Constant Growth DCF Model

The DCF approach is based on the theory that a stock's current price represents the present value of all expected future cash flows. In its most general form, the DCF model is expressed as follows:

$$P_0 = \frac{D_1}{(1+k)} + \frac{D_2}{(1+k)^2} + ... + \frac{D_\infty}{(1+k)^\infty} \quad [1]$$

where:

P_0 = the current stock price;

$D_1 \ldots D_\infty$ = all expected future dividends; and

k = the discount rate or required ROE.

Equation [1] is a standard present value calculation that can be simplified and rearranged into the familiar form:

$$k = \frac{D(1+g)}{P_0} + g \quad [2]$$

Equation [2] is often referred to as the "Constant Growth DCF" model in which the first term is the expected dividend yield and the second term is the expected long-term growth rate.

Multi-Stage DCF Model

The model sets the subject company's stock price equal to the present value of future cash flows received over three "stages." In all three stages, cash flows are equal to the annual dividend payments that stockholders receive. Stage one is a short-term growth period that consists of the first five years; stage two is a transition period from the short-term growth rate to the long-term growth rate which occurs over five years (i.e., years six through 10); and stage three is a long-term growth period that begins in year 11 and continues in perpetuity (i.e., year 200). The ROE is then calculated from the initial stock investment and the dividend payments over the analytical period. A summary description of the model is provided in Table 1.

Table 1: Multi-Stage DCF Structure

Stage	**0**	**1**	**2**	**3**
Cash Flow Component	Initial Stock Price	Expected Dividend	Expected Dividend	Expected Dividend
Inputs	Stock Price Earnings Per Share ("EPS") Dividends Per Share ("DPS")	Expected EPS Expected DPS	Expected EPS Expected DPS	Expected EPS Expected DPS
Assumptions	30, 90, and 180-day average stock price	Analyst EPS growth rate	Transition growth rate	Long-term growth rate (nominal GDP)

Table 2 summarizes the assumptions that are used in the multi-stage DCF model.

Table 2: Assumptions in the Multi-Stage DCF Model

Stage	**0**	**1**	**2**	**3**
Stock Price	30, 90, and 180-day average stock price as of March 31, 2014			
Earnings Growth	EPS as reported by Value Line	EPS growth as average of (1) Value Line, (2) Zacks, and (3) First Call projected growth rates	Transition to Long-term GDP growth on geometric average basis	Long-term GDP Growth

It is important to note that while the model calculates the cost of equity based on expected dividends, it does not rely solely on Value Line for dividend growth rate projections. A common and legitimate criticism of DCF models that rely on projected dividend growth rates (especially in the Constant Growth form of the model) is that Value Line is the sole source of such projections.

Capital Asset Pricing Model

The CAPM is defined by four components, each of which must theoretically be a forward-looking estimate:

$$K_e = r_f + \beta(r_m - r_f) \quad [3]$$

where:

K_e = the required market ROE;

β = Beta of an individual security;

r_f = the risk-free rate of return; and

r_m = the required return on the market as a whole.

In this specification, the term $(r_m - r_f)$ represents the market risk premium. According to the theory underlying the CAPM, since unsystematic risk can be diversified away, investors should be concerned only with systematic or non-diversifiable risk. Non-diversifiable risk is measured by Beta, which is defined as:

$$\beta = \frac{Covariance(r_e, r_m)}{Variance(r_m)} \quad [4]$$

The variance of the market return, noted in Equation [5], is a measure of the uncertainty of the general market, and the covariance between the return on a specific security and the market reflects the extent to which the return on that security will respond to a given change in the market return. Thus, Beta represents the risk of the security relative to the market.

Bond Yield Plus Risk Premium

To estimate that relationship, I conducted a regression analysis using the following equation:

$$RP = a + b(T) \qquad [5]$$

Where:

RP = Risk Premium (difference between allowed ROEs and the yield on 30-year U.S. Treasury bonds)

a = intercept term

b = slope term

T = 30-year U.S. Treasury bond yield

Data regarding allowed ROEs were derived from 636 rate cases from 1992 through March 2014 as reported by Regulatory Research Associates. This equation's coefficients were statistically significant at the 99.00 percent level.