
110	ROSS STORES	58.01	0.56	13.02%	14.1%
111	SAFEWAY	16.83	0.70	10.13%	14.8%
112	SEALED AIR	16.50	0.52	8.57%	12.0%
113	ST.JUDE MEDICAL	36.87	0.92	9.49%	12.2%
114	STATE STREET	44.63	0.96	8.93%	11.3%
115	STRYKER	54.11	1.06	9.08%	11.2%
116	TARGET	62.11	1.44	11.70%	14.3%
117	TE CONNECTIVITY	34.48	0.84	10.14%	12.8%
118	THE HERSHEY COMPANY	71.21	1.68	9.72%	12.3%
119	THERMO FISHER SCIENTIFIC	61.74	0.60	11.73%	12.8%
120	TIFFANY & CO	61.15	1.28	11.59%	13.9%
121	TIME WARNER	45.66	1.04	11.11%	13.7%
122	TJX COS.	42.75	0.46	11.64%	12.8%
123	TORCHMARK	51.11	0.60	10.15%	11.4%
124	TOTAL SYSTEM SERVICES	22.35	0.40	12.37%	14.4%
125	UNITED PARCEL SER.'B'	72.90	2.28	9.79%	13.3%
126	UNITED TECHNOLOGIES	78.81	2.14	10.93%	14.0%
127	UNITEDHEALTH GP.	55.18	0.85	10.52%	12.2%
128	UNUM GROUP	20.34	0.52	8.13%	10.9%
129	US BANCORP	32.89	0.78	9.15%	11.8%
130	V F	157.63	3.48	10.50%	13.0%
131	WAL MART STORES	72.35	1.59	9.20%	11.6%
132	WALT DISNEY	49.85	0.75	11.41%	13.1%
133	WASTE MAN.	32.63	1.42	5.87%	10.6%
134	WELLS FARGO & CO	33.85	0.88	8.62%	11.5%
135	WESTERN UNION	13.77	0.50	9.31%	13.3%
136	WYNN RESORTS	113.61	2.00	10.16%	12.1%
137	XILINX	34.00	0.88	8.90%	11.7%
138	XL GROUP	24.59	0.44	8.75%	10.7%
139	ZIMMER HDG.	66.01	0.72	9.34%	10.5%
140	Market-weighted Average				12.5%

Notes: In applying the DCF model to the S&P 500, I included 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 eliminated those 25% of companies with the highest and lowest DCF results, a decision which had no impact on my CAPM estimate of the cost of equity.

D_0	=	Current dividend per Thomson Reuters.
P_0	=	Average of the monthly high and low stock prices during the three months ending December 2012 per Thomson Reuters.
g	=	I/B/E/S forecast of future earnings growth December 2012.
k	=	Cost of equity using the quarterly version of the DCF model shown below:

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

APPENDIX 1
QUALIFICATIONS OF JAMES H. VANDER WEIDE, PH.D.

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James H. Vander Weide is Research Professor of Finance and Economics at Duke University, the Fuqua School of Business. Dr. Vander Weide is also founder and President of Financial Strategy Associates, a consulting firm that provides strategic, financial, and economic consulting services to corporate clients, including cost of capital and valuation studies.

Educational Background and Prior Academic Experience

Dr. Vander Weide holds a Ph.D. in Finance from Northwestern University and a Bachelor of Arts in Economics from Cornell University. He joined the faculty at Duke University and was named Assistant Professor, Associate Professor, Professor, and then Research Professor of Finance and Economics.

Since joining the faculty at Duke, Dr. Vander Weide has taught courses in corporate finance, investment management, and management of financial institutions. He has also taught courses in statistics, economics, and operations research, and a Ph.D. seminar on the theory of public utility pricing. In addition, 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, real options, capital budgeting, cash management, measuring corporate performance, valuation, short-run financial planning, depreciation policies, financial strategy, and competitive strategy. Dr. Vander Weide has 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.

Publications

Dr. Vander Weide has written a book entitled *Managing Corporate Liquidity: An Introduction to Working Capital Management* published by John Wiley and Sons, Inc. He has also written a chapter titled, "Financial Management in the Short Run" for *The Handbook of Modern Finance*;" a chapter for *The Handbook of Portfolio Construction: Contemporary Applications of Markowitz Techniques,* "Principles for Lifetime Portfolio Selection: Lessons from Portfolio Theory," and 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, Financial Management, International Journal of Industrial Organization, Journal of Finance, Journal of Financial and Quantitative Analysis, Journal of Bank Research, Journal of Portfolio Management, Journal of Accounting Research, Journal of Cash Management, Management Science, Atlantic Economic Journal, Journal of Economics and Business,* and *Computers and Operations Research*.

Professional Consulting Experience

Dr. Vander Weide has provided financial and economic consulting services to firms in the electric, gas, insurance, telecommunications, and water industries for more than 25 years. He has testified on the cost of capital, competition, risk, incentive regulation, forward-looking economic cost, economic pricing guidelines, depreciation, accounting, valuation, and other financial and economic issues in more than 400 cases before the United States Congress, the Canadian Radio-Television and Telecommunications Commission, the Federal Communications Commission, the National Energy Board (Canada), the National Telecommunications and Information Administration, the Federal Energy Regulatory Commission, the public service commissions of 43 states, the District of Columbia, four Canadian provinces, the insurance commissions of five states, the Iowa State Board of Tax Review, the National Association of Securities Dealers, and the North Carolina Property Tax Commission. In addition, he has testified as an expert witness in proceedings before the United States District Court for the District of New Hampshire; United States District Court for the Northern District of California; United States District Court for the Northern District of Illinois, United States District Court for the District of Nebraska; United States District Court for the Eastern District of North Carolina; Superior Court of North Carolina, the United States Bankruptcy Court for the Southern District of West Virginia; and United States District Court for the Eastern District of Michigan. With respect to implementation of the Telecommunications Act of 1996, Dr. Vander Weide has testified in 30 states on issues relating to the pricing of unbundled network elements and universal service cost studies and has consulted with Bell Canada, Deutsche Telekom, and Telefónica on similar issues. He has also provided expert testimony on issues related to electric and natural gas restructuring. He has worked for Bell Canada/Nortel on a special task force to study the effects of vertical integration in the Canadian telephone industry and has worked for Bell Canada as an expert witness on the cost of capital. Dr. Vander Weide has provided consulting and expert witness testimony to the following companies:

ELECTRIC, GAS, WATER, OIL COMPANIES	
Alcoa Power Generating, Inc.	Maritimes & Northeast Pipeline
Alliant Energy and subsidiaries	MidAmerican Energy and subsidiaries
AltaLink, L.P.	Nevada Power Company
Ameren	NICOR
American Water Works	North Carolina Natural Gas
Atmos Energy and subsidiaries	North Shore Gas
BP p.l.c.	Northern Natural Gas Company
Central Illinois Public Service	NOVA Gas Transmission Ltd.
Citizens Utilities	PacifiCorp
Consolidated Natural Gas and subsidiaries	Peoples Energy and its subsidiaries
Dominion Resources and subsidiaries	PG&E
Duke Energy and subsidiaries	Progress Energy
Empire District Electric Company	PSE&G
EPCOR Distribution & Transmission Inc.	Public Service Company of North Carolina
EPCOR Energy Alberta Inc.	Sempra Energy/San Diego Gas and Electric

ELECTRIC, GAS, WATER, OIL COMPANIES	
FortisAlberta Inc.	South Carolina Electric and Gas
Hope Natural Gas	Southern Company and subsidiaries
Interstate Power Company	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
Kinder Morgan Energy Partners	Virginia-American Water Company

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)
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 conducts 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.

In the 1970's, Dr. Vander Weide helped found University Analytics, Inc., which at that time was one of the fastest growing small firms in the country. As an officer at University Analytics, he designed cash management models, databases, and software packages that are still 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.

PUBLICATIONS
JAMES H. VANDER WEIDE

The Lock-Box Location Problem: a Practical Reformulation, *Journal of Bank Research*, Summer, 1974, pp. 92-96 (with S. Maier). Reprinted in *Management Science in Banking*, edited by K. J. Cohen and S. E. Gibson, Warren, Gorham and Lamont, 1978.

A Finite Horizon Dynamic Programming Approach to the Telephone Cable Layout Problem, *Conference Record*, 1976 International Conference on Communications (with S. Maier and C. Lam).

A Note on the Optimal Investment Policy of the Regulated Firm, *Atlantic Economic Journal*, Fall, 1976 (with D. Peterson).

A Unified Location Model for Cash Disbursements and Lock-Box Collections, *Journal of Bank Research*, Summer, 1976 (with S. Maier). Reprinted in *Management Science in Banking*, edited by K. J. Cohen and S. E. Gibson, Warren Gorham and Lamont, 1978. Also reprinted in *Readings on the Management of Working Capital*, edited by K. V. Smith, West Publishing Company, 1979.

Capital Budgeting in the Decentralized Firm,' *Management Science*, Vol. 23, No. 4, December 1976, pp. 433-443 (with S. Maier).

A Monte Carlo Investigation of Characteristics of Optimal Geometric Mean Portfolios, *Journal of Financial and Quantitative Analysis*, June, 1977, pp. 215-233 (with S. Maier and D. Peterson).

A Strategy which Maximizes the Geometric Mean Return on Portfolio Investments, *Management Science*, June, 1977, Vol. 23, No. 10, pp. 1117-1123 (with S. Maier and D. Peterson).

A Decision Analysis Approach to the Computer Lease-Purchase Decision, *Computers and Operations Research*, Vol. 4, No. 3, September, 1977, pp. 167-172 (with S. Maier).

A Practical Approach to Short-run Financial Planning, *Financial Management*, Winter, 1978 (with S. Maier). Reprinted in *Readings on the Management of Working Capital*, edited by K. V. Smith, West Publishing Company, 1979.

Effectiveness of Regulation in the Electric Utility Industry,' *Journal of Economics and Business*, May, 1979 (with F. Tapon).

On the Decentralized Capital Budgeting Problem Under Uncertainty, *Management Science*, September 1979 (with B. Obel).

Expectations Data and the Predictive Value of Interim Reporting: A Comment, *Journal of Accounting Research*, Spring 1980 (with L. D. Brown, J. S. Hughes, and M. S. Rozeff).

General Telephone's Experience with a Short-run Financial Planning Model, *Cash Management Forum*, June 1980, Vol. 6, No. 1 (with J. Austin and S. Maier).

Deregulation and Oligopolistic Price-Quality Rivalry, *American Economic Review*, March 1981 (with J. Zalkind).

Forecasting Disbursement Float, *Financial Management*, Spring 1981 (with S. Maier and D. Robinson).

Recent Developments in Management Science in Banking, *Management Science*, October 1981 (with K. Cohen and S. Maier).

Incentive Considerations in the Reporting of Leveraged Leases, *Journal of Bank Research*, April 1982 (with J. S. Hughes).

A Decision-Support System for Managing a Short-term Financial Instrument Portfolio, *Journal of Cash Management*, March 1982 (with S. Maier).

An Empirical Bayes Estimate of Market Risk, *Management Science*, July 1982 (with S. Maier and D. Peterson).

The Bond Scheduling Problem of the Multi-subsidiary Holding Company, *Management Science*, July 1982 (with K. Baker).

Deregulation and Locational Rents in Banking: a Comment, *Journal of Bank Research*, Summer 1983.

What Lockbox and Disbursement Models Really Do, *Journal of Finance*, May 1983 (with S. Maier).

Financial Management in the Short Run, *Handbook of Modern Finance*, edited by Dennis Logue, published by Warren, Gorham, & Lamont, Inc., New York, 1984.

Measuring Investors' Growth Expectations: Analysts vs. History, *The Journal of Portfolio Management*, Spring 1988 (with W. Carleton).

Entry Auctions and Strategic Behavior under Cross-Market Price Constraints, *International Journal of Industrial Organization*, 20 (2002) 611-629 (with J. Anton and N. Vettas).

Principles for Lifetime Portfolio Selection: Lessons from Portfolio Theory, *Handbook of Portfolio Construction: Contemporary Applications of Markowitz Techniques*, John B. Guerard, (Ed.), Springer, 2009.

Managing Corporate Liquidity: an Introduction to Working Capital Management, John Wiley and Sons, 1984 (with S. Maier).

APPENDIX 2
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

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

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:

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

<u>Application to DCF Model</u>

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

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

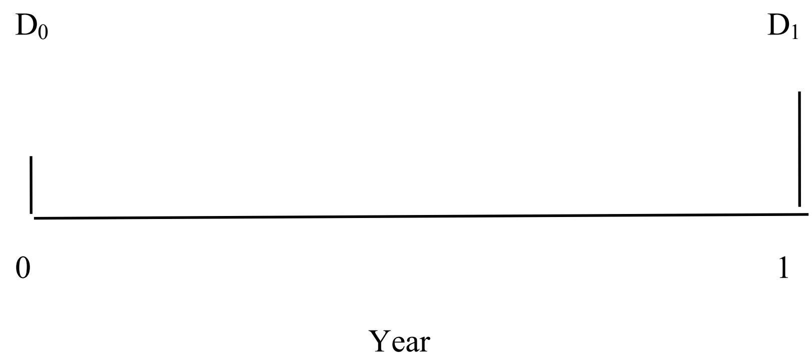
as we suggested earlier.

Quarterly DCF Model

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

Figure 1

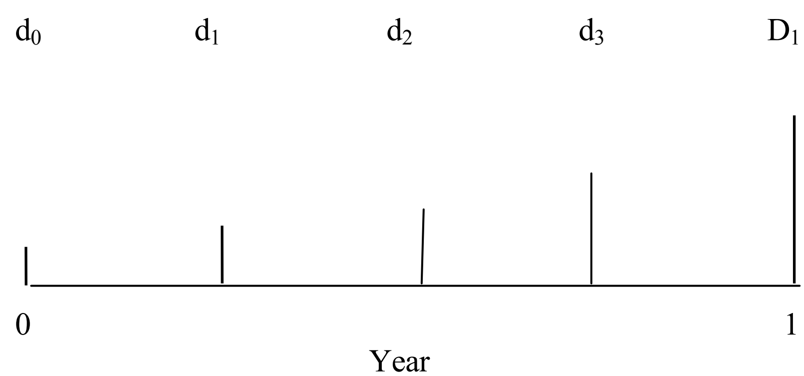
Annual DCF Model



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

Figure 2

Quarterly DCF Model (Constant Growth Version)



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

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

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

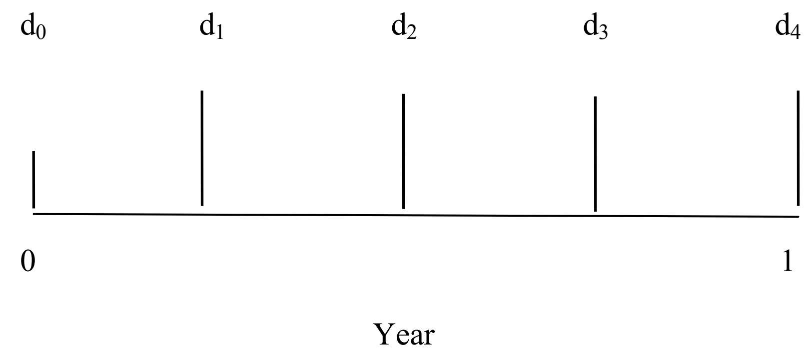
Although the constant growth Quarterly DCF Model [equation (8)] allows for the quarterly timing of dividend payments, it does require the assumption that the firm increases its dividend payments each quarter. Since this assumption is difficult for some analysts to accept, we now discuss a second Quarterly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

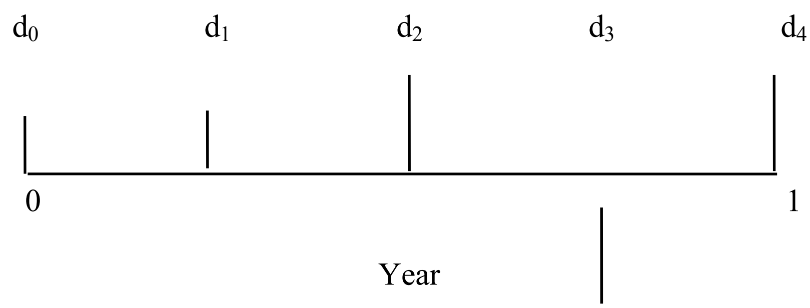
Quarterly DCF Model (Constant Dividend Version)

Case 1



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

Case 2

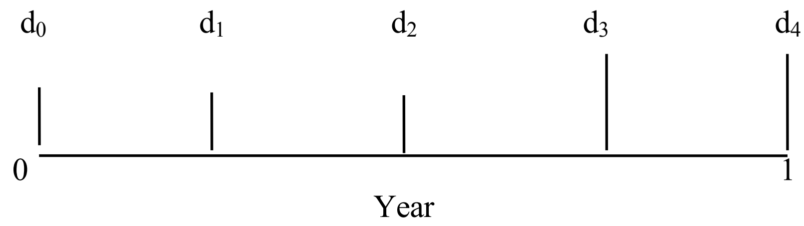


$d_1 = d_0$

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

Figure 3 (continued)

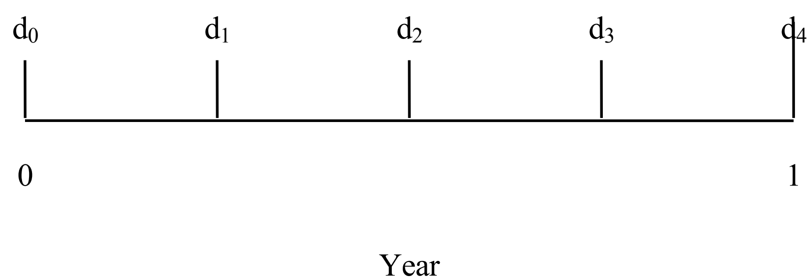
Case 3



$d_1 = d_2 = d_0$

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

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

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

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.

APPENDIX 3
ADJUSTING FOR FLOTATION COSTS IN DETERMINING
A PUBLIC UTILITY'S ALLOWED RATE OF RETURN ON EQUITY

II. Introduction

Regulation of public utilities is guided by the principle that utility revenues should be sufficient to allow recovery of all prudently incurred expenses, including the cost of capital. As set forth in the 1944 *Hope Natural Gas* Case [*Federal Power Comm'n v. Hope Natural Gas Co*. 320 U. S. 591 (1944) at 603], the U. S. Supreme Court states:

> 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.

Since the flotation costs arising from the issuance of debt and equity securities are an integral component of capital costs, this standard requires that the company's revenues be sufficient to fully recover flotation costs.

Despite the widespread agreement that flotation costs should be recovered in the regulatory process, several issues still need to be resolved. These include:

1. How is the term "flotation costs" defined? Does it include only the out-of-pocket costs associated with issuing securities (e. g., legal fees, printing costs, selling and underwriting expenses), or does it also include the reduction in a security's price that frequently accompanies flotation (i. e., market pressure)?
2. What should be the time pattern of cost recovery? Should a company be allowed to recover flotation costs immediately, or should flotation costs be recovered over the life of the issue?
3. For the purposes of regulatory accounting, should flotation costs be included as an expense? As an addition to rate base? Or as an additional element of a firm's allowed rate of return?
4. Do existing regulatory methods for flotation cost recovery allow a firm ***full*** recovery of flotation costs?

In this paper, I review the literature pertaining to the above issues and discuss my own views regarding how this literature applies to the cost of equity for a regulated firm.

III. Definition of Flotation Cost

The value of a firm is related to the future stream of net cash flows (revenues minus expenses measured on a cash basis) that can be derived from its assets. In the process of acquiring assets, a firm incurs certain expenses which reduce its value. Some of these expenses or costs are directly associated with revenue production in one period (e. g., wages, cost of goods sold), others are more properly associated with revenue production in many periods (e. g., the acquisition cost of plant and equipment). In either case, the word "cost" refers to any item that reduces the value of a firm.

If this concept is applied to the act of issuing new securities to finance asset purchases, many items are properly included in issuance or flotation costs. These include: (1) compensation received by investment bankers for underwriting services, (2) legal fees, (3) accounting fees, (4) engineering fees, (5) trustee's fees, (6) listing fees, (7) printing and engraving expenses, (8) SEC registration fees, (9) Federal Revenue Stamps, (10) state taxes, (11) warrants granted to underwriters as extra compensation, (12) postage expenses, (13) employees' time, (14) market pressure, and (15) the offer discount. The finance literature generally divides these flotation cost items into three categories, namely, underwriting expenses, issuer expenses, and price effects.

IV. Magnitude of Flotation Costs

The finance literature contains several studies of the magnitude of the flotation costs associated with new debt and equity issues. These studies differ primarily with regard to the time period studied, the sample of companies included, and the source of data. The flotation cost studies generally agree, however, that for large issues, underwriting expenses represent approximately one and one-half percent of the proceeds of debt issues and three to five percent of the proceeds of seasoned equity issues. They also agree that issuer expenses represent approximately 0.5 percent of both debt and equity issues, and that the announcement of an equity issue reduces the company's stock price by at least two to three percent of the proceeds from the stock issue. Thus, total flotation costs represent approximately two percent[6] of the proceeds from debt issues, and five and one-half to eight and one-half percent of the proceeds of equity issues.

Lee *et. al.* [14] is an excellent example of the type of flotation cost studies found in the finance literature. The Lee study is a comprehensive recent study of the underwriting and issuer costs associated with debt and equity issues for both utilities and non-utilities. The results of the Lee *et. al.* study are reproduced in Tables 1 and 2. Table 1 demonstrates that the total underwriting and issuer expenses for the 1,092 debt issues in their study averaged 2.24 percent of the proceeds of the issues, while the total underwriting and issuer costs for the 1,593 seasoned equity issues in their study averaged 7.11 percent of the proceeds of the new issue. Table 1 also demonstrates that the total underwriting and issuer costs of seasoned equity offerings, as a percent of proceeds, decline with the size of the issue. For issues above $60 million, total underwriting and issuer costs amount to from three to five percent of the amount of the proceeds.

Table 2 reports the total underwriting and issuer expenses for 135 utility debt issues and 136 seasoned utility equity issues. Total underwriting and issuer expenses for utility bond

[6] The two percent flotation cost on debt only recognizes the cost of newly-issued debt. When interest rates decline, many companies exercise the call provisions on higher cost debt and reissue debt at lower rates. This process involves reacquisition costs that are not included in the academic studies. If reacquisition costs were included in the academic studies, debt flotation costs could increase significantly.

offerings averaged 1.47 percent of the amount of the proceeds and for seasoned utility equity offerings averaged 4.92 percent of the amount of the proceeds. Again, there are some economies of scale associated with larger equity offerings. Total underwriting and issuer expenses for equity offerings in excess of 40 million dollars generally range from three to four percent of the proceeds.

The results of the Lee study for large equity issues are consistent with results of earlier studies by Bhagat and Frost [4], Mikkelson and Partch [17], and Smith [24]. Bhagat and Frost found that total underwriting and issuer expenses average approximately four and one-half percent of the amount of proceeds from negotiated utility offerings during the period 1973 to 1980, and approximately three and one-half percent of the amount of the proceeds from competitive utility offerings over the same period. Mikkelson and Partch found that total underwriting and issuer expenses average five and one-half percent of the proceeds from seasoned equity offerings over the 1972 to 1982 period. Smith found that total underwriting and issuer expenses for larger equity issues generally amount to four to five percent of the proceeds of the new issue.

The finance literature also contains numerous studies of the decline in price associated with sales of large blocks of stock to the public. These articles relate to the price impact of: (1) initial public offerings; (2) the sale of large blocks of stock from one investor to another; and (3) the issuance of seasoned equity issues to the general public. All of these studies generally support the notion that the announcement of the sale of large blocks of stock produces a decline in a company's share price. The decline in share price for initial public offerings is significantly larger than the decline in share price for seasoned equity offerings; and the decline in share price for public utilities is less than the decline in share price for non-public utilities. A comprehensive study of the magnitude of the decline in share price associated specifically with the sale of new equity by public utilities is reported in Pettway [19], who found the market pressure effect for a sample of 368 public utility equity sales to be in the range of two to three percent. This decline in price is a real cost to the utility, because the proceeds to the utility depend on the stock price on the day of issue.

In addition to the price decline associated with the announcement of a new equity issue, the finance literature recognizes that there is also a price decline associated with the actual issuance of equity securities. In particular, underwriters typically sell seasoned new equity securities to investors at a price lower than the closing market price on the day preceding the issue. The Rules of Fair Practice of the National Association of Securities Dealers require that underwriters not sell shares at a price above the offer price. Since the offer price represents a binding constraint to the underwriter, the underwriter tends to set the offer price slightly below the market price on the day of issue to compensate for the risk that the price received by the underwriter may go down, but can not increase. Smith provides evidence that the offer discount tends to be between 0.5 and 0.8 percent of the proceeds of an equity issue. I am not aware of any similar studies for debt issues.

In summary, the finance literature provides strong support for the conclusion that total underwriting and issuer expenses for public utility debt offerings represent approximately two percent of the amount of the proceeds, while total underwriting and issuer expenses for public utility equity offerings represent at least four to five percent of the amount of the proceeds. In addition, the finance literature supports the conclusion that the cost associated with the decline in stock price at the announcement date represents approximately two to three percent as a result of a large public utility equity issue.

V. Time Pattern Of Flotation Cost Recovery

Although flotation costs are incurred only at the time a firm issues new securities, there is no reason why an issuing firm ought to recognize the expense only in the current period. In fact, if assets purchased with the proceeds of a security issue produce revenues over many years, a sound argument can be made in favor of recognizing flotation expenses over a reasonably lengthy period of time. Such recognition is certainly consistent with the generally accepted accounting principle that the time pattern of expenses match the time pattern of revenues, and it is also consistent with the normal treatment of debt flotation expenses in both regulated and unregulated industries.

In the context of a regulated firm, it should be noted that there are many possible time patterns for the recovery of flotation expenses. However, if it is felt that flotation expenses are most appropriately recovered over a period of years, then it should be recognized that investors must also be compensated for the passage of time. That is to say, the value of an investor's capital will be reduced if the expenses are merely distributed over time, without any allowance for the time value of money.

VI. Accounting For Flotation Cost In A Regulatory Setting

In a regulatory setting, a firm's revenue requirements are determined by the equation:

Revenue Requirement = Total Expenses + Allowed Rate of Return x Rate Base

Thus, there are three ways in which an issuing firm can account for and recover its flotation expenses: (1) treat flotation expenses as a current expense and recover them immediately; (2) include flotation expenses in rate base and recover them over time; and (3) adjust the allowed rate of return upward and again recover flotation expenses over time. Before considering methods currently being used to recover flotation expenses in a regulatory setting, I shall briefly consider the advantages and disadvantages of these three basic recovery methods.

Expenses. Treating flotation costs as a current expense has several advantages. Because it allows for recovery at the time the expense occurs, it is not necessary to compute amortized balances over time and to debate which interest rate should be applied to these balances. A firm's stockholders are treated fairly, and so are the firm's customers, because they pay neither more nor less than the actual flotation expense. Since flotation costs are relatively small compared to the total revenue requirement, treatment as a current expense does not cause unusual rate hikes in the year of flotation, as would the introduction of a large generating plant in a state that does not allow Construction Work in Progress in rate base.

On the other hand, there are two major disadvantages of treating flotation costs as a current expense. First, since the asset purchased with the acquired funds will likely generate revenues for many years into the future, it seems unfair that current ratepayers should bear the full cost of issuing new securities, when future ratepayers share in the benefits. Second, this method requires an estimate of the underpricing effect on each security issue. Given the difficulties involved in measuring the extent of underpricing, it may be more accurate to estimate the average underpricing allowance for many securities than to estimate the exact figure for one security.

Rate Base. In an article in *Public Utilities Fortnightly*, Bierman and Hass [5] recommend that flotation costs be treated as an intangible asset that is included in a firm's rate base along with the assets acquired with the stock proceeds. This approach has many advantages. For ratepayers, it provides a better match between benefits and expenses: the future ratepayers who benefit from the financing costs contribute the revenues to recover these costs. For investors, if the allowed rate of return is equal to the investors' required rate of return, it is also theoretically fair since they are compensated for the opportunity cost of their investment (including both the time value of money and the investment risk).

Despite the compelling advantages of this method of cost recovery, there are several disadvantages that probably explain why it has not been used in practice. First, a firm will only recover the proper amount for flotation expenses if the rate base is multiplied by the appropriate cost of capital. To the extent that a commission under or over estimates the cost of capital, a firm will under or over recover its flotation expenses. Second, it is may be both legally and psychologically difficult for commissioners to include an intangible asset in a firm's rate base. According to established legal doctrine, assets are to be included in rate base only if they are "used and useful" in the public service. It is unclear whether intangible assets such as flotation expenses meet this criterion.

Rate of Return. The prevailing practice among state regulators is to treat flotation expenses as an additional element of a firm's cost of capital or allowed rate of return. This method is similar to the second method above (treatment in rate base) in that some part of the initial flotation cost is amortized over time. However, it has a disadvantage not shared by the rate base method. If flotation cost is included in rate base, it is fairly easy to keep track of the flotation cost on each new equity issue and see how it is recovered over time. Using the rate of return method, it is not possible to track the flotation cost for specific issues because the flotation cost for a specific issue is never recorded. Thus, it is not clear to participants whether a current allowance is meant to recover (1) flotation costs actually incurred in a test period, (2) expected future flotation costs, or (3) past flotation costs. This confusion never arises in the treatment of debt flotation costs. Because the exact costs are recorded and explicitly amortized over time, participants recognize that current allowances for debt flotation costs are meant to recover some fraction of the flotation costs on all past debt issues.

VII. Existing Regulatory Methods

Although most state commissions prefer to let a regulated firm recover flotation expenses through an adjustment to the allowed rate of return, there is considerable controversy about the magnitude of the required adjustment. The following are some of the most frequently asked questions: (1) Should an adjustment to the allowed return be made every year, or should the adjustment be made only in those years in which new equity is raised? (2) Should an adjusted rate of return be applied to the entire rate base, or should it be applied only to that portion of the rate base financed with paid-in capital (as opposed to retained earnings)? (3) What is the appropriate formula for adjusting the rate of return?

This section reviews several methods of allowing for flotation cost recovery. Since the regulatory methods of allowing for recovery of debt flotation costs is well known and widely accepted, I will begin my discussion of flotation cost recovery procedures by describing the widely accepted procedure of allowing for debt flotation cost recovery.

Debt Flotation Costs

Regulators uniformly recognize that companies incur flotation costs when they issue debt securities. They typically allow recovery of debt flotation costs by making an adjustment to both the cost of debt and the rate base (see Brigham [6]). Assume that: (1) a regulated company issues $100 million in bonds that mature in 10 years; (2) the interest rate on these bonds is seven percent; and (3) flotation costs represent four percent of the amount of the proceeds. Then the cost of debt for regulatory purposes will generally be calculated as follows:

$$\begin{aligned}\text{Cost of Debt} &= \frac{\text{Interest expense} + \text{Amortization of flotation costs}}{\text{Principal value - Unamortized flotation costs}}\\ &= \frac{\$7{,}000{,}000 + \$400{,}000}{\$100{,}000{,}000 - \$4{,}000{,}000}\\ &= 7.71\%\end{aligned}$$

Thus, current regulatory practice requires that the cost of debt be adjusted upward by approximately 71 basis points, in this example, to allow for the recovery of debt flotation costs. This example does not include losses on reacquisition of debt. The flotation cost allowance would increase if losses on reacquisition of debt were included.

The logic behind the traditional method of allowing for recovery of debt flotation costs is simple. Although the company has issued $100 million in bonds, it can only invest $96 million in rate base because flotation costs have reduced the amount of funds received by $4 million. If the company is not allowed to earn a 71 basis point higher rate of return on the $96 million invested in rate base, it will not generate sufficient cash flow to pay the seven percent interest on the $100 million in bonds it has issued. Thus, proper regulatory treatment is to increase the required rate of return on debt by 71 basis points.

Equity Flotation Costs

The finance literature discusses several methods of recovering equity flotation costs. Since each method stems from a specific model, (i. e., set of assumptions) of a firm and its cash flows, I will highlight the assumptions that distinguish one method from another.

Arzac and Marcus. Arzac and Marcus [2] study the proper flotation cost adjustment formula for a firm that makes continuous use of retained earnings and external equity financing and maintains a constant capital structure (debt/equity ratio). They assume at the outset that underwriting expenses and underpricing apply only to new equity obtained from external sources. They also assume that a firm has previously recovered all underwriting expenses, issuer expenses, and underpricing associated with previous issues of new equity.

To discuss and compare various equity flotation cost adjustment formulas, Arzac and Marcus make use of the following notation:

k	=	an investors' required return on equity
r	=	a utility's allowed return on equity base
S	=	value of equity in the absence of flotation costs
S_f	=	value of equity net of flotation costs
K_t	=	equity base at time t
E_t	=	total earnings in year t
D_t	=	total cash dividends at time t
b	=	$(E_t - D_t) \div E_t$ = retention rate, expressed as a fraction of earnings
h	=	new equity issues, expressed as a fraction of earnings
m	=	equity investment rate, expressed as a fraction of earnings, $m = b + h < 1$
f	=	flotation costs, expressed as a fraction of the value of an issue.

Because of flotation costs, Arzac and Marcus assume that a firm must issue a greater amount of external equity each year than it actually needs. In terms of the above notation, a firm issues $hE_t \div (1\text{-}f)$ to obtain hE_t in external equity funding. Thus, each year a firm loses:

Equation 3

$$L = \frac{hE_t}{1-f} - hE_t = \frac{f}{1-f} \times hE_t$$

due to flotation expenses. The present value, V, of all future flotation expenses is:

Equation 4

$$V = \sum_{t=1}^{\infty} \frac{fhE_t}{(1-f)(1+k)^t} = \frac{fh}{1-f} \times \frac{rK_0}{k-mr}$$

To avoid diluting the value of the initial stockholder's equity, a regulatory authority needs to find the value of r, a firm's allowed return on equity base, that equates the value of equity net of flotation costs to the initial equity base ($S_f = K_0$). Since the value of equity net of flotation costs equals the value of equity in the absence of flotation costs minus the present value of flotation costs, a regulatory authority needs to find that value of *r* that solves the following equation:

$$S_f = S - L.$$

This value is:

Equation 5

$$r = \frac{k}{1 - \frac{fh}{1-f}}$$

To illustrate the Arzac-Marcus approach to adjusting the allowed return on equity for the effect of flotation costs, suppose that the cost of equity in the absence of flotation costs is 12 percent. Furthermore, assume that a firm obtains external equity financing each year equal to 10 percent of its earnings and that flotation expenses equal 5 percent of the value of each issue. Then, according to Arzac and Marcus, the allowed return on equity should be:

$$r = \frac{.12}{1 - \frac{(.05).(.1)}{.95}} = .1206 = 12.06\%$$

<u>Summary</u>. With respect to the three questions raised at the beginning of this section, it is evident that Arzac and Marcus believe the flotation cost adjustment should be applied each year, since continuous external equity financing is a fundamental assumption of their model. They also believe that the adjusted rate of return should be applied to the entire equity-financed portion of the rate base because their model is based on the assumption that the flotation cost adjustment mechanism will be applied to the entire equity financed portion of the rate base. Finally, Arzac and Marcus recommend a flotation cost adjustment formula, Equation (3), that implicitly excludes recovery of financing costs associated with financing in previous periods and includes only an allowance for the fraction of equity financing obtained from external sources.

<u>Patterson</u>. The Arzac-Marcus flotation cost adjustment formula is significantly different from the conventional approach (found in many introductory textbooks) which recommends the adjustment equation:

Equation 6

$$r = \frac{D_t}{P_{t-1}(1-f)} + g$$

where P_{t-1} is the stock price in the previous period and g is the expected dividend growth rate. Patterson [18] compares the Arzac-Marcus adjustment formula to the conventional approach and reaches the conclusion that the Arzac-Marcus formula effectively expenses issuance costs as they are incurred, while the conventional approach effectively amortizes them over an assumed infinite life of the equity issue. Thus, the conventional formula is similar to the formula for the recovery of debt flotation costs: it is not meant to compensate investors for the flotation costs of future issues, but instead is meant to compensate investors for the flotation costs of previous issues. Patterson argues that the conventional approach is more appropriate for rate making purposes because the plant purchased with external equity funds will yield benefits over many future periods.

Illustration. To illustrate the Patterson approach to flotation cost recovery, assume that a newly organized utility sells an initial issue of stock for $100 per share, and that the utility plans to finance all new investments with retained earnings. Assume also that: (1) the initial dividend per share is six dollars; (2) the expected long-run dividend growth rate is six percent; (3) the flotation cost is five percent of the amount of the proceeds; and (4) the payout ratio is 51.28 percent. Then, the investor's required rate of return on equity is [k = (D/P) + g = 6 percent + 6 percent = 12 percent]; and the flotation-cost-adjusted cost of equity is [6 percent (1/.95) + 6 percent = 12.316 percent].

The effects of the Patterson adjustment formula on the utility's rate base, dividends, earnings, and stock price are shown in Table 3. We see that the Patterson formula allows earnings and dividends to grow at the expected six percent rate. We also see that the present value of expected future dividends, $100, is just sufficient to induce investors to part with their money. If the present value of expected future dividends were less than $100, investors would not have been willing to invest $100 in the firm. Furthermore, the present value of future dividends will only equal $100 if the firm is allowed to earn the 12.316 percent flotation-cost-adjusted cost of equity on its entire rate base.

Summary. Patterson's opinions on the three issues raised in this section are in stark contrast to those of Arzac and Marcus. He believes that: (1) a flotation cost adjustment should be applied in every year, regardless of whether a firm issues any new equity in each year; (2) a flotation cost adjustment should be applied to the entire equity-financed portion of the rate base, including that portion financed by retained earnings; and (3) the rate of return adjustment formula should allow a firm to recover an appropriate fraction of all previous flotation expenses.

VIII. Conclusion

Having reviewed the literature and analyzed flotation cost issues, I conclude that:

Definition of Flotation Cost: A regulated firm should be allowed to recover both the total underwriting and issuance expenses associated with issuing securities and the cost of market pressure.

Time Pattern of Flotation Cost Recovery. Shareholders are indifferent between the alternatives of immediate recovery of flotation costs and recovery over time, as long as they are fairly compensated for the opportunity cost of their money. This opportunity cost must include both the time value of money and a risk premium for equity investments of this nature.

Regulatory Recovery of Flotation Costs. The Patterson approach to recovering flotation costs is the only rate-of-return-adjustment approach that meets the *Hope* case criterion that a regulated company's revenues must be sufficient to allow the company an opportunity to recover all prudently incurred expenses, including the cost of capital. The Patterson approach is also the only rate-of-return-adjustment approach that provides an incentive for investors to invest in the regulated company.

Implementation of a Flotation Cost Adjustment. As noted earlier, prevailing regulatory practice seems to be to allow the recovery of flotation costs through an adjustment to the required rate of return. My review of the literature on this subject indicates that there are at least two recommended methods of making this adjustment: the Patterson approach and the Arzac-Marcus approach. The Patterson approach assumes that a firm's flotation expenses on new equity issues are treated in the same manner as flotation expenses on new bond issues, i. e., they are amortized over future time periods. If this assumption is true (and I believe it is), then the flotation cost adjustment should be applied to a firm's entire equity base, including retained earnings. In practical terms, the Patterson approach produces an increase in a firm's cost of equity of approximately thirty basis points. The Arzac-Marcus approach assumes that flotation costs on new equity issues are recovered entirely in the year in which the securities are sold. Under the Arzac-Marcus assumption, a firm should not be allowed any adjustments for flotation costs associated with previous flotations. Instead, a firm should be allowed only an adjustment on future security sales as they occur. Under reasonable assumptions about the rate of new equity sales, this method produces an increase in the cost of equity of approximately six basis points. Since the Arzac-Marcus approach does not allow the company to recover the entire amount of its flotation cost, I recommend that this approach be rejected and the Patterson approach be accepted.

BIBLIOGRAPHY

1. Armknecht, Raymond, Fred Grygiel and Patrick Hess, “Market Pressure: The Sales of New Common Equity and Rate of Return Regulation, “Proceedings of the Business and Economic Statistics Section of the American Statistical Association, 1974, pp. 80—91.
2. Arzac, E. R., and M. Marcus, “Flotation Cost Allowance in Rate of Return Regulation: A Note,” *Journal of Finance*, December 1981, pp. 1199—1202.
3. Barclay, M. J. and R. H. Litzenberger, 1988, “Announcement Effects of New Equity Issues and the Use of Intraday Price Data,” *Journal of Financial Economics* 21, 71—99.
4. Bhagat, S. and P. A. Frost, 1986, “Issuing Costs to Existing Shareholders in Competitive and Negotiated Underwritten Public Utility Equity Offerings,” *Journal of Financial Economics* 15, 233—59.
5. Bierman, H., and J. E. Hass, “Equity Flotation Cost Adjustments in Utilities’ Cost of Service,” *Public Utilities Fortnightly*, March 1, 1983, pp.46—49 .
6. Bowyer, Jr., John W., and Jess B. Yawitz, “The Effect of New Equity Issues on Utility Stock Prices,” *Pubic Utilities Fortnightly*, May 22, 1980.
7. Brigham, Eugene F., Dana Aberwald, and Louis C. Gapenski, “Common Equity Flotation Costs and Rate Making,” *Public Utilities Fortnightly*, May 2, 1985, pp. 28—26.
8. Calomiris, C. W. and D. M. G Raff, 1995, “The Evolution of Market Structure, Information, and Spreads in American Investment Banking,” in M. B. Bordo and R. Sylla, eds., *Anglo-American Finance: Financial Markets and Institutions in 20th Century North America and the U. K.* (Business One-Irwin Homewood, IL), 103—60.
9. Dunbar, C. G., 1995, “The Use of Warrants as Underwriter Compensation in Initial Public Offerings,” *Journal of Financial Economics* 38, 59—78.
10. Evans, Robert E., “On the Existence, Measurement, and Economic Significance of Market Pressure in the Pricing of New Equity Shares,” unpublished dissertation, University of Wisconsin, 1978.
11. Howe, K. M., “Flotation Cost Allowance in Rate of Return Regulation: Comment,” *Journal of Finance*, March 1984, pp. 289—290.
12. Howe, K. M., “Flotation Cost Allowance for the Regulated Firm: A Comparison of Alternatives,” unpublished working paper, School of Business, Iowa State University.
13. Ibbotson, R. C., “Price Performance of Common Stock New Issues,” *Journal of Financial Economics*, 1975, pp. 235—272.
14. Lee, Inmoo, Scott Lochhead, Jay Ritter, and Quanshui Zhao, “The Costs of Raising Capital,” *The Journal of Financial Research*, Vol XIX No 1 (Spring 1996), 59—74
15. Logue, D. E., “On the Pricing of Unseasoned Equity Offerings: 1965—1969,” *Journal of Financial and Quantitative Analysis*, January 1973, pp. 91—103.
16. McDonald, J. G. and A. K. Fisher, “New Issue Stock Price Behavior,” *Journal of Finance*, March 1972, pp. 97—102.
17. Mikkelson, Wayne H. and M. Megan Partch, “Valuation Effects of Security Offerings and the Issuance Process,” *Journal of Financial Economics* 15 (1986), pp. 31-60.
18. Patterson, C. S., “Flotation Cost Allowance in Rate of Return Regulation: Comment,” *Journal of Finance*, September 1983, pp. 1335—1338.
19. Pettway, R. H., “The Effects of New Equity Sales Upon Utility Share Prices,” *Public Utilities Fortnightly*, May 10, 1984, pp. 35—39.
20. Reilly, F. K. and K. Hatfield, “Investor Experience with New Stock Issues,” *Financial Analysts’ Journal*, September--October 1969, pp. 73—80.
21. Richter, P. H., “The Ever Present Need for an Underpricing Allowance,” *Public Utilities Fortnightly*, February 18, 1982, pp. 58—61.

22. Scholes, M., “The Market for New Securities: Substitution versus Price Pressure and the Effects of Information on Share Prices,” *Journal of Business*, April 1972, pp. 179—211.

23. Securities and Exchange Commission, Report of Special Study on Securities Markets, U. S. Government Printing Office, Washington, D. C. 1963.

24. Smith, Clifford W. Jr., “Alternative Methods for Raising Capital,” *Journal of Financial Economics* 5 (1977) 273-307.

Table 1

Direct Costs as a Percentage of Gross Proceeds
for Equity (IPOs and SEOs) and Straight and Convertible Bonds
Offered by Domestic Operating Companies 1990—1994[7]

Equities

		IPOs				SEOs			
Line No.	Proceeds ($ in millions)	No. of Issues	Gross Spreads	Other Direct Expenses	Total Direct Costs	No. of Issues	Gross Spreads	Other Direct Expenses	Total Direct Costs
1	2-9.99	337	9.05%	7.91%	16.96%	167	7.72%	5.56%	13.28%
2	10-19.99	389	7.24%	4.39%	11.63%	310	6.23%	2.49%	8.72%
3	20-39.99	533	7.01%	2.69%	9.70%	425	5.60%	1.33%	6.93%
4	40-59.99	215	6.96%	1.76%	8.72%	261	5.05%	0.82%	5.87%
5	60-79.99	79	6.74%	1.46%	8.20%	143	4.57%	0.61%	5.18%
6	80-99.99	51	6.47%	1.44%	7.91%	71	4.25%	0.48%	4.73%
7	100-199.99	106	6.03%	1.03%	7.06%	152	3.85%	0.37%	4.22%
8	200-499.99	47	5.67%	0.86%	6.53%	55	3.26%	0.21%	3.47%
9	500 and up	10	5.21%	0.51%	5.72%	9	3.03%	0.12%	3.15%
10	**Total/Average**	**1,767**	**7.31%**	**3.69%**	**11.00%**	**1,593**	**5.44%**	**1.67%**	**7.11%**

Bonds

		Convertible Bonds				Straight Bonds			
Line No.	Proceeds ($ in millions)	No. of Issues	Gross Spreads	Other Direct Expenses	Total Direct Costs	No. of Issues	Gross Spreads	Other Direct Expenses	Total Direct Costs
1	2-9.99	4	6.07%	2.68%	8.75%	32	2.07%	2.32%	4.39%
2	10-19.99	14	5.48%	3.18%	8.66%	78	1.36%	1.40%	2.76%
3	20-39.99	18	4.16%	1.95%	6.11%	89	1.54%	0.88%	2.42%
4	40-59.99	28	3.26%	1.04%	4.30%	90	0.72%	0.60%	1.32%
5	60-79.99	47	2.64%	0.59%	3.23%	92	1.76%	0.58%	2.34%
6	80-99.99	13	2.43%	0.61%	3.04%	112	1.55%	0.61%	2.16%
7	100-199.99	57	2.34%	0.42%	2.76%	409	1.77%	0.54%	2.31%
8	200-499.99	27	1.99%	0.19%	2.18%	170	1.79%	0.40%	2.19%
9	500 and up	3	2.00%	0.09%	2.09%	20	1.39%	0.25%	1.64%
10	**Total/Average**	**211**	**2.92%**	**0.87%**	**3.79%**	**1,092**	**1.62%**	**0.62%**	**2.24%**

[7] Inmoo Lee, Scott Lochhead, Jay Ritter, and Quanshui Zhao, "The Costs of Raising Capital," *Journal of Financial Research* Vol 19 No 1 (Spring 1996) pp. 59-74.

Notes:

Closed-end funds and unit offerings are excluded from the sample. Rights offerings for SEOs are also excluded. Bond offerings do not include securities backed by mortgages and issues by Federal agencies. Only firm commitment offerings and non-shelf-registered offerings are included.
Gross Spreads as a percentage of total proceeds, including management fee, underwriting fee, and selling concession.
Other Direct Expenses as a percentage of total proceeds, including management fee, underwriting fee, and selling concession.
Total Direct Costs as a percentage of total proceeds (total direct costs are the sum of gross spreads and other direct expenses).

Table 2
Direct Costs of Raising Capital 1990—1994
Utility versus Non-Utility Companies[8]

Equities

	Non-Utilities	IPOs			SEOs		
Line No.	Proceeds ($ in millions)	No. of Issues	Gross Spreads	Total Direct Costs	No. Of Issues	Gross Spreads	Total Direct Costs
1	2-9.99	332	9.04%	16.97%	154	7.91%	13.76%
2	10-19.99	388	7.24%	11.64%	278	6.42%	9.01%
3	20-39.99	528	7.01%	9.70%	399	5.70%	7.07%
4	40-59.99	214	6.96%	8.71%	240	5.17%	6.02%
5	60-79.99	78	6.74%	8.21%	131	4.68%	5.31%
6	80-99.99	47	6.46%	7.88%	60	4.35%	4.84%
7	100-199.99	101	6.01%	7.01%	137	3.97%	4.36%
8	200-499.99	44	5.65%	6.49%	50	3.27%	3.48%
9	500 and up	10	5.21%	5.72%	8	3.12%	3.25%
10	**Total/Average**	1,742	7.31%	11.01%	1,457	5.57%	7.32%
11	**Utilities Only**						
12	2-9.99	5	9.40%	16.54%	13	5.41%	7.68%
13	10-19.99	1	7.00%	8.77%	32	4.59%	6.21%
14	20-39.99	5	7.00%	9.86%	26	4.17%	4.96%
15	40-59.99	1	6.98%	11.55%	21	3.69%	4.12%
16	60-79.99	1	6.50%	7.55%	12	3.39%	3.72%
17	80-99.99	4	6.57%	8.24%	11	3.68%	4.11%
18	100-199.99	5	6.45%	7.96%	15	2.83%	2.98%
19	200-499.99	3	5.88%	7.00%	5	3.19%	3.48%
20	500 and up	0			1	2.25%	2.31%
21	**Total/Average**	25	7.15%	10.14%	136	4.01%	4.92%

[8] Lee *et al, op. cit.*

Table 2 (continued)
Direct Costs of Raising Capital 1990—1994
Utility versus Non-Utility Companies[9]

Bonds

	Non- Utilities	Convertible Bonds			Straight Bonds		
Line No.	Proceeds ($ in millions)	No. of Issues	Gross Spreads	Total Direct Costs	No. of Issues	Gross Spreads	Total Direct Costs
1	2-9.99	4	6.07%	8.75%	29	2.07%	4.53%
2	10-19.99	12	5.54%	8.65%	47	1.70%	3.28%
3	20-39.99	16	4.20%	6.23%	63	1.59%	2.52%
4	40-59.99	28	3.26%	4.30%	76	0.73%	1.37%
5	60-79.99	47	2.64%	3.23%	84	1.84%	2.44%
6	80-99.99	12	2.54%	3.19%	104	1.61%	2.25%
7	100-199.99	55	2.34%	2.77%	381	1.83%	2.38%
8	200-499.99	26	1.97%	2.16%	154	1.87%	2.27%
9	500 and up	3	2.00%	2.09%	19	1.28%	1.53%
10	**Total/Average**	203	2.90%	3.75%	957	1.70%	2.34%
11	**Utilities Only**						
12	2-9.99	0			3	2.00%	3.28%
13	10-19.99	2	5.13%	8.72%	31	0.86%	1.35%
14	20-39.99	2	3.88%	5.18%	26	1.40%	2.06%
15	40-59.99	0			14	0.63%	1.10%
16	60-79.99	0			8	0.87%	1.13%
17	80-99.99	1	1.13%	1.34%	8	0.71%	0.98%
18	100-199.99	2	2.50%	2.74%	28	1.06%	1.42%
19	200-499.99	1	2.50%	2.65%	16	1.00%	1.40%
20	500 and up	0			1	3.50%	na[10]
21	**Total/Average**	8	3.33%	4.66%	135	1.04%	1.47%

Notes:
Total proceeds raised in the United States, excluding proceeds from the exercise of over allotment options.
Gross spreads as a percentage of total proceeds (including management fee, underwriting fee, and selling concession).
Other direct expenses as a percentage of total proceeds (including registration fee and printing, legal, and auditing costs).

[9] Lee *et al*, *op. cit.*

[10] Not available because of missing data on other direct expenses.

Table 3
Illustration of Patterson Approach to Flotation Cost Recovery

Line No.	Time Period	Rate Base	Earnings @ 12.32%	Earnings @ 12.00%	Dividends	Amortization Initial FC
1	0	95.00				
2	1	100.70	11.70	11.40	6.00	0.3000
3	2	106.74	12.40	12.08	6.36	0.3180
4	3	113.15	13.15	12.81	6.74	0.3371
5	4	119.94	13.93	13.58	7.15	0.3573
6	5	127.13	14.77	14.39	7.57	0.3787
7	6	134.76	15.66	15.26	8.03	0.4015
8	7	142.84	16.60	16.17	8.51	0.4256
9	8	151.42	17.59	17.14	9.02	0.4511
10	9	160.50	18.65	18.17	9.56	0.4782
11	10	170.13	19.77	19.26	10.14	0.5068
12	11	180.34	20.95	20.42	10.75	0.5373
13	12	191.16	22.21	21.64	11.39	0.5695
14	13	202.63	23.54	22.94	12.07	0.6037
15	14	214.79	24.96	24.32	12.80	0.6399
16	15	227.67	26.45	25.77	13.57	0.6783
17	16	241.33	28.04	27.32	14.38	0.7190
18	17	255.81	29.72	28.96	15.24	0.7621
19	18	271.16	31.51	30.70	16.16	0.8078
20	19	287.43	33.40	32.54	17.13	0.8563
21	20	304.68	35.40	34.49	18.15	0.9077
22	21	322.96	37.52	36.56	19.24	0.9621
23	22	342.34	39.77	38.76	20.40	1.0199
24	23	362.88	42.16	41.08	21.62	1.0811
25	24	384.65	44.69	43.55	22.92	1.1459
26	25	407.73	47.37	46.16	24.29	1.2147
27	26	432.19	50.21	48.93	25.75	1.2876
28	27	458.12	53.23	51.86	27.30	1.3648
29	28	485.61	56.42	54.97	28.93	1.4467
30	29	514.75	59.81	58.27	30.67	1.5335
31	30	545.63	63.40	61.77	32.51	1.6255
32	Present Value@12%		195.00	190.00	100.00	5.00

APPENDIX 4
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.

<u>Electric Company Ex Ante Risk Premium Analysis</u>. For my ex ante risk premium electric proxy group DCF analysis, I begin with the Moody's group of 24 electric utilities shown in Table 1. I use the Moody's group of electric utilities because they are a widely followed group of electric utilities, and use of this constant group greatly simplified 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 exhibit in my direct testimony displays the average DCF estimated cost of equity on an investment in the portfolio of electric utilities 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 performed 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 made 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:

$$RP_{PROXY} = 8.21 - .546 \times I_A.$$

$$= (11.07) \qquad (-4.89)$$ [11]

Using the forecast 6.54 percent yield to maturity on A-rated utility bonds, the regression equation produces an ex ante risk premium based on the electric proxy group equal to 4.64 percent (8.21 – .546 x 6.54 = 4.64).

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 yield to maturity on A-rated utility bonds. The forecast yield on A-rated utility bonds is 6.54percent. As noted above, my analyses produce an estimated risk premium over the

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

yield on A-rated utility bonds equal to 4.64 percent. Adding an estimated risk premium of 4.64 percent to the 6.54 percent average yield to maturity on A-rated utility bonds produces a cost of equity estimate of 11.2 percent for the electric company proxy group using the ex ante risk premium method.

TABLE 1
MOODY'S ELECTRIC UTILITIES

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.

APPENDIX 5
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 in the schedules are the January values of the respective indices.

Calculation of Stock and Bond Returns

Sample calculation of "Stock Return" column:

$$\text{Stock Return (2009)} = \left[\frac{\text{Stock Price (2010) - Stock Price (2009) + Dividend (2009)}}{\text{Stock Price (2009)}}\right]$$

where Dividend (2009) = Stock Price (2009) x Stock Div. Yield (2009)

Sample calculation of "Bond Return" column:

$$\text{Bond Return (2009)} = \left[\frac{\text{Bond Price (2010) - Bond Price (2009) + Interest (2009)}}{\text{Bond Price (2009)}}\right]$$

where Interest = $4.00.