CORROBORATIVE EQUITY CAPITAL COST ESTIMATION METHODS

CAPITAL ASSET PRICING MODEL

Q. PLEASE DESCRIBE THE CAPITAL ASSET PRICING MODEL (CAPM) YOU USED TO ARRIVE AT AN ESTIMATE FOR THE COST RATE OF THE COMPANY'S EQUITY CAPITAL.

A. The CAPM states that the expected rate of return on a security is determined by a risk-free rate of return plus a risk premium which is proportional to the non-diversifiable (systematic) risk of a security. Systematic risk refers to the risk associated with movements in the macro-economy (the economic "system") and, thus, cannot be eliminated through diversification by holding a portfolio of securities. The beta coefficient (β) is a statistical measure that attempts to quantify the non-diversifiable risk of the return on a particular security against the returns inherent in general stock market fluctuations. The formula is expressed as follows:

$$k = r_f + \beta(r_m - r_f), \qquad \text{(i)}$$

where "k" is the cost of equity capital of an individual security, "r_f" is the risk-free rate of return, "β" is the beta coefficient, "r_m" is the average market return and "$r_m - r_f$" is the market risk premium. The CAPM is used in my analysis, not as a primary cost of equity analysis, but as a check of the DCF cost of equity estimate. Although I believe the CAPM can be useful in testing the reasonableness of a cost of capital estimate, certain theoretical shortcomings of this model (when applied in cost of capital analysis) reduce its usefulness.

Q. CAN YOU EXPLAIN WHY YOU APPLY THE CAPM ANALYSIS WITH CAUTION?

A. Yes. The reasons why the CAPM should be used in cost of capital analysis with caution are set out below. It is important to understand that my caution with regard to the use of the CAPM in a cost of equity capital analysis does not indicate that the model is not a useful description of the capital markets. Rather, it recognizes that in the practical application of the CAPM to cost of capital analysis there are problems that can cause the results of that type of analysis to be less reliable than other, more widely accepted models such as the DCF.

The CAPM was originally designed as a point-in-time tool for selecting stock portfolios that matched a particular investor's risk/return preference. Its use in rate of return analysis to estimate multi-period return expectations for one stock or one type of stock, rather than a diversified portfolio of stocks, takes the model out of the context for which it was intended. Also, questions regarding the fundamental applicability of the CAPM theory and the accuracy of beta have arisen recently in the financial literature.

Over the past few years there has been much comment in the financial literature over the strength of the assumptions that underlie the CAPM and the inability to substantiate those assumptions through empirical analysis. Also, there are problems with the key CAPM risk measure that indicate that the CAPM analysis is not a reliable primary indicator of equity capital costs.

Cost of capital analysis is a decidedly forward-looking, or *ex-ante*, concept. Beta is not. The measurement of beta is derived with historical, or *ex-post*, information. Therefore, the beta of a particular company, because it is usually derived with five years of historical data, is slow to change to current (i.e., forward-looking) conditions, and some price abnormality that may have happened four years ago could substantially affect beta while, currently, being of little actual concern to investors. Moreover, this same shortcoming which assumes that past results mirror investor expectations for the future plagues the market risk premium in an ex-post, or historically-oriented CAPM.

Also, an important study performed for the Center for Research in Security Prices at the University of Chicago Graduate School of Business shows that the assumed linear relationship between beta, risk and return (i.e., beta varies directly with risk and return) simply does not appear to exist in the marketplace. As Value Line reported in its Industry Review published in March of 1992:

> Two of the most prestigious researchers in the financial community, Professors Eugene F. Fama and Kenneth R. French from the University of Chicago have challenged the traditional relationship between Beta and return in a recent paper published by the Center for Research in Security Prices. In this study, the duo traced the performance of thousands of stocks over 50 years, but found no statistical support for the hypothesis that the relationship between volatility and return is significantly different from random. (Value Line Industry Review, March 13, 1992, p. 1-8.)

Fama and French have continued their investigation of the CAPM since their 1992 article and have postulated that a more accurate CAPM would use two additional risk measures in addition to beta. However, it is important to note that while those authors tout the superiority of their three-factor CAPM to the single-beta CAPM on theoretical grounds, they recognize that there are significant problems with any type of asset pricing model when it comes to using the model to estimate the cost of equity capital. Just last year, Fama and French noted regarding the CAPM:

> "The attraction of the CAPM is that is offers powerful and intuitively pleasing predictions about how to measure risk and the relation between expected return and risk. Unfortunately, the empirical record of the model is poor—poor enough to invalidate the way it is used in applications. The CAPM's empirical problems may reflect theoretical failings, the result of many simplifying assumptions. But they may also be caused by difficulties in implementing valid tests of the model....In the end, we argue that whether the model's problems reflect weaknesses in the theory or in

> its empirical implementation, the failure of the CAPM in empirical tests implies that most applications of the model are invalid." (Fama, E., French, K., "The Capital Asset Pricing Model: Theory and Evidence," *Journal of Economic Perspectives*, Vol. 18, No. 3, Summer 2004, pp. 25-46)

While the recently published conclusions as to the imprecision of equity cost estimates produced by CAPM-type models does not necessarily negate the risk/return basis of asset pricing, it does call for more accurate measures with which asset returns can be more reliably indexed. However, unless and until such indices are published and widely accepted in the marketplace, CAPM cost of equity capital estimates should be relegated to a supporting role or informational status. Therefore, I use the CAPM for informational purposes and do not rely on that methodology as a primary equity capital cost estimation technique.

Q. WHAT VALUE HAVE YOU CHOSEN FOR A RISK-FREE RATE OF RETURN IN YOUR CAPM ANALYSIS?

A. As the CAPM is designed, the risk-free rate is that short-term rate of return investors can realize with certainty. The nearest analog in the investment spectrum is the 13-week U. S. Treasury Bill. Although longer-term Treasury bonds have equivalent default risk to T-Bills, those longer-term government securities carry maturity risk that the T-Bills do not have. When investors tie up their money for longer periods of time, as they do when purchasing a long-term Treasury, they must be compensated for future investment opportunities forgone as well as the potential for future changes in inflation. Investors are compensated for this increased investment risk by receiving a higher yield on T-Bonds.

As I noted in my previous discussion of the macro-economy, due to a sluggish economy, the Fed has acted vigorously during 2003 to lower short-term interest rates. However, the Fed has recently reversed course and, over the past year, has increased short-term rates. Over the most recent six-week period, T-Bills have produced an average yield of 3.47% (data from Value Line *Selection & Opinion*, six most recent weekly

editions[1]).

Q. DO YOU BELIEVE THE USE OF A LONG-TERM TREASURY BOND RATE IS APPROPRIATE IN THE CAPM?

A. Although the selection of a long- or short-term Treasury security as the risk free rate of return to be used in the CAPM is often one of the areas of contention in applying the model in cost of capital analysis, the use of a normalized short-term T-Bill rate is the more theoretically correct parameter. However, the T-Bill yield can be influenced by Federal Reserve policy, and, could provide inaccurate indications of the cost of equity, especially if the yield differential between T-Bonds and T-Bills is different from long-term averages. Recently, with the increase in short-term T-Bill yields resulting from Federal Reserve credit tightening, combined with stable long-term yields, the yield differential between T-Bonds and T-Bills is about 1% to 1.5%, which is somewhat below but similar to long-term averages. Therefore, for purposes of analysis in this proceeding I will use both the T-Bill and long-term Treasury bond yields for the risk-free rate in the CAPM. Also, along with those measures of the risk-free rate I use the corresponding measures of market risk premiums.

Q. WHAT HAVE YOU CHOSEN AS THE MARKET RISK PREMIUM FOR THE CAPM ANALYSIS?

A. In their 2004 edition of Stocks, Bonds, Bills and Inflation, R.G. Ibbotson Associates indicates that the average market risk premium between stocks and T-Bills over the 1926–2003 time period is 8.6% (based on an arithmetic average), and 6.7% (based on a geometric average). For long-term Treasuries, the market risk premiums are 6.6% (based on an arithmetic average) and 5.0% (based on a geometric average). I have used these values to estimate the market risk premium in the CAPM analysis. The geometric mean is based on compound returns over time and the arithmetic mean is based on the average of

[1] Current T-Bill yield, six-week average yield from Value Line Selection & Opinion (8/19/05-9/23/05).

single-period returns.

It is important to note that, as I point out in Section I of my testimony, recent research in the field of financial economics has shown that the market risk premium data published by Ibbotson Associates—the earned return differentials that existed in the U.S. between 1926 and 2003—overstates investor-expected market risk premiums. The most recent research indicates that the return investors require over the risk-free rate ranges from 2.5% to 4.5% as opposed to the 5.0% to 6.6% estimate published by Ibbotson. Also Ibbotson, himself, has published a recent paper that indicates the forward-looking risk premium expectation ranges between 4% and 6%.[2] Therefore, the upper end of the CAPM cost of equity estimates, based on the historical Ibbotson data, should be considered to be higher than the current cost of common equity capital.

Q. IF THE IBBOTSON HISTORICAL DATA OVERSTATE THE EXPECTED MARKET RISK PREMIUM, WHY DO YOU USE THOSE DATA IN YOUR CAPM ESTIMATE OF THE COST OF COMMON EQUITY CAPITAL?

A. I continue to utilize the historical Ibbotson data in my CAPM analysis in order to be consistent with the manner in which I have traditionally used those data. I have been testifying on the subject of the cost of equity capital for more than twenty years and have consistently used the Ibbotson historical data in my CAPM analyses, and choose not to deviate from that practice at this time. However, the new research on the market risk premium (including a paper from Ibbotson, himself) indicates that the expected market risk premium is considerably lower than the risk premium contained in the historical data. While that information does not cause me to change my long-standing CAPM methodology of relying on the Ibbotson historical risk premium data, the current research on the topic of the market risk premium is important, deserves consideration and causes me to put considerably less weight on the higher end of the CAPM estimates.

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[2] Ibbotson, R, Chen, P., "Long-Run Stock Returns: Participating in the Real Economy," *Financial Analysts Journal*, January/February 2003, pp. 88-89.

Q. WHAT VALUES HAVE YOU CHOSEN FOR THE BETA COEFFICIENTS IN THE CAPM ANALYSIS?

A. Value Line reports beta coefficients for all the stocks it follows. Value Line's beta is derived from a regression analysis between weekly percentage changes in the market price of a stock and weekly percentage changes in the New York Stock Exchange Composite Index over a period of five years. The average beta coefficient of the sample group of electric companies is 0.76.

Q. WHAT IS YOUR RECOMMENDED COST OF EQUITY CAPITAL FOR THE SAMPLE OF ELECTRIC COMPANIES USING THE CAPITAL ASSET PRICING MODEL ANALYSIS?

A. Exhibit__(SGH-13) shows that the average Value Line beta coefficient for the group of electric companies under study is 0.76. The overall arithmetic average market risk premium of 8.6% would, upon the adoption of a 0.76 beta, become a sample group premium of 6.55% (0.76 x 8.6%). That non-specific risk premium added to the risk-free T-Bill rate of 3.47%, previously derived, yields a common equity cost rate estimate of 10.02%. As noted above, that upper-end estimate of the CAPM exceeds the current cost of equity capital.

Exhibit__(SGH-13) also shows that using an average long-term T-bond yield (4.41%)[3] the CAPM produces equity cost estimates of 8.21% (geometric) and 9.43% (arithmetic). It is also important to note that those results are predicated on Ibbotson's long-term historical market risk premiums, which current research indicates overstate actual investor expectations. Those CAPM results bracket the DCF results derived previously, supporting the reasonableness of those results.

[3] The recent six-week average T-Bond yield is 4.61% (Value Line *Selection & Opinion,* 8/19/05-9/23/05).

MODIFIED EARNINGS-PRICE RATIO ANALYSIS

Q. PLEASE DESCRIBE THE MODIFIED EARNINGS-PRICE RATIO (MEPR) ANALYSIS OF THE COST OF COMMON EQUITY CAPITAL.

A. The earnings-price ratio is calculated simply as the expected earnings per share divided by the current market price. In cost of capital analysis, the earnings-price ratio (which is one portion of this analysis) can be useful in a corroborative sense, since it can be a good indicator of the proper range of equity costs when the market price of a stock is near its book value. When the market price of a stock is *above* its book value, the earnings-price ratio *understates* the cost of equity capital. Exhbit__(SGH-14) contains mathematical proof for this concept. The opposite is also true, i.e.; the earnings-price ratio *overstates* the cost of equity capital when the market price of a stock is *below* book value.

Under current market conditions, the electric utilities under study have an average market-to-book ratio of 1.76 and, therefore, the average earnings-price ratio alone would understate the cost of equity for the sample group. However, it is important to emphasize that I do not use the earnings-price ratio alone as an indicator of equity capital cost rates. Because of the relationship among the earnings-price ratio, the market-to-book ratio and the investor-expected return on equity described in Exhibit__(SGH-14), I have modified the standard earnings-price ratio analysis by including expected returns on equity for the companies under study. It is that modified analysis that I will use to assist in estimating an appropriate range of equity capital costs in this proceeding.

Q. PLEASE EXPLAIN THE RELATIONSHIP AMONG THE EARNINGS-PRICE RATIO, THE EXPECTED RETURN ON EQUITY, AND THE MARKET-TO-BOOK RATIO.

A. When the expected return (ROE) approximates the cost of equity, the market price of the utility approximates its book value and the earnings-price ratio provides an unbiased estimate of the cost of equity. When the investor-expected return on equity for a utility

(ROE) exceeds the investor-required return (the cost of equity capital), the market price of the firm will tend to exceed its book value. As explained above, when the market price exceeds book value, the earnings-price ratio understates the cost of equity capital. Therefore, when the expected equity return (ROE) exceeds the cost of equity capital, the earnings-price ratio will understate that cost rate.

Also, in situations where the expected equity return is below what investors require for that type of investment, market prices fall below book value. Further, when market-to-book ratios are below 1.0, the earnings-price ratio overstates the cost of equity capital. Thus, the expected rate of return on equity and the earnings-price ratio tend to move in a countervailing fashion around the cost of equity capital.

When market-to-book ratios are above one, the expected equity return exceeds and the earnings-price ratio understates the cost of equity capital. When market-to-book ratios are below one, the expected equity return understates and the earnings-price ratio exceeds the cost of equity capital. Further, as market-to-book ratios approach unity, the expected return and the earnings price ratio approach the cost of equity capital. Therefore, the average of the expected book return and the earnings price ratio provides a reasonable estimate of the cost of equity capital.

These relationships represent general rather than precisely quantifiable tendencies but are useful in corroborating other cost of capital methodologies. The Federal Energy Regulatory Commission, in its generic rate of return hearings, found this technique useful and indicated that under the circumstances of market-to-book ratios exceeding unity, the cost of equity is bounded above by the expected equity return and below by the earnings-price ratio (e.g., 50 Fed Reg, 1985, p. 21822; 51 Fed Reg, 1986, pp. 361, 362; 37 FERC ¶ 61,287). The mid-point of these two parameters, therefore, produces an estimate of the cost of equity capital which, when market-to-book ratios are different from unity, is far more accurate than the earnings-price ratio alone.

Q. WHAT ARE THE RESULTS OF YOUR EARNINGS-PRICE RATIO ANALYSIS OF THE COST OF EQUITY FOR THE SAMPLE GROUP?

A. Exhibit__(SGH-15) shows the First Call projected 2006 per share earnings for each of the firms in my sample group. Recent average market prices (the same market prices used in my DCF analysis), Value Line's projected return on equity for 2006 and 2008-2010 for each of the companies are also shown.

The average earnings-price ratio for the electric sample group, 6.51%, is below the cost of equity for those companies due to the fact that their average market-to-book ratio is currently above unity. The sample electric companies' 2006 expected book equity return averages 10.54%. For the entire sample group, then, the mid-point of the earnings-price ratio and the current equity return is 8.52%.

Exhibit__(SGH-15) also shows that the average expected book equity return over the next three- to five-year period is 10.38%, indicating increasing return expectations. The midpoint of these two boundaries of equity capital cost for the whole group, i.e., the long-term projected return on book equity (10.38%) and the current earnings-price ratio (6.51%) is 8.45%, and provides another forward-looking estimate of the equity capital cost rate of an electric utility firm. The results of this MEPR analysis indicate that the DCF equity cost estimate previously derived may be overstated (i.e., too high).

MARKET-TO-BOOK RATIO ANALYSIS

Q. PLEASE DESCRIBE YOUR MARKET-TO-BOOK (MTB) ANALYSIS OF THE COST OF COMMON EQUITY CAPITAL FOR THE SAMPLE GROUP.

A. This technique of analysis is a derivative of the DCF model that attempts to adjust the capital cost derived with regard to inequalities that might exist in the market-to-book ratio. This method is derived algebraically from the DCF model and, therefore, cannot be considered a strictly independent check of that method. However, the MTB analysis is useful in a corroborative sense. The MTB seeks to determine the cost of equity using

market-determined parameters in a format different from that employed in the DCF analysis. In the DCF analysis, the available data is "smoothed" to identify investors' long-term sustainable expectations. The MTB analysis, while based on the DCF theory, relies instead on point-in-time data projected one year and five years into the future and, thus, offers a practical corroborative check on the traditional DCF. The MTB formula is derived as follows:

Solving for "P" from Equation (1), the standard DCF model, we have

$$P = D/(k-g). \qquad \text{(ii)}$$

But the dividend (D) is equal to the earnings (E) times the earnings payout ratio, or one minus the retention ratio (b), or

$$D = E(1-b). \qquad \text{(iii)}$$

Substituting Equation (iii) into Equation (ii), we have

$$P = \frac{E(1-b)}{k-g} . \qquad \text{(iv)}$$

The earnings (E) are equal to the return on equity (r) times the book value of that equity (B). Making that substitution into Equation (iv), we have

$$P = \frac{rB(1-b)}{k-g} . \qquad \text{(v)}$$

Dividing both sides of Equation (v) by the book value (B) and noting from Equation (iii) in Appendix B that g = br+sv,

$$\frac{P}{B} = \frac{r(1-b)}{k-br-sv} . \qquad \text{(vi)}$$

Finally, solving Equation (vi) for the cost of equity capital (k) yields the MTB formula:

$$k = \frac{r(1-b)}{P/B} + br + sv. \qquad \text{(vii)}$$

Equation (vii) indicates that the cost of equity capital equals the expected return on equity multiplied by the payout ratio, divided by the market-to-book ratio plus growth. Exhibit__(SGH-16) shows the results of applying Equation (vii) to the defined parameters for the electric utility firms in the comparable sample. Page 1 of Exhibit__(SGH-16) utilizes current year (2005) data for the MTB analysis while Page 2 of Exhibit__(SGH-16) utilizes Value Line's 2008-2010 projections.

The MTB cost of equity for the entire sample of electric utility firms, recognizing a current average market-to-book ratio of 1.76 is 9.27% using the current year data and 8.98% using projected three- to five-year data. This analysis supports the accuracy of my DCF equity cost estimate.