Principles of Public Utility Rates

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$$k = \frac{D_1}{P_0} + g$$

which may be read as the required cost of equity is equal to the expected dividend yield plus the expected constant growth rate. Suppose the current price of the stock is $15 a share, the current dividend is $1.00 a share and the expected growth rate in dividend is 10 percent per year. Then, the expected return from an investment in this stock is:

$$k = \frac{\$1.00\ (1.10)}{\$15} + 10 \text{ percent}$$

$$= .073 + .100$$

$$= .173 \text{ or } 17.3 \text{ percent}$$

It should be obvious that one can get any expected return on equity one wants simply by picking a particular growth rate. This is where most of the controversy arises among cost of capital witnesses. The first point to remember in evaluating the growth rate is that it is not what a witness thinks the growth rate should be that matters. What matters is what investors *expect* the growth rate to be. The rate of return analyst is really trying to (or should be trying to) replicate the thinking of investors in developing their expectations regarding the growth in dividends. In all, the DCF method takes into account several factors important in the determination of the fair rate of return: (1) preferences of investors; (2) equity financing; (3) risk, and (4) inflation. (For a detailed discussion of these factors see Howe and Rasmussen 1982, pp. 131-133.)

Three Methods of Estimating the Growth Rate. Three methods are commonly used to estimate the growth rate: (1) historical growth rates, (2) analysts' forecasts of growth rates, and (3) sustainable growth or retention growth. The historical growth rate in dividends or earnings per share over some period of time, usually five or ten years, is often used. Sometimes historical growth in book value per share is used. Because dividends are changed at discrete intervals, and because growth in earnings is sometimes erratic, some type of smoothing technique is often applied to the raw data. The real question, however, is whether or not investors base their expectations of future growth on what the growth rate has been in the past.

Analysts' forecasts have become quite popular in recent years. Some services such as *Value Line* publish forecasts of dividend growth rates for five years on a regular basis which are readily available to investors. Consensus forecasts, or the average of several forecasts are frequently utilized by rate of return analysts. Regardless which forecasts are considered, analysts' forecasts generally are for three or five years. Since the basic DCF model calls for a long-term sustainable growth rate, the use of analysts' forecasts represents a compromise.

The third method of estimating the expected growth rate is what is called the retention growth rate method. This method is based on the reality that future dividends will be generated by future earnings. The source of the growth in future dividends is derived from plowing back earnings into the firm rather than paying them out in dividends. The method estimates future growth based on the percentage of earnings retained and the rate of return on book equity. Quite, simply, if the percentage of earnings retained is (b), and it is multiplied by the rate of return on book equity (R), the estimate of future growth (g) is: $g = b \times R$. If a company earns 10 percent on book equity, and pays all the earnings out in dividends, the plowback factor will be zero and earnings per share will not increase, and dividends assumed to be a constant fraction of earnings will not increase either. Conversely, a company which retains all of its earnings and pays no dividend, will be able to grow at an annual rate of 10 percent in the future. For the retention growth method to produce an accurate or exactly correct estimate, three assumptions must hold: (1) the rate of return on equity must be constant over time, (2) the retention rate must be constant over time, and (3) the company cannot sell any new common stock or, if it does, must sell it at book value.

Realistically, these assumptions have not held in the past for utilities in general. In fact, one would be hard pressed to find a utility for which they have held. However, it is the future, not the past, that matters. While year-to-year fluctuations in the variables are to be expected, the average return on equity and the average retention rate over time may be expected to be reasonably stable, particularly when the payout ratio, and hence, the retention rate, is a matter of policy. Despite its limitations it is a frequently used method of estimating the required growth rate, and has its proponents and opponents.

In actually implementing the DCF method, information on known dividend increases may be substituted for mechanically increased dividends based on an adopted growth rate. Also, the stock price used in making the calculation may reflect an average price over a period of time rather than the price on a particular day in order to remove aberrations from the calculation. Aberrations may be caused by events internal to the company, such as the stock going ex-dividend, or external factors, such as political events influencing the price of a

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company's stock. Even accepting that an average price is more appropriate than a spot price does not eliminate disagreement among analysts regarding how long the period over which prices should be averaged. In principle, the period should be long enough to take out the aberrations, but short enough so as not to obscure any real trends in the market.

It should be obvious that the resulting DCF estimate of the cost of equity for a particular utility is sensitive to the assumptions the analyst makes regarding the necessary data inputs. As a result the DCF approach is frequently extended to groups of comparable companies, usually, but not always, utilities. The alleged advantage is that errors in the estimates of individual companies tend to cancel, and one can have greater confidence in the group average (see Brealey and Meyers, 1984, p. 50).

The practical problem with such an application, and where controversy is likely to arise, is in the comparability of the group or groups of companies. If there is any one point on which analysts agree, it is that no two utilities are identical with respect to all types of risk. Risk indicators used as screens to test comparability include bond ratings, betas, equity ratios, Safety Rankings and Financial Strength Ratings from *Value Line*, and statistical measures of the variability in equity returns. In the case of electric utilities a measure of nuclear exposure is used by some analysts.

Adjustment for Quarterly Dividend Payout. Another variant of the basic DCF model is a model which explicitly takes into account the fact that dividends on utility stocks usually are received four times a year rather than only once as assumed in the annual version of the model. The purpose of specifying the model in quarterly rather than annual terms is to take into account the possibility of reinvesting the quarterly dividends for part of the year. Depending upon the magnitude of the variables, the dividend, price, and growth rate, the difference between the return estimated by the annual version of the model and the quarterly version may be as much as 0.5 percent to 0.6 percent. This difference could explain a major part of the difference in the estimated cost of equity among expert witnesses.

In evaluating the merits of the quarterly timing adjustment a few points stand out. First, some of the models that are used are based on the assumption that the dividend is increased each and every quarter. That is as unrealistic an assumption as the one based on a single annual payout. Second, sometimes the annual growth rate that is estimated is used in the quarterly model. There should be consistency between the growth rate used in making the estimates and the time historical returns of a stock are compared with the returns of the market, usually defined as one of the broad based market indexes like the Standard and Poor's 500 or the New York Stock Exchange index. If the volatility of a stock's returns is greater than that of the market, the stock is regarded as above average risk. It follows that if the stock's returns are less volatile than the market, the stock is regarded as below average risk. Beta provides a way of adjusting the market premium of equity compared to debt for the riskiness of an individual stock.

CAPM is closely connected to the efficient market hypothesis that assumes since information is very rapidly and accurately assimilated, securities are properly priced at any point in time (See e.g., Hirt and Block, 1987). Since there is almost instantaneous adjustment to new information, no stock price is in disequilibrium or improperly priced for very long. This information travels randomly so that stock prices are an unbiased independent reflection of all currently available information. Most researchers feel that the semi-strong form of theory that maintains that all publicly available information is already embedded in the value of a security is generally valid. But there are exceptions.

Basic Formula. In its basic form, the CAPM asserts that an investor expects a return on a stock that could be realized on a risk-free investment plus a risk premium that is proportional to the stock's market risk, beta, and market risk. Although it sounds complicated, the relationship may be written as:

$$k = R_F + ß\,(R_M - R_F)$$

where: k is the expected return or cost of capital

R_F is the expected risk-free return

$ß$ is the stock's expected relevant market risk beta

R_M is the expected stock market return (i.e., expected return on a stock market portfolio).

To implement this model, the expected beta for the company, the expected risk-free rate and the expected return on the stock market are required. Theoretically, the rate of a short-term U.S. government obligation is risk-free. It is free of default risk and as a practical

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In principle, the beta should be forward looking. In practice, however, the beta used to implement the CAPM is an historical beta, Usually, a beta published by a service such as *Value Line* is used. The third data requirement of the model is an estimate of the market return. What is the expected return on the stock market? Some analysts attempt to measure or estimate the expected return on the market directly. If so, one technique would be to perform a DCF analysis for a broad market index such as the Standard & Poor's 500. Conceptually, the market index that is used should be consistent with the index used to estimate the beta, but this is rarely done in practice. One way around the necessity of directly estimating the expected return on the market is to add the current risk-free rate to an historical equity differential between the stock market and the risk-free rate. One frequently used source of the necessary differential is the Ibbotson and Sinquefield (1984) study discussed previously.

Criticism. CAPM has been castigated on both theoretical and practical problems (See the survey in Phillips 1984, pp. 358-360). The theoretic problems involve the reliability of CAPM's basic assumptions and its static nature. While the CAPM has been critiqued rather extensively in the finance literature (Roll, 1977, and Ross, 1978; and the Autumn 1978 issue of *Financial Management*, Vandell and Malernee, 1978; Roll and Ross, 1983), its limited popularity is probably more a result of the estimates it produces and their volatility. It should be rather obvious that when interest rates are high and volatile, the use of a short-term risk-free rate will produce very high estimates of the cost of equity. Conversely, when the risk-free rate is low, the results derived from the CAPM are likely to be quite low. The popularity of the model itself likely will vary inversely with the level of interest rates. Also there are problems associated with estimating beta and selecting appropriate market portfolios (Malko and Enholm, 1985). The acceptability of witnesses tied to this model is likely to vary inversely with interest rates also. The popularity of the CAPM in rate cases is the subject of surveys by Pettway (1978) and Harrington (1980, 1981). Vandell and Malernee (1978, p.23) conclude that as of