DIRECT TESTIMONY

OF

JANIS FREETLY

FINANCE DEPARTMENT

FINANCIAL ANALYSIS DIVISION

ILLINOIS COMMERCE COMMISSION

UNITED CITIES GAS COMPANY
A DIVISION OF ATMOS ENERGY CORPORATION

PROPOSED GENERAL INCREASE IN GAS RATES

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Introduction

Q. Please state your name and business address.

A. My name is Janis Freetly. My business address is 527 East Capitol Avenue, P.O. Box 19280, Springfield, Illinois 62794-9280.

Q. What is your current position with the Illinois Commerce Commission (ICC)?

A. I am currently employed as a Financial Analyst in the Finance Department of the Financial Analysis Division.

Q. Please describe your qualifications and background.

A. In May of 1995, I earned a Bachelor of Business degree in Marketing from Western Illinois University. I received a Master of Business Administration degree, with a concentration in Finance, from Western Illinois University in May of 1998. I have been employed by the ICC in my present position since September of 1998. I have previously testified before the Commission on various financial issues.

Q. What is the purpose of your testimony in this proceeding?

A. The purpose of my testimony is to present the overall cost of capital and to recommend a fair rate of return on rate base for the utility operations of United Cities Gas Company, a division of Atmos Energy Corporation (Atmos or the

Company). I will also respond to the direct testimony of Company witness, Dr. Donald A. Murry.

Cost of Capital

Q. Please summarize your cost of capital findings.

A. United Cities Gas Company is a division of Atmos Energy Corporation; it is not a stand alone company with its own capital structure. Therefore, the overall cost of capital should be that of Atmos, to which I will be referring throughout this testimony. The overall cost of capital for Atmos ranges from 9.07% to 9.30%, with a midpoint estimate of 9.18%, as shown on Schedule 12.0.

Q. What is the overall cost of capital for a public utility?

A. The overall cost of capital is the sum of the component costs of the capital structure (i.e., debt, preferred stock, and common equity) after each is weighted by its proportion to total capital. It represents the rate of return the utility needs to earn on its assets to satisfy contractual obligations to, or the market requirements of, its investors.

Q. Why is it important to determine a reasonable cost of capital for a public utility?

A. A primary objective of regulation is to minimize the cost of reliable service to ratepayers while allowing public utilities to earn a fair and reasonable rate of return. When a public utility is authorized a rate of return on rate base equal to a reasonable cost of capital, the interests of ratepayers and investors are properly balanced. If the authorized rate of return is greater than a reasonable cost of capital, ratepayers are burdened with excessive rates. Conversely, if the authorized rate of return is less than a reasonable cost of capital, the utility may be unable to raise capital at a reasonable cost and ultimately may be unable to raise sufficient capital to meet demands for service. Therefore, the interests of ratepayers and investors are best served when a utility's allowed rate of return is set equal to a reasonable overall cost of capital.

Capital Structure

Q. What capital structure did the Company propose for setting rates?

A. The Company proposes to use a historical test year for the year ended September 30, 1999 for determining the return on rate base. In contrast, Atmos proposes to use a forecasted September 30, 2000 capital structure, as is shown on Schedule 1.0. On Schedule D-1, Atmos mistakenly labels the September 30, 2000 capital structure as September 30, 1999.

Q. Is the Company's proposed capital structure appropriate for determining Atmos' overall rate of return?

A. Since this proceeding will set rates for future service, the capital structure should reflect the best available estimates of its components for the period during which those rates will remain effective. The capital structure should reflect all known and measurable changes, including security issuances and retirements. The capital structure proposed by Atmos is based on forecasted data for the year ended September 30, 2000. The balances suggested by the Company are based on a forecast that it did not adequately support. Moreover, the Company's forecast does not reflect the effect that its $385 million debt-financed acquisition of Louisiana Gas Service Company will have on its capital structure. Therefore the Company's proposed capital structure should not be used in determining the overall rate of return.

Q. Does capital structure affect the overall cost of capital?

A. Yes. Financial theory suggests capital structure will affect the value of a firm and, therefore, its cost of capital, to the extent it affects the expected level of cash flows that accrue to third parties (i.e., other than debt and stock holders). Employing debt as a source of capital reduces a company's income taxes,[1] thereby reducing the

[1] The tax advantage debt has over equity at the corporate level is partially offset at the individual investor level. Debt investors receive returns largely in the form of current income (i.e., interest). In contrast, equity investors receive returns in the form of both current income (i.e., dividends) and capital appreciation

cost of capital. However, as reliance on debt as a source of capital increases, so does the probability of bankruptcy. As bankruptcy becomes more probable, expected payments to attorneys, trustees, accountants and other third parties increase. Simultaneously, the expected value of the income tax shield provided by debt financing declines. Beyond a certain point, a growing dependence on debt as a source of funds increases the overall cost of capital. Therefore, the Commission should not determine the overall rate of return from a utility's actual capital structure if it determines that capital structure adversely affects the overall cost of capital.

An optimal capital structure would minimize the cost associated with the capital a utility raises and maintain its financial integrity. Unfortunately, determining whether a capital structure is optimal remains problematic because (1) the cost of capital is a continuous function of the capital structure, rendering its precise measurement along each segment of the range of possible capital structures problematic; (2) the optimal capital structure is a function of operating risk, which is dynamic; and (3) the relative costs of the different types of capital vary with dynamic market conditions. Consequently, one should determine whether the capital structure is consistent with the financial strength necessary to access the capital markets under all conditions, and if so, whether the cost of that financial strength is reasonable.

Q. What capital structure do you recommend?

(i.e., capital gains). Taxes on capital gains are lower than taxes on interest and dividend income because capital gains tax rates are lower, and taxes on capital gains are deferred until realized.

A. For determining Atmos' return on rate base I recommend using an imputed capital structure. Because the Company's forecasted capital structure was inadequately supported, I began with the actual September 30, 1999 capital structure as reported by the Company on Revised Schedule D-1. I then adjusted the balance of long-term debt and common equity to eliminate the debt and equity of the non-utility subsidiaries of Atmos, based on the Company's response to Staff data requests FD-2.10, FD-2.15, and FD-4.01. Next, I added $385 million long-term debt to reflect the Company's intent to issue additional debt to acquire the Louisiana gas operations of Louisiana Gas Service Company and LGS Natural Gas Company from Citizens Utilities Company. This additional long-term debt resulted in a pro forma total debt to capitalization ratio of 73.23% and a pro forma common equity ratio of 26.77%.

I then compared these capitalization ratios to industry standards. For the four quarters ended March 2000, the weighted average common equity ratio for the gas distribution utilities on *Standard & Poor's Utility Compustat* equaled 49.66% with a standard deviation of 4.97%. Standard and Poor's categorizes debt securities on the basis of default risk. Although no formula exists for determining a debt rating, Standard & Poor's publishes benchmark values of various financial ratios according to business position rating and debt rating.[2] The Standard & Poor's benchmark values for gas distribution utilities that share Atmos' business position rating of "3" range from 47.5% to 53% for the A debt rating and 53% to 61% for the BBB debt rating.[3]

The pro forma common equity ratio that I computed for Atmos is below the *Utility Compustat* average for a gas distribution utility. The pro forma total debt ratio that I calculated is above the benchmark range for gas distribution utilities with debt ratings of A and BBB. The above suggests that this pro forma capital structure is not reasonable due to a very high total debt to capitalization ratio for Atmos.

Therefore, I imputed a capital structure consisting of 67% total debt and 33% common equity, as shown on Schedule 1.0. The September 30, 1999 pro forma capital structure does not reflect any additional increase in common equity from the retention of earnings or the issuance of stock pursuant to Atmos' Employee Stock Ownership Program. Moreover, the Company has represented that it does not expect its debt ration to exceed 67%; hence, I imputed the capital structure based on that representation. Although this indicates a relatively high degree of financial leverage for Atmos, if the resulting risk is not passed through to ratepayers in the form of higher costs of debt and equity, then it would be reasonable to use this capital structure to set rates in this proceeding. Therefore, my cost of capital recommendation assumes Atmos' new debt will be issued at interest rates commensurate with Atmos' current A- credit rating and my cost of equity

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[2] Standard & Poor's business position scores assess the qualitative attributes of a firm, with "1" being considered the lowest risk and "10" the highest risk.

recommendation will be based on Atmos' financial leverage before the issuance of the $385 million in debt.[4] Hence, Atmos' post-acquisition capital structure would not adversely affect its rate of return in this proceeding.

Q. How did you measure the balance of short-term debt?

A. I calculated twelve monthly averages from the monthly ending balances of short-term debt for the period from April 1999 through March 2000. I then averaged the twelve monthly average balances to arrive at the average balance of short-term debt outstanding over that period. Since short-term debt balances tend to fluctuate substantially during a year, any single balance might not be representative of the amount utilized throughout the year. I chose the April 1999 to March 2000 period because it is centered in time at September 30, 1999, the measurement date for the other components of the capital structure. Schedule 2.0 presents the calculation of the average balance of short-term debt.

Q. Why did you not subtract the monthly ending balances of construction-work-in-progress (CWIP) accruing an allowance for funds used during construction (AFUDC) from the corresponding monthly ending balances of short-term debt?

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[3] Standard & Poor's *Utilities & Perspectives,* June 21,1999, p. 3
[4] Standard & Poor's, *Utilities & Perspectives*, June 19, 2000, p. 11.

A. In response to Staff data request FD-1.05, the Company stated "The records of the Company do not provide actual monthly balances of CWIP accruing AFUDC." I made several attempts to follow-up with the Company to attain the monthly ending balances, but to no avail. Without the Company's input, I could not subtract the monthly ending balance of CWIP accruing AFUDC from the corresponding monthly ending balances of short-term debt. Therefore, I used only the actual monthly ending balances of short-term debt to compute the average balance of short-term debt outstanding.

Cost of Short-Term Debt

Q. What is the cost of short-term debt for Atmos?

A. Atmos issues short-term debt in the form of commercial paper and through committed and uncommitted credit facilities. Atmos' commercial paper was rated A-2 by Standard & Poor's and P-2 by Moody's.[5] The interest rate on commercial paper varies with grade and term to maturity. The Federal Reserve reports that the maturity of commercial paper averages thirty days.[6] Therefore, to estimate the cost of short-term debt, I converted the June 22, 2000, 6.83% discount rate on thirty-day,

[5] Standard & Poor's, Utilities and Perspectives, June 19, 2000, p.11; Mergent Bond Record, May 2000, p. 360.

[6] "About Commercial Paper and Rate Calculations," Federal Reserve Release, www.federalreserve.gov/Releases/CP/about.htm.

"A-2/P-2 nonfinancial" commercial paper into an annual yield of 6.93% using the following formula:[7]

$$Annual\ yield\ =\ \left(\frac{discount\ rate\ \times\left(\frac{days\ to\ maturity}{360}\right)}{1\ -\ discount\ rate\ \times\left(\frac{days\ to\ maturity}{360}\right)}\right)\times\left(\frac{365}{days\ to\ maturity}\right)$$

Q. Have the non-utility subsidiaries of Atmos caused the cost of short-term debt to increase?

A. In my judgement, they have not.

Q. How did you reach that conclusion?

A. First, I compared the financial performance of the consolidated operations of Atmos to the financial performance of the utility operations of Atmos. Over the 1998-1999 period, the financial ratios indicate that Atmos' financial performance would have been worse absent the non-utility subsidiaries, as shown on Schedule 3.0. Therefore, I found no evidence that Atmos' non-utility subsidiaries increased its cost of short-term debt.

Q. Are you aware of any means that would quantify the precise effect the non-utility subsidiaries have on Atmos' cost of short-term debt?

[7] "Commercial Paper," Federal Reserve Release, June 23, 2000,

A. No.

Cost of Long-Term Debt

Q. What is the embedded cost of long-term debt for Atmos?

A. The embedded cost of long-term debt for the utility operations of Atmos is 8.33%. This cost includes the additional $385 million in long-term debt, reflecting the June 20, 2000, 8.31% yield on A-rated public utility debt, as shown on Schedule 4.0.[8]

Q. Have the non-utility subsidiaries of Atmos increased the cost of long-term debt?

A. In my judgement, they have not.

Q. How did you reach that conclusion?

A. The ratio analysis that I described above indicated that Atmos' financial performance would have been worse absent the non-utility subsidiaries. Therefore, I found no evidence that Atmos' non-utility subsidiaries increased its cost of long-term debt.

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www.federalreserve.gov/Releases/CP/default.htm.

[8] Moody's Investors Service, *Long-Term Corporate Bond Yield Averages,* June 26, 2000, www.moodys.com/economics.nsf/web/ecoindyd?OpenDocument.

Cost of Common Equity

Q. How did you measure the investor required rate of return on common equity for Atmos?

A. I measured the investor required rate of return on common equity for Atmos with the discounted cash flow (DCF) and risk premium models. DCF and risk premium models cannot be applied directly to Atmos' gas utility operations because its common stock is not market-traded. Therefore, I applied those models to a sample of twelve gas distribution companies comparable in risk to Atmos' gas utility operations.

Comparable Sample

Q. How did you select a sample of public utilities comparable in risk to Atmos?

A. According to financial theory, the market-required rate of return on common equity is a function of operating and financial risk. Thus, the method used to select a sample should reflect both the operating and financial characteristics of a firm. I selected a sample with eight financial and operating ratios: (1) common equity; (2) cash flow to capitalization; (3) cash flow to debt; (4) expenditures to net plant; (5) fixed asset turnover; (6) funds flow interest coverage; (7) operating profit margin; and (8) operating revenue stability. The last ratio was measured with the coefficient of determination of a least-squares regression of the natural logarithm of the quarterly operating revenue data against time.[9] The operating revenue stability ratio was measured over the period 1995-1999. Data from the period 1998-1999 were averaged to normalize the remaining ratios.

I began with all market-traded electric, natural gas, and water companies on Standard & Poor's *Utility Compustat* tape. Among those utilities, 105 gas companies had sufficient data to calculate the financial and operating ratios. Next, I conducted a principal components analysis of the financial and operating ratios. Principal components constitute linear combinations of optimally-weighted variables which are uncorrelated with one another.[10,11] For each utility in the data base, the principal components analysis calculates values for each component, known as principal components scores, which have a mean of zero and a standard deviation of one. From the principal components analysis, I retained four components for risk analysis. Of the 22 gas utilities in the data base, I eliminated ten from the sample due to pending mergers. I then computed the average of the factor scores for the remaining twelve gas utilities. Next I compared the average factor scores for the twelve gas utilities with those of Atmos' gas utility to ascertain the comparability of the sample. Schedule 5.0 presents the four principal components for the remaining twelve gas utilities ("comparable sample").

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[9] Dummy variables were added to the regression model to incorporate seasonality.

[10] A principal component can be described mathematically as follows:

$$c_i = b_{i1} \times x_1 + b_{i2} \times x_2 + \ldots + b_{in} \times x_n$$

where c_i = the utility's score on principal component i;

b_{in} = the weight for ratio x_n to create component c_i; and

Q. Does the sample include any incremental risk or increased cost of capital which is the direct or indirect result of the affiliation of Atmos' public utility operations with unregulated or nonutility companies?

A. No. The operating and financial ratios from which the sample was constructed reflect only the utility operations of Atmos, not the operations of its non-utility subsidiaries.[12]

DCF Analysis

Q. Please describe DCF analysis.

A. DCF analysis is a market-based approach for establishing a security's value. This value reflects all relevant risks the market associates with the security. DCF analysis establishes a cost of common equity capital directly from investors' rate of return requirements.

According to DCF theory, a security price equals the present value of the cash flow investors expect it to generate. Specifically, the market value of common stock equals the cumulative value of the expected stream of future dividends after each is discounted by the investor required rate of return.

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x_n = the utility's value on variable n

[11] The variables are optimally weighted when the resulting principal components explain the maximum amount of variance in the data base.

[12] The ratios were computed using financial statements reflecting only the regulated utility operations of Atmos provided by the Company in response to Staff data request FD-2.05.

Q. Please describe the DCF model with which you measured the investor required rate of return on common equity.

A. As it applies to common stocks, DCF analysis is generally employed to determine appropriate stock prices given a specified discount rate. Since a DCF model incorporates time-sensitive valuation factors, it must correctly reflect the timing of the dividend payments that stock prices embody. Incorporating stock prices that the financial market sets on the basis of quarterly dividend payments into a model that ignores the time value of quarterly cash flows constitutes a misapplication of DCF analysis.

The companies in the sample pay dividends quarterly. Therefore, I applied a constant-growth DCF model that measures the annual required rate of return on common equity as follows:

$$k = \frac{\sum_{q=1}^{4} D_{0,q}(1+g)(1+k)^{1-[x+0.25(q-1)]}}{P} + g.$$

That model assumes dividends will grow at a constant rate, and the market value of common stock (i.e., stock price) equals the sum of the discounted value of each dividend. Schedule 6.0 describes the derivation of the model.

Q. How did you estimate the growth rate parameter?

A. Determining the market-required rate of return with the DCF methodology requires a growth rate that reflects the expectations of investors. Although the current market price reflects aggregate investor expectations, market-consensus expected growth rates cannot be measured directly. Therefore, I measured market-consensus expected growth indirectly with growth rates forecasted by securities analysts that are disseminated to investors.

I examined analysts' projected earnings growth rates in the May 18, 2000, edition of Institutional Brokers Estimate System (IBES) and data provided by Zacks Investment Research (Zacks) as of June 21, 2000. IBES and Zacks summarize and publish the earnings growth expectations of financial analysts employed by the research departments of investment brokerage firms. Both provide forward-looking estimates of expected earnings growth. Schedule 7.0 presents the analyst growth rate estimates for the companies in the comparable sample.

Q. How were these growth rates incorporated into your DCF analysis?

A. Since market-consensus expected growth is unobservable, any DCF estimate of the investor required rate of return includes an unknown degree of measurement error. To reflect that uncertainty, I grouped growth rate estimates based on the lower and higher observed mean growth rate of each company which ultimately leads to a range for the cost of common equity. The growth rate ranges for the companies in the sample are presented in Schedule 7.0.

Q. How did you measure the stock price?

A. For each company in the two samples, I measured its current stock price with its closing market price from June 20, 2000. Those stock prices are presented in Schedule 8.0. A current stock price reflects all information that is available and relevant to the market; thus, it represents the investors' assessment of the common stock's current value.

Since stock prices reflect the market's expectation of the cash flows the securities will produce and the rate at which those cash flows are discounted, an observed change in the market price does not necessarily indicate the required rate of return on common equity has changed. Rather, price changes may simply reflect investors' re-evaluation of the expected dividend growth rate. In addition, stock prices change with the approach of dividend payment dates. Consequently, when estimating the required return on common equity with the DCF model, analysts should measure the expected dividend yield and the corresponding expected growth rate concurrently. Using a historical stock price along with current growth expectations or combining an updated stock price with past growth expectations will likely produce an inaccurate estimate of the market-required rate of return on common equity.

Q. Please explain the significance of the column titled "Next Dividend Payment Date" shown on Schedule 8.0.

A. Estimating year-end dividend values requires measuring the length of time between each dividend payment date and the first anniversary of the stock observation date. For the first dividend payment, that length of time is measured from the "Next Dividend Payment Date." Subsequent dividend payments occur in quarterly intervals.

Q. How did you estimate the next four expected quarterly dividends?

A. Most utilities declare and pay the same dividend per share for four consecutive quarters before adjusting the rate. Therefore, I assumed the dividend rate will adjust during the same quarter it changed during the preceding year. If the utility did not change its dividend during the last year, I assumed the rate would change during the next quarter. The lower and higher expected growth rates were applied to the current dividend rate to estimate the expected dividend rate. Schedule 8.0 presents the current quarterly dividends. Schedule 9.0 presents the expected quarterly dividends.

Q. Based on your DCF analysis, what is the estimated required rate of return on common equity for the comparable sample?

A. The DCF analysis estimates of the required rate of return on common equity range from 11.58% to 12.04% for the comparable sample as shown on Schedule 10.0. Those estimates are derived from the growth rates from Schedule 7.0, the stock price and dividend payment dates from Schedule 8.0, and the expected quarterly dividends from Schedule 9.0.

Risk Premium Analysis

Q. Please describe the risk premium model.

A. The risk premium model is based on the theory that the market-required rate of return for a given security equals the risk-free rate of return plus a risk premium associated with that security. A risk premium represents the additional return investors expect in exchange for assuming the risk inherent in an investment. Mathematically, a risk premium equals the difference between the expected rate of return on a risk factor and the risk-free rate. If the risk of a security is measured relative to a portfolio, then multiplying that relative measure of risk and the portfolio's risk premium produces a security-specific risk premium for that risk factor.

The risk premium methodology is consistent with the theory that investors are risk-averse. That is, investors require higher returns to accept greater exposure to risk. Thus, if investors had an opportunity to purchase one of two securities with equal expected returns, they would purchase the security with less risk. Conversely, if investors had an opportunity to purchase one of two securities with equal risk, they would purchase the security with the higher expected return. In equilibrium, two securities with equal quantities of risk have equal required rates of return.

The Capital Asset Pricing Model (CAPM) is a one-factor risk premium model that mathematically depicts the relationship between risk and return as:

$$R_j = R_f + \beta_j \times (R_m - R_f)$$

where R_j ≡ the required rate of return for security j;

R_f ≡ the risk-free rate;

R_m ≡ the expected rate of return for the market portfolio; and

b_j ≡ the measure of market risk for security j.

In the CAPM, the risk factor is market risk which is defined as risk that cannot be eliminated through portfolio diversification. To implement the CAPM, one must estimate the risk-free rate of return, the expected rate of return on the market portfolio and a security or portfolio-specific measure of market risk.

Q. How did you measure market risk on a security-specific basis?

A. Beta is widely recognized by the financial community as a measure of risk in a portfolio context. When multiplied by the market risk premium, a security's beta produces a market risk premium specific to that security.

The beta for a security or portfolio of securities is estimated with the following model using an ordinary least-squares technique:

$$R_{j,t} - R_{f,t} = \alpha_j + \beta_j \times (R_{m,t} - R_{f,t}) + e_{j,t}$$

where $R_{j,t}$ ≡ the return on security *j* in period *t*;

$R_{f,t}$ ≡ the risk-free rate of return in period *t*;

$R_{m,t}$ ≡ the return on the market portfolio in period *t*;

a_j ≡ the intercept term for security *j*;

b_j ≡ beta, the measure of market risk for security *j*; and

$e_{j,t}$ ≡ the residual term in period *t* for security *j*.

A beta can be calculated for firms with market-traded common stock. I calculated a beta for the comparable sample in three steps. First, I subtracted the U.S. Treasury bill return from the average percentage change in company stock prices and the percentage change in the Standard & Poor's Composite Index (S&PCI) to estimate each portfolio's return in excess of the risk-free rate. Second, the excess returns of the sample were regressed against the excess returns of the S&PCI to estimate a raw beta. The regression analysis employs sixty monthly observations of stock return and U.S. Treasury bill yield data. Third, I adjusted the raw beta estimate through the following equation:

$$b_{adjusted} = 0.33743 + 0.66257 \text{ x } b_{raw}.$$

That adjustment is based upon the theory that betas regress towards the market mean value of 1.0 over time and represents an attempt to estimate a forward-looking beta.

Q. What is the beta estimate for the sample?

A. The adjusted beta for the comparable sample, estimated over sixty months ending May 2000, equals 0.52.

Q. How did you estimate the risk-free rate of return?

A. I examined the suitability of the yields on three-month U.S. Treasury bills and thirty-year U.S. Treasury bonds as estimates of the risk-free rate of return.

Q. Why did you examine the yields on U.S. Treasury bills and bonds as measures of the risk-free rate?

A. The proxy for the nominal risk-free rate should contain no risk premium and reflect similar inflation and real risk-free rate expectations to the security being analyzed through the risk premium methodology.[13] The yields of fixed income securities include premiums for default and interest rate risk. Default risk pertains to the possibility of default on principal or interest payments. Securities of the United States Treasury are virtually free of default risk by virtue of the federal government's fiscal and monetary authority. Interest rate risk pertains to the effect of unexpected interest rate fluctuations on the value of securities.

[13] Real risk-free rate and inflation expectations comprise the non-risk related portion of a security's rate of return.

Since common equity theoretically has an infinite life, its market-required rate of return reflects the inflation and real risk-free rates anticipated to prevail over the long run. U.S. Treasury bonds, the longest term treasury securities, are issued with terms to maturity of thirty years; U.S. Treasury notes are issued with terms to maturity ranging from two to ten years; U.S. Treasury bills are issued with terms to maturity ranging from ninety-one days to one year. Therefore, U.S. Treasury bonds are more likely to incorporate within their yields the inflation and real risk-free rate expectations that drive, in part, the prices of common stocks than either U.S. Treasury notes or Treasury bills.

Although U.S. Treasury bond yields are more likely to incorporate the inflation and real risk-free rate expectations embodied in the returns demanded from common stock, U.S. Treasury bill yields contain a smaller premium for interest rate risk. Due to relatively long terms to maturity, U.S. Treasury bond yields contain an interest rate risk premium that diminishes their usefulness as measures of the risk-free rate. Thus, in terms of interest rate risk, U.S. Treasury bill yields more accurately measure the risk-free rate.

Q. Given that the inflation and real risk-free rate expectations that are reflected in the yields on U.S. Treasury bonds and the prices of common stocks are similar, does it necessarily follow that the inflation and real risk-free rate expectations that are reflected in the yields on U.S. Treasury bills and the prices of common stocks are dissimiliar?

A. No. To the contrary, short and long-term inflation and real risk-free rate expectations, including those that are reflected in the yields on U.S. Treasury bills, U.S. Treasury bonds, and the prices of common stocks should equal over time. Any other assumption unrealistically implies that the real risk-free rate and inflation are expected to systematically and continuously rise or fall.

Although expectations for short and long-term real risk-free rates and inflation should equal over time, in finite time periods, short and long-term expectations may differ. Short-term interest rates tend to be more volatile than long-term interest rates.[14] Consequently, over time U.S. Treasury bill yields are less biased (i.e., more accurate) but less reliable (i.e., more volatile) estimators of the long-term risk-free rate than U.S. Treasury bond yields. In comparison, U.S. Treasury bond yields are more biased (i.e., less accurate) but more reliable (i.e., less volatile) estimators of the long-term risk-free rate. Therefore, an estimator of the long-term nominal risk-free rate should not be chosen mechanistically. Rather, the similarity in current short and long-term nominal risk-free rates should be evaluated. If those risk-free rates are similar, then U.S. Treasury bill yields should be used to measure the long-term nominal risk-free rate. If not, some other proxy or combination of proxies should be found.

[14] Fabozzi and Pollack, ed., *The Handbook of Fixed Income Securities*, Fourth Edition, Irwin, p. 789.

Q. What are the current yields on three-month U.S. Treasury bills and thirty-year U.S. Treasury bonds?

A. Three-month U.S. Treasury bills are currently yielding 5.92%. Thirty-year U.S. Treasury bonds are currently yielding 5.99%. Both estimates are derived from quotes for June 20, 2000.[15] Schedule 11.0 presents the published quotes and effective yields.

Q. Of the U.S. Treasury bill and bond yields, which is currently a better proxy for the long term risk-free rate?

A. In terms of the gross domestic product (GDP) price index, WEFA forecasts the inflation rate will average 1.9% annually during the 2000-2019 period.[16] In terms of the consumer price index (CPI), the *Survey of Professional Forecasters (Survey)* forecasts the inflation rate will average 2.7% during the 2000-2009 period.[17] In terms of real GDP growth, WEFA forecasts the real risk-free rate will average 3.0% during the 2000-2019 period.[18] The *Survey* forecasts real GDP growth will average 2.7% during the 2000-2009 period.[19] Those forecasts imply a long-term, nominal risk-free rate between 5.0% and 5.4%.[20] Therefore, to the extent inflation and real

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[15] Federal Reserve Statistical Release, *H.15 Selected Interest Rates*, June 23, 2000.
[16] WEFA Group, *U.S. Long-Term Economic Outlook*, vol. 1, First Quarter 2000, pp. 4.4-4.5.
[17] Federal Reserve Bank of Philadelphia, *Survey of Porfessional Forecasters,* May 22, 2000.
[18] WEFA Group, *U.S. Long-Term Economic Outlook*, vol. 1, First Quarter 2000, pp. 4.2-4.3.
[19] Federal Reserve Bank of Philadelphia, *Survey of Porfessional Forecasters,* May 22, 2000.
[20] Nominal interest rates are calculated as follows:

GDP growth expectations coincide with WEFA and *Survey* forecasts, the U.S. Treasury bill yield more closely approximates the long-term risk-free rate. Therefore, I conclude that the U.S. Treasury bill yield is currently the superior proxy for the long-term risk-free rate.

Q. How was the expected rate of return on the market portfolio estimated?

A. The expected rate of return on the market was estimated by conducting a DCF analysis on the firms composing the Standard & Poor's Composite Index. That analysis uses dividends and closing market prices as of March 31, 2000 as reported in the April 2000 edition of Standard & Poor's *Security Owner's Stock Guide*. Growth rate estimates were obtained from the March 2000 edition of *IBES Monthly Summary Data* and April 9, 2000 Zacks reports. Firms not paying a dividend as of March 31, 2000, or for which neither IBES nor Zacks growth rates were available were eliminated from the analysis. The resulting company-specific estimates of the expected rate of return on common equity were then weighted using relative market value data from Salomon Brothers, *Performance and Weights of the S&P500: First Quarter 2000.* The estimated weighted average expected

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$$r = (1 + R) \times (1 + i) - 1.$$

where r ≡ nominal interest rate;
R ≡ real interest rate; and
i ≡ inflation rate.

rate of return for the remaining 396 firms, composing 73% of the market capitalization of the S&PCI, equals 15.94%.

Q. What is the risk premium estimate of the required rate of return on common equity for the comparable sample?

A. The risk premium model indicates that the required rate of return on common equity is 11.13% for the comparable sample. This estimate results from measuring the risk-free rate with U.S. Treasury bill yields. The computation of that estimate is shown on Schedule 11.0.

Recommendation

Q. Based on your analysis, what is your estimate of the required rate of return on common equity for Atmos?

A. A thorough analysis of the required rate of return on common equity requires both the application of financial models and the analyst's informed judgment. An estimate of the required rate of return on common equity based solely on judgment is inappropriate. Nevertheless, because techniques to measure the required rate of return on common equity necessarily employ proxies for investor expectations, judgment remains necessary to evaluate the results of such analyses. Based on my analysis, in my judgment, the investor required rate of return for Atmos' common equity ranges from 11.15% to 11.85%.

Q. Please summarize how you formed the range for the investor required rate of return on Atmos' common equity.

A. The models from which the individual company estimates were derived are correctly specified and thus contain no source of bias. Moreover, I am unaware of bias in any of my proxies for investor expectations.[21] Consequently, estimates for a sample as a whole are subject to less measurement error than individual company estimates. Therefore, I formed a range for the sample by: 1) averaging the DCF-derived estimates of the required rate of return on common equity, or 11.81%, and rounding to the nearest five hundredth of a percent, or 11.85%; 2) adopting the U.S. Treasury bill yield as the risk-free rate proxy for the reasons stated above and rounding the resulting risk premium estimate of the required rate of return on common equity (11.13%), to the nearest five hundredth of a percent, or 11.15%.

Q. Should the investor required rate of return on common equity be adjusted for issuance costs?

A. Yes. In Docket No. 90-0008, cons., the Commission allowed recovery of issuance costs associated with common stock issues in 1989 and 1991.[22] Subsequent to that rate proceeding, the Company incurred common equity issuance expenses in

[21] Except as discussed above in regard to U.S. Treasury bond yields as proxies for the long-term risk-free rate.
[22] Docket No. 90-0008, Order on Remand, September 30, 1992, pp. 6-9.

1992, totaling $931 thousand, and 1995, totaling $1,110 thousand.[23] Therefore, the $2.042 million in costs associated with those two common stock issues remain unrecovered.

Q. How should the issuance cost adjustment be calculated?

A. The common equity issuance cost adjustment should be calculated using the following formula:

$$\textit{Issuance Cost Adjustment} = \frac{\textit{ROE x Unrecoverd Issuance Costs}}{\textit{Common Equity Balance}}$$

where *ROE* = the investor required rate of return on common equity.

Q. Would the above formula include an allowance for issuance cost recovery?

A. No. Any attempt to recover a cost requires the establishment of an amortization period. However, common equity's indefinite life-span renders any finite recovery period arbitrary, leading to a failure to match cost recovery with the benefits associated with common equity capital. Therefore, the above formula permits a return on, but not a return of, those costs. Permitting a return on common equity issuance costs without recovery of those costs is consistent with the manner in which issuance costs for perpetual preferred stock are treated for setting rates.

[23] Docket 96-0618, Direct Testimony of Alan S. Pregozen, March 1997, p. 35.

Q. What is the common equity issuance cost adjustment?

A. Using Atmos' September 30, 1999 balance of common equity of $377.663 million and an investor-required rate of return on common equity equal to the low-end of my recommended range, or 11.15%, the common equity issuance cost adjustment equals 0.06%.[24] At an investor-required rate of return on common equity equal to the high-end of my recommended range, or 11.85%, the common equity issuance cost adjustment also equals 0.06%. Therefore, Atmos' cost of common equity, including issuance costs, ranges from 11.21% to 11.91%, with a 11.56% midpoint.

Q. Why did you calculate the issuance cost adjustment with Atmos' entire balance of common equity?

A. Since Atmos has unregulated subsidiaries, both the utility and its subsidiaries are responsible for the costs incurred to issue common stock. Therefore, to spread those costs over both utility and subsidiary operations, the balance of common equity for the entire company, including unregulated subsidiaries, should be used in the issuance cost adjustment calculation.

[24]Company Schedule D-1, Revised.

Overall Cost of Capital

Q. What is the overall cost of capital for Atmos in this proceeding?

A. As shown on Schedule 12.00, the overall cost of capital for Atmos ranges from 9.07% to 9.30% with a midpoint estimate of 9.18%. The midpoint estimate is based on a cost of common equity of 11.56%.

Response to Dr. Murry

Q. Please summarize your evaluation of Dr. Murry's analysis of Atmos' cost of common equity.

A. Dr. Murry's analysis contains several errors that result in his over-estimation of the cost of common equity for Atmos. Critical errors occur in the DCF and the standard historical and size-adjusted CAPM analyses. The large number of errors in Dr. Murry's analysis makes commenting on them all infeasible. Therefore, absence of a comment on any particular aspect of Dr. Murry's analysis should not be interpreted that I find it reasonable.

DCF Analyses

Q. Please describe the errors in Dr. Murry's DCF analyses.

A. Dr. Murry's DCF analyses contain numerous errors; however I will comment on only one. Dr. Murry improperly measures stock prices in two of his DCF analyses.

Q. Please describe why Dr. Murry's measurement of stock price is improper.

A. To estimate stock price, Dr. Murry averaged the highest and lowest observed stock price for the twelve months ending December 31, 1999, as reported by *Value Line Investment Survey*.[25] To estimate a more current cost of equity, he averages the highest and lowest observed stock prices over a two week period, from December 28, 1999 through January 10, 2000.[26] Both of these approaches have several deficiencies. First, averaging the most extreme stock price observations for a given period is unlikely to accurately measure the mean stock price for that period. Second, since stock prices reflect all concurrently available and relevant information, average stock prices must include observations that no longer have any relevance to current and expected market conditions. Third, DCF models include time-sensitive factors; therefore implementing the model with stock price observations from various points in time renders valid implementation of the model problematic. Dr. Murry's combination of expected dividends that were not known until December 24, 1999,[27] with stock price observations from January through December 1999 violates DCF valuation principals.

[25] Company response to Staff data request FD-1.12.
[26] Company response to Staff data request FD-1.13.
[27] Company response to Staff data requests FD-1.27 and FD-2.19.

Q. Should average stock prices be used to reduce the effect of volatility?

A. No. Measurement error is a problem inherent in cost of common equity analysis and should be avoided as much as possible. Introducing old stock prices into an analysis substitutes one alleged source of measurement error, volatile stock prices, for another, irrelevant stock prices. Stock prices can be influenced by temporary imbalances in supply and demand; however, any distortions such imbalances might have on the measured cost of common equity can be reduced with samples.

CAPM Analyses

Q. Please describe the errors Dr. Murry committed in this standard historical CAPM analysis.

A. In his standard historical CAPM analysis, Dr. Murry adds a risk premium that is supposedly specific to a security to the current yield on long-term corporate bonds. This analysis has several flaws. First, Dr. Murry's CAPM model uses an inappropriate proxy for the risk-free rate. Dr. Murry's CAPM model can be depicted mathematically as follows:

$$R_j = R_c + b_j \text{ x } (R_m - R_c)$$

where $R_j \equiv$ the required rate of return for security j;

$R_c \equiv$ the corporate bond rate;

$R_m \equiv$ the expected rate of return for the market portfolio; and

$b_j \equiv$ the measure of risk for security j.

The above model is almost identical to the CAPM except that it substitutes a risky debt rate, R_c, for the risk-free rate, R_f. That substitution has no basis in financial theory. The consequences of the substitution of a risky debt rate for the risk-free rate can be illustrated mathematically as follows:

Since $R_c = R_f + (R_c - R_f)$ then

$$\begin{aligned} R_j &= R_f + (R_c - R_f) + b_j \times (R_m - [R_f + (R_c - R_f)]) \\ &= R_f + (R_c - R_f) + b_j \times [(R_m - R_f) - (R_c - R_f)] \\ &= R_f + (R_c - R_f) + b_j \times (R_m - R_f) - b_j \times (R_c - R_f) \\ &= R_f + (1 - b_j) \times (R_c - R_f) + b_j \times (R_m - R_f) \end{aligned}$$

Dr. Murry's CAPM model adds to CAPM cost of common equity estimates an amount equal to $(1 - b_j) \times (R_c - R_f)$. Since the cost of risky debt, R_c, exceeds the risk-free rate, R_f, Dr. Murry's risk premium model over-estimates the cost of common equity for companies with betas less than one.

In addition, Dr. Murry's CAPM model inappropriately incorporates two different long-term corporate bond yields. Consequently, his CAPM analysis violates a fundamental tenet of financial theory: investors require identical returns from two securities with identical risk. Dr. Murry estimated the required rate of return on the market currently equals 15.30%.[28] Consequently, a security with the same risk as

[28] Prepared Direct Testimony of Donald A. Murry, Ph.D., Schedule DAM-13.

the market, that is, with a beta equal to one, would also have a required rate of return of 15.30%. Yet, Dr. Murry's current risk premium model would estimate that company's rate of return at 16.75% as follows:

$$7.55\% + 1.0 \times (15.30\% - 6.10\%) = 16.75\%.$$

Thus, Dr. Murry's risk premium model over-estimates the cost of common equity.

Furthermore, the historical CAPM analysis has two additional deficiencies. First, it relies on the notion that historical risk premiums are appropriate estimates for expected risk premiums. Realized returns possess several shortcomings in that regard. The returns an investment generates are unlikely to have equaled investor return requirements due to unpredictable economic, industry-related, or company-specific events. Even if an investment's return equaled investor requirements in a given period, both the price of, and the investment's sensitivity to, each source of risk changes over time. Consequently, the past relationship between two investments, such as utility common equity and utility debt, is unlikely to remain constant. Finally, the magnitude of the historical risk premium depends upon the measurement period.

Second, Dr. Murry averages the earned return on small and large company stocks to estimate the earned return on the market. That is inappropriate because the beta he uses in his analysis is based on the NYSE index, which comprises mostly large company stocks.[29] As shown below, beta is based, in part, on the volatility of the market:

$$b_j = \frac{Cov(R_j,\ R_m)}{s_m^{\ 2}}$$

where $Cov(R_j, R_m) \equiv$ the covariance of the returns on security *j* and the market; and

$s_m^{\ 2} \equiv$ the variance (i.e., volatility) of returns on the market.

Since small stocks have been more volatile than large stocks,[30] betas estimated in relation to a market index composing both small and large stocks would likely be lower than betas based on large stocks alone.

Size-adjusted CAPM

Q. Is Dr. Murry's adjustment for a size-based risk premium appropriate?

A. No. Dr. Murry's size-adjusted CAPM has no theoretical basis. Rather, it is based on an empirical study that is not applicable to United Cities Gas Company. Regardless, should a size-based risk premium be adopted, it should be based on the size of Atmos Energy Corporation.

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[29] Statman, "Betas compared: Merrill Lynch vs. Value Line," *Journal of Portfolio Management*, Winter 1981, p. 42.

[30] Company response to Staff data request FD-1.18.

Q. Why should Atmos be the basis for a size adjustment?

A. United Cities Gas Company is an operating division of Atmos. As such, it has neither debt nor equity. To the extent that a size premium exists, it would be borne by the entity that issues common stock to the public, that is, Atmos.

Q. Please explain the significance of the absence of a theoretical basis for a size-based risk premium.

A. Since a size-based risk premium has no theoretical basis, to the extent that a correlation between firm size and return exists, that relationship is likely the result of some other factor or factors that are related to both size and return, such as liquidity or information costs. Relatively illiquid securities impose costs on the investor since he or she may be unable to sell them at a fair price on a timely basis. Gathering information regarding the expected cash flows and risks of a security imposes costs that an investor must recover through the returns that the security generates. The securities of smaller companies tend to be less liquid than those of larger companies since the potential breadth of the market for the former is usually more limited. Similarly, if fewer sources of information regarding smaller companies exist, then obtaining information might be more expensive.

If the securities of Atmos are less liquid or the availability of information regarding Atmos is more restricted than the average security, then adding a size-based premium to a CAPM analysis of Atmos' cost of common equity might be proper.

The study reported in Ibbotson Associates, which forms the basis of Dr. Murry's size-based risk premium adjustment, is not restricted to utilities. Rather, it is based on the stocks listed on the New York Stock Exchange.[31] Yet, utilities, unlike most stocks listed on the New York Stock Exchange, are subject to uniform reporting requirements. Moreover, their rates and conditions of service are publicly reported. Therefore, the cost of obtaining information regarding smaller utilities in general, and Atmos in particular, is unlikely to be as high as that of unregulated companies that are similar in size. That was confirmed in a study which found no size premium for utilities.[32]

Even for non-utilities, evidence of the existence of a size-based risk premium is not very strong. Ibbotson Associates' data shows that out of a 1926-1998 study period, small stocks consistently out-performed large stocks only during the 1962-1998 period.[33] Frenholz found that a statistical property he termed the "crossover effect" was the primary cause of the difference between large and small company stock returns. The "crossover effect" measures the effect on rate of return of those stocks that switch from one size portfolio to another.[34] Fernholz states that as random price changes affect the size of stocks, some stocks cross over from one size portfolio to another. When a stock that starts in the large stock portfolio experiences a <u>random</u> negative price change that moves it into the small stock portfolio, its

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[31] Ibbotson Associates, *SBBI 1999 Yearbook*, pp. 127-143.

[32] Wong, "Utility Stocks and the Size Effect: an Empirical Analysis," *Journal of the Midwest Finance Association*, 1993, pp. 95-101.

[33] Ibbotson Associates, *SBBI 1999 Yearbook*, pp. 100-101.

resulting negative return is assigned to, and therefore reduces, the return on the large stock portfolio. Conversely, when that same stock experiences a random positive price change that moves it back into the large stock portfolio, its resulting positive return is assigned to, and therefore increases, the return on the small stock portfolio.[35] The combination of portfolio construction and random (i.e., non-systematic) price movements creates a biased source of measurement error. Thus, the "crossover effect" may be less a market return phenomenon than a modeling problem. That is, the "small stock effect" may be nothing more than a statistical anomaly.

In another study of domestic stocks listed on the NYSE and AMEX, Jensen, Johnson and Mercer, (hereinafter "Jensen") found that small stock premiums appear to be related to monetary policy. Specifically, changes in monetary policy play a prominent role in determining the magnitude of small stock premiums. During expansive monetary periods, defined as months following a reduction in the Federal Reserve discount rate, Jensen found that small stock returns were significantly greater than large stock returns. Conversely, during restrictive monetary periods, defined as months following an increase in the discount rate, Jensen found that small stock returns were not significantly greater than large stock returns.[36] Nevertheless, the applicability of the Jensen results to small utility stocks is doubtful.

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[34] Fernholz, "Crossovers, Dividends, and the Size Effect," *Financial Analysts Journal*, May/June1998, pp. 73-75.

[35] Fernholz, "Crossovers, Dividends, and the Size Effect," *Financial Analysts Journal*, May/June1998, p. 73.

First, since the Jensen study was based on largely non-utility companies, their findings that small stocks outperformed large stocks during “expansionary” monetary periods is not surprising. During monetary expansions, as the supply of loanable funds increases, investors are more likely to invest in speculative, small company stocks. However, during monetary contractions, as the supply of loanable funds decreases, investors are more likely to switch from speculative investments to safer ones – the well-known “flight to quality.” It is counter-intuitive to claim that investors would consider the smaller firms in the regulated utility sector to be speculative investments. Moreover, Jensen did not control their measurement of the small stock premium for risk as measured by beta or other means.[37] Therefore, their study does not support Dr. Murry’s size-based risk premium adjustment.

Even if a size-based risk premium exists, Dr. Murry’s estimates of the size of the premium are questionable. First, Dr. Murry’s size-based risk premiums are based on historical returns, which implies that historical risk premiums are appropriate estimates for expected risk premiums. As described previously, that implication is questionable at best.

Second, as noted previously, Dr. Murry’s historical size-based risk premium is based on the realized returns of the stocks listed on the New York Stock

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[36] Jensen, Johnson, and Mercer, “The Inconsistency of Small-Firm and Value Stock Premiums,” *Journal of Portfolio Management*, p. 35.

[37] Jensen, Johnson, and Mercer, “The Inconsistency of Small-Firm and Value Stock Premiums,” *Journal of Portfolio Management*, pp. 30 and 34.

Exchange.[38] That implies that small utility stocks are similar to small industrial stocks, a very questionable premise that Dr. Murry did not verify. Ibbotson Associates issued a similar warning against applying its results outside stocks listed on the New York Stock Exchange.[39]

Third, two principals of Ibbotson Associates, Roger Ibbotson and Paul Kaplan along with James Peterson (hereinafter “Ibbotson”), have asserted that biases in beta estimates for small companies are largely due to a lag in the amount of time that it takes some information to be incorporated into the prices of less frequently traded stocks.[40] Ibbotson found that incorporating that lag into beta estimates for small companies partially explains the “size effect” in common stock returns.[41] Therefore, before one bases an adjustment of the cost of common equity for “small” utilities on studies of predominantly industrial NYSE stocks, one should first investigate whether the Ibbotson lag-factor is present in the stock returns of small utilities.

Q. Did you perform such an analysis?

[38] Ibbotson Associates, *SBBI 1999 Yearbook*, pp. 127-143.

[39] Ibbotson Associates, *SBBI 1999 Yearbook*, p. 137.

[40] Ibbotson, Kaplan and Peterson, “Estimates of Small-Stock Betas Are Much Too Low,” *Journal of Portfolio Management*, Summer 1997, pp. 105 and 110.

[41] Ibbotson, Kaplan and Peterson, “Estimates of Small-Stock Betas Are Much Too Low,” *Journal of Portfolio Management*, Summer 1997, p. 105.

A. Yes. I calculated the traditional and lag betas for both of my samples and Dr. Murry's sample from the following model using an ordinary least-squares technique:[42]

$$R_{j,t} - R_{f,t} = \alpha_j + b_j \times (R_{m,t} - R_{f,t}) + b_{lag,j} \times (R_{m,t-1} - R_{f,t-1}) + \varepsilon_{j,t}$$

where $R_{j,t}$ ≡ the return on security j in period t;

$R_{f,t}$ ≡ the risk-free rate of return in period t;

$R_{m,t}$ ≡ the return on the market portfolio in period t;

a_j ≡ the intercept term for security j;

b_j ≡ traditional beta for security j;

$b_{lag,j}$ ≡ lagged beta for security j; and

$e_{j,t}$ ≡ the residual term in period t for security j.

The above equation is similar to that used to estimate "traditional" betas except that a term for the "lagged" beta, (i.e., $b_{lag,j} \times (R_{m,t-1} - R_{f,t-1})$) is added. The lagged beta equaled -0.12 for my comparable sample. For Dr. Murry's sample, the lagged beta equaled -0.11.[43] In all cases, the lagged betas were not statistically different from zero. That is, Ibbotson's size-based lag-factor does not appear to be present in the stock returns of the utilities in my comparable sample or Dr. Murry's sample.

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[42] Ibbotson, Kaplan and Peterson, "Estimates of Small-Stock Betas Are Much Too Low," *Journal of Portfolio Management*, Summer 1997, p. 106.

[43] The adjusted beta for Dr. Murry's sample equals 0.55; the adjusted sum beta (i.e., the sum of the adjusted beta and the adjusted lag beta) equals 0.47.

Finally, Dr. Murry's application of the Ibbotson Associates' historical size-based risk premiums are probably inconsistent with the manner in which Ibbotson Associates measured them. While Dr. Murry adds the historical size premium to his CAPM-based risk premium analysis which is based on adjusted Value Line betas, the studies I have reviewed on the effect of size on returns employ raw betas.[44] Since the Ibbotson Associates size-based risk premiums are a function of raw beta, Dr. Murry should have used the same type of beta as Ibbotson Associates.

Q. Does this conclude your direct testimony?

A. Yes, it does.

[44] Wong, "Utility Stocks and the Size Effect: An Empirical Analysis," *Journal of Midwest Finance Association*, 1993, p. 96; Ibbotson, Kaplan, and Peterson, "Estimates of Small-Stock Betas Are Much Too Low," *Journal of Portfolio Management*, Summer 1997, p.106.