4.4: Cost of Capital

To prepare for this lecture, read Hirschey, chapter 16, 644 – 650; 17, 687 – 693

Firms raise capital in a variety of ways. Broadly speaking, however, there are two sources of capital – debt and equity, and historically these two kinds of capital have exhibited different prices, with equity exhibiting the higher price. The difference is typically referred to as the equity risk premium.

The relative importance of debt and equity capital summarize the firm's capital structure, which together with the costs of debt and equity may be used to estimate the firm's opportunity cost of capital for discounting purposes (*k*). This is also known as the ***firm's weighted average cost of capital*** (WACC), and it represents the opportunity cost of the resources that a firm employs to generate benefits or value.

Suppose for example that a firm has a debt/equity ratio of 0.60 (60% debt financing, 40% equity financing), has market-determined cost of debt (k_d) of 6% (the rate at which outsiders will offer loans) and its cost of equity (k_e) is 14% (the rate of return that investors require). The firm's weighted average cost of capital (WACC = *k*) is:

$$(0.60 * 6\%) + (0.40 * 14\%) = 9.2\%$$

Cost of Debt
This is the return that creditors demand when they lend to a firm. It is closely related to the after-tax return on the firm's bonds, $k_d = (1-t)i$. The interest rate, *i*, in this equation is determined by the market in which the firm seeks a loan.

Cost of Equity
Generally speaking and to keep things relatively simple, there are two methods for calculating the cost of equity – Dividend valuation (sometimes called the Gordon dividend growth model), or the Capital Asset Pricing Model (CAPM).

The Gordon dividend growth model is a simple shareholder valuation model given by:

$$P = D_1 / (k_e - g)$$

where:
$$\begin{cases} P = \text{current value of an ownership share} \\ D_1 = \text{current annual dividend} \\ k_e = \text{discount rate applied to the stock by financial markets} \\ g = \text{annual growth rate of dividends} \end{cases}$$

This model hypothesizes that the price investors are willing to pay for a piece of ownership of a particular firm (a share of the firm's stock) is a function of the dividends that the firm will pay in the future and some rate of growth in the stock price itself (capital appreciation). Using this model, one may infer the discount rate, k_e, being applied by financial markets, and this discount rate is effectively the firm's cost of equity.

For example, if the current price of a share of GE is $30, its annual dividend is $0.72, and consensus forecast of dividend growth over the next five years is 13.5%, the implied discount rate is 15.9%:

$$k_e = \left(\frac{D_1}{P}\right) + g = \left(\frac{\$0.72}{\$30}\right) + 13.5\% = 15.9\%$$

The main implications for cost of equity calculations using the Capital Asset Pricing Model may be summarized by:

$$k_e = r_f + b\lfloor E(r_m) - r_f \rfloor$$

where: $\begin{cases} r_f = \text{a "risk-free" rate, such as a government treasury bill} \\ E(r_m) = \text{the expected market return} \\ b = \text{a company's beta, a measure of company-specific risk} \end{cases}$

Some comments about these elements of the CAPM:

- The risk-free rate of return is the return on an alternative investment with a perfectly predictable rate of return in terms of the unit of account being used. Thus, it is not free of currency risk.

- The expected return of the market is influenced by the aggregate risk aversion of investors and the volatility of the market returns in general. Thus, in periods of great uncertainty and high market volatility, we might expect $E(r_m)$ to rise.

- The equity risk premium, $RP = E(r_m) - r_f$, is not directly observable in the market, and must be estimated. It is best thought of as a weighted average of the degree of risk aversion of the holders of wealth (*A*) times the variance of the market:

  $$RP = E(r_m) - r_f = A\sigma_m^2$$

  Siegel (1992) estimates that the *RP* from 1926 to 1990 was about 8.1%. Ibbotson Assoc. (a consultancy) has estimated the *RP* to be between 6.2% - 7.8% over the last 74 years, but it has been lower over the last 30 years. Other researchers have suggested that the best guess is between 4% and 6%. Thus a range for *RP* might be 4% to 8 %. If r_f is 5%, a decent expected return for the market is in the neighborhood of 9% to 13%. Of course, expected return and actual return rarely meet – that's what uncertainty in the marketplace is all about.

- The firm's beta is a statistical measure of a firm's market-related risk. It tells us how a firm's stock return tends to co-vary with the market return. It is calculated as:

  $$b = \frac{\sigma_{i,m}}{\sigma_m^2}$$

Illustrations

Case 1: Wal-Mart's cost of equity

On September 1, 2000, the common stock of Wal-Mart closed at $49.00 per share. In 1999 Wal-Mart paid a dividend of $0.22. The consensus forecast of dividend growth for Wal-Mart was 14.6% per year (thus, the expected dividend for 2000 was $0.25). At the time, Wal-Mart's β was 1.198. On September 1, 2000, a risk-free rate was 6.23%.

Using the Gordon dividend growth model to estimate the cost of capital:

$$k_e = \left(\frac{D_1}{P}\right) + g = \left(\frac{\$0.25}{\$49.00}\right) + 14.6\% = 15.11\%$$

Using the CAPM to estimate the cost of capital:

$$k_e\big|_{RP=4\%} = r_f + \beta\left[E(r_m) - r_f\right] = 6.23\% + 1.198[4\%] = 11.02\%$$
$$k_e\big|_{RP=8\%} = r_f + \beta\left[E(r_m) - r_f\right] = 6.23\% + 1.198[8\%] = 15.81\%$$

Case 2: Briggs & Stratton's Weighted Average Cost of Capital

Suppose that in the year 2000, Briggs & Stratton had the following capital structure:

Debt financing:	$251.6 million
Equity financing:	$843.4 million
Debt/Equity ratio:	.23
Before-tax cost of debt:	7.5%
Corporate tax rate:	38%
r_f (weighted average of 30-year government bond rates):	6.05%
	0.83

Using the CAPM (with RP = 6%) to compute Briggs & Stratton's cost of equity, and incorporating this into the calculation for WACC:

$$k = w_d k_d + w_e k_e$$
$$k = 0.23 * [7.5\% * (1 - .38)] + 0.77 * [6.05\% + 0.83 * (6\%)]$$
$$k = (0.23 * 4.65\%) + (0.77 * 11.03\%)$$
$$k = 9.56\%$$

Relevant Textbook Problems: 17.1, 17.3, 17.10

Relevant Case Study for an understanding of the CAPM: Stock-Price Beta Estimation for Google, Inc. (chapter 16.