Corporate Finance, Module 3: “The Value of Common Stocks”

Formulas for Common Stock Valuation

(The attached PDF file has better formatting.)

Know especially the following formulas for this module:

Page 61: $$r = \frac{DIV_1 + P_1 - P_0}{P_0}$$

Question: In lay terms, what does this formula say?

Answer: The *market capitalization rate* is *economic income* divided by *market value* at the *beginning of the period*.

Economic income is the *cash flows* (the dividends) plus the *change in the market value*. In a later module, we denote the change in the market value, which is the *change in the present values of future cash flows*, as the negative of *economic depreciation*. We can state the numerator of this ratio as: *economic income* is the *cash flows* minus *economic depreciation*. The stock price P is the market value of the asset.

Page 61: $$P_0 = \frac{DIV_1 + P_1}{1 + r}$$

This formula re-writes the formula above to express the current market value as a function of cash flows, capitalization rate, and the future market value.

Question: If we don’t know the current market value, we surely don’t know the future market value. What is the purpose of this formula?

Answer: This is an intermediate formula; we expand P_1 in terms of P_2, then P_2 in terms of P_3, and so forth to get the market value in terms of the stream of future dividends and the market capitalization rate.

Page 62: $$P_0 = \sum_{t=1}^{H} \frac{DIV_t}{(1+r)^t} + \frac{P_H}{(1+r)^H}$$

Question: Do actuaries use this formula?

Answer: The formula expresses the market value in terms of the stream of future cash flows for a definite period, such as 20 years, discounted to the present value, plus the horizon value at the end of the period. Suppose we are pricing a long term policy whose cash flows may extend over 60 years, such as permanent life or workers’ compensation. Using a 60 year pricing model is inefficient, since the cash flows more than 20 years in the future are small and uncertain. Instead, we use a 20 year pricing model and estimate the horizon value after 20 years. The Atkinson and Dallas text on the SOA Course 5 syllabus uses this method.

Page 64: $$P_0 = \frac{DIV_1}{r - g}$$

This formula is called the dividend growth model or the dividend discount model; it is the most commonly used formula for this module.

The variable *g* is the dividend growth rate; it is also the earnings growth rate if the dividend payout ratio remains constant. The formula has numerous variants for mixed situations, such as a firm that grows at 15% per annum for 5 years with a 10% dividend payout ratio and then grows at 5% per annum with a 50% payout ratio afterward. Investment courses emphasize these formulas; the CFA syllabus has a hundred pages on variants of this formula. For the corporate finance course, know the basic formula; you will not be tested on the variants.

Question: Why do we infer the stock price, which is known, from the capitalization rate and the dividend growth rate, which are unknown?

Answer: In practice, we switch the terms around to infer the capitalization rate from the stock price and the dividend growth rate; see below.

Page 65: $r = \frac{DIV_1}{P_0} + g$

This is the most important practical formula in this module. We use the capitalization rate for many problems. We can estimate the capitalization rate from the Capital Asset Pricing Model or the dividend growth model. It is rarely possible to use the CAPM, since we rarely know the covariance of the stock's return with the market returns; see the modules on the CAPM. The dividend growth model is easier. Suppose the current stock price is \$80, this year's dividend is \$4, and the dividends have been growing at about 10% per annum. We infer next year's dividend as \$4 × 1.1 = \$4.40. The capitalization rate is \$4.40 / \$80 + 10% = 15.50%.

Page 66: plow-back ratio = 1 – payout ratio

This is a definition, not a formula. The plow-back ratio is the percentage of earnings that are not paid as dividends.

Page 66: payout ratio = DIV / EPS

Page 66: ROE = EPS / book equity per share

Question: What is the difference between ROE and the capitalization rate?

Answer: The ROE is the return on book equity; the capitalization rate is the return on market value. Be careful with these concepts. The return on book equity is used for common stock valuation and for accounting measures of return. In later modules we deal with r_A, r_E, and r_D, which are the returns on assets, equity, and debt. The return on equity in those modules in the return on market equity, not book equity.

Question: So the denominator is different for these two ratios: book equity for the ROE and market value for the capitalization rate. Is the numerator also different?

Answer: The numerator for ROE is GAAP income, or the cash flows minus accounting depreciation. The numerator for the capitalization rate is economic income, or the cash flows minus economic depreciation. Economic depreciation for a period is the market value at the beginning of the period minus the market value at the end of the period.

- For an infinite life project, like a common stock, $P_{j-1} – P_j$ is normally negative. Similarly, the market value of land generally increases over time, so its depreciation is negative. Stocks and land appreciate; they do not depreciate.
- For a limited life project, $P_{j-1} – P_j$ is normally positive, since the investment occurs at the very beginning, after which the firm receives cash inflows. Similarly, many real assets, such as machinery or a factory, depreciate over time.

Page 67: dividend growth rate = plow-back ratio × ROE

- If a firm earns a 10% return on its equity (ROE), and it reinvests 100% of its earnings in the firm (plow-back ratio), its earnings and its dividends grow at 10% a year.
- If a firm earns a 10% return on its equity (ROE), and it reinvests 20% of its earnings in the firm (plow-back ratio), its earnings and its dividends grow at 2% a year.

Page 71: $P_0 = \frac{EPS_1}{r} + PVGO$

Brealey and Myers seek to explain why common stock prices differ so greatly. Two firms with the same systematic risk may be earning $5 per share, but one firm has a stock price of $40 and the other firm has a stock price of $80. The difference is the potential for growth, or the present value of growth opportunities.

Suppose the capitalization rate for a stock is 12% per annum, and the firm earns $3 per share. If the firm is not growing, the dividends are a constant perpetuity, whose value is $3 / 12% = $25. If the firm's stock is selling for $45 per share, the present value of growth opportunities is $20 per share.

This formula is true by definition, since we define the PVGO as the market value of the firm minus the value it would have were it not growing. Brealey and Myers demonstrate this formula by separately quantifying the value of growth.

Page 72: $\frac{EPS}{P_0} = r \times \left(1 - \frac{PVGO}{P_0}\right)$

Stock analysts use the price-earnings ratio as a measure of a stock's growth potential. A high price-earnings ratio means the stock is selling for a high multiple of its annual earnings.

- A high ratio of earnings to book equity is good; it means the firm is using its capital well and returning a high yield to investors.
- Given the ratio of earnings to book equity, a lower ratio of earnings to price means the firm has greater potential for growth (present value of growth opportunities).

This formula is a re-write of the previous formula; make sure you see the correspondence. A higher ratio of PVGO to price means a lower ratio of earnings to price.

The discussion of present value of growth opportunities on pages 71-72 is not easy. If you understand it, that's great; if not, make sure you know the formulas here.