Chapter 9

DETERMINING THE COST OF CAPITAL

The previous chapter introduced the DCF approach to company valuation. We noted that the approach was the most scientific, but suffered from limitations – in particular, the accuracy of cash flow forecasts. A second issue affecting the accuracy of DCF valuations is the selection of an appropriate rate at which to discount the cash flows.

The discount rate that is to be used is the firm's 'cost of capital'; that is, the amount (in percent) that the firm must 'pay' to its providers of capital. In Chapter 2 we discussed the various sources of capital available to corporations, from commercial paper, to convertible bonds to ordinary shares. Each source of capital has a cost – some higher than others. Corporate financiers work with their clients to minimise the firm's cost of capital because as the discount rate declines the firm's value increases.

In this chapter we will focus on the costs of the two main sources of capital: debt and equity.

WEIGHTED AVERAGE COST OF CAPITAL

When trying to determine the correct discount rate, corporate financiers calculate a weighted average of the cost of each component or source of finance (capital). The Weighted Average Cost of Capital (*WACC*) is also known as the opportunity cost of capital (i.e., the amount

of return that a rational investor requires for an investment of similar risk).

The WACC is calculated on an after-tax basis, since free cash flows represent cash available to all providers of capital. Remember when calculating free cash flows we deduct a notional tax charge from the Earnings Before Interest and Tax (*EBIT*) to determine Net Operating Profit After Tax (*NOPAT*).

The formula for the WACC of a company with two sources of capital is set out below:

$$WACC = [(K_d \times (1 - t)) \times (D/T)] + [K_e \times (E/T)]$$

where K_d = Cost of debt;
t = Tax rate;
D = Total debt (market value);
E = Total equity (market value);
T = Debt + Equity (market values);
K_e = Cost of equity.

There are four rules that corporate financiers should obey when calculating the WACC in corporate valuation.

Use market values

The weights used in the formula should be based on the market values of debt and equity, not their book values. The WACC is the expected return on a firm's securities based on their current price – i.e., the return a new

investor would require before purchasing the bonds or shares.

Given this definition, it is clear that the book or accounting values of debt and equity are not appropriate in the weighting. New investors cannot buy shares at book value – they must pay the market price. Similarly, investors in corporate bonds or corporate loans will receive a return that has been adjusted by the market to reflect current market conditions, investment risk, income (interest rate paid) and maturity of the bonds.

However, it is often impossible to determine the market value of privately held debt. When this is the case, the corporate financier is forced to use the book value in her calculation.

Use target/optimal weighting

The proportions used in the WACC are the expected or target proportions of debt and equity capital intended to finance the company during the period in question. Raising capital is 'chunky'. Companies typically wait until they require a significant sum and then raise capital either through the debt or equity capital markets or via a bank loan. Thus, they will regularly deviate from their targets. This should not be seen as an issue as long as, over time, companies tend to stay near their target ratios.

Changes in market prices will also change the existing ratios of debt to equity and other financing sources on a

daily basis. It is more appropriate to use the company's long-term target capital structure.

When determining the target capital structure, the corporate financier will estimate the current market value based capital structure of the company. He then reviews the capital structure of other companies. Finally, the management's approach to financing the business and its implications for the target capital structure is reviewed and an appropriate capital structure is set.

After tax

The WACC must be stated after tax, as free cash flow is also stated after tax. Remember that the free cash flows that are being discounted are based on NOPAT plus depreciation less capital expenditures and increases in working capital.

Match nominal rates with nominal cash flows

In general, nominal rates of return (or costs) should be used. This matches the nominal cash flows that are used in the free cash flow forecast.

In highly inflationary environments, one may wish to calculate a 'real' discount rate to discount 'real' cash flows. This is because high inflation rates are often

very volatile and the forecaster's accuracy can be thrown off. The key rule to remember is that the analyst should never mix nominal cash flows with real discount rates and *vice versa*.

Box 9.1 Example.

Company X has the following costs of capital:

Cost of debt (pre-tax)	8%
Cost of equity	11%
Tax rate	30%
Market value of debt	€5m
Book value of debt	€5m
Market value of equity	€20m
Book value of equity	€10m

The WACC is determined as follows: First, determine the after-tax cost of debt:

$$8\% \times (1 - 30\%) = 8\% \times (0.70) = 5.6\%$$

Second, using market values, determine the total capital outstanding:

$$€5 + €20 = €25 \text{ million}$$

Third, determine the portions of debt and equity:

$$\text{Debt}\left(\frac{D}{T}\right) = \frac{€5}{€25} = 0.20$$

$$\text{Equity}\left(\frac{E}{T}\right) = \frac{€20}{€25} = 0.80$$

Fourth, fill in the equation to determine the WACC:

$$WACC = \left[(K_d \times (1 - t)) \times \frac{D}{T}\right] + \left[K_e \times \frac{E}{T}\right]$$

$$= [(8.0 \times (1 - 0.3)) \times 0.20] + [11 \times 0.80]$$

$$= [5.6 \times 0.20] + [11 \times 0.80]$$

$$= 1.12 + 8.80$$

$$= 9.92\%$$

COST OF DEBT: K_d

The cost of debt to a company is the borrowing cost that the company would pay if it was raising funds today. It is not the existing coupon on its bonds and debentures. It must be stated after tax in order to match the cash flows which are also stated after tax.

There are two approaches to determining the cost of debt:

1. Calculate the yield to maturity and current market values of all outstanding debt. With this information, determine the WACC.
2. Estimate the cost of debt using the 'debt risk premium' method.

The cost of debt is not the coupon rate. It is the current yield to maturity: the opportunity cost of debt.

The first method is the most appropriate, but only works if the business has issued debt for which current yields

to maturity can be determined. So, if a firm has issued bonds with a coupon of 9% and a current yield to maturity of 7.5%, the latter figure would be used in calculating the cost of debt. Remember also that if the yield to maturity has changed from the initial coupon rate, the market price of the bonds will also have changed. If the yield to maturity has increased, the market price of the bonds will be lower than the initial book price, while if the yield to maturity has decreased, the market price of the bonds will have increased.

The debt risk premium method is less exact and less preferred by finance professionals. The corporate financier first finds the risk-free rate (a government bond) and adds a premium for the risk of the company. Typically, the corporate financier will find the credit rating of the company from one of the credit rating agencies and apply the appropriate premium over the government bond.

COST OF EQUITY: K_e

As noted above, the calculation of the cost of debt for companies with publicly traded fixed income securities is fairly straightforward. The calculation of the cost of equity, for both public and private companies, is more difficult.

Remember from the above sections that a company's cost of capital is the same figure as investors' expected

returns from investing in that company's securities.

When estimating the cost of equity or the expected return on equity, the corporate financier needs to estimate the present value of future dividends as well as the present value of the share's anticipated capital appreciation.

In the past, corporate financiers commonly used the dividend discount model to determine the firm's cost of equity. The dividend discount model is a rearrangement of the equation used in the dividend yield approach to valuation. The formula follows:

$$K_e = \frac{\text{Div}_1}{P_0} + g$$

where K_e = Cost of equity;
Div_1 = Dividend per share expected to be paid in the next year;
P_0 = Price per share today;
g = Growth rate of dividends in percent per annum.

Box 9.2 Example.

In October 2005, HSBC – the international banking group – had a share price of 920p and a dividend per share in the past 12 months of 37p per share. Stock Market analysts predicted that its dividend would increase to 41p per share in 2001 and maintain long-term growth of 4%.

According to the dividend model, HSBC's cost of equity at that

time was:

$$K_e = \frac{41}{920} + 4.0\%$$
$$= 0.0444 + 0.04$$
$$= 0.0844$$
$$= 8.44\%$$

Clearly, the dividend model has limitations in its ability to predict the cost of equity: it cannot calculate a cost for companies that do not pay any dividends, nor can it deal with variable dividend growth rates.

CAPITAL ASSET PRICING MODEL

During the 1980s, an academic model that had been developed in the 1960s, called the *Capital Asset Pricing Model* (*CAPM*) began to gain popularity among corporate financiers. The CAPM (pronounced 'cap-em') is a theory of the relationship between the risk of an asset (company) and the expected rate of return required on the asset.

The opportunity cost of capital equals the return on a risk-free asset plus the company's systematic risk (beta) times the market price of risk (market risk premium). The formula, originally derived for investment management purposes, is as follows:

$$K_e = r_f + \beta(r_m - r_f)$$

where K_e = Cost of equity or expected return;
r_f = Risk-free rate of return;
β = Beta;
r_m = (Expected) equity market return;
$(r_m - r_f)$ = Equity risk premium.

The CAPM begins by assuming that investors require a return of at least that which can be earned on the risk-free asset (i.e., the risk-free return). Its next step says that to be attracted to investing in the stock market, an investor requires a premium to compensate him for the additional risk involved. This is represented as $(r_m - r_f)$ and is referred to as the *equity risk premium* or *market premium*.

The major (simplifying) assumption of the CAPM is that the only influence on a share price movement is the movement of the stock market as a whole (market risk). Thus, CAPM finds that the risk of an individual company's share is found in its beta factor. Beta is a measure of a share's riskiness compared with the stock market as a whole.

You should note that the above paragraph is a gross simplification of the theory supporting the CAPM. Those readers who are interested should consult any finance textbook – Brealey and Myers (2000) is a good one. For those corporate financiers who are really keen, the original theory is set out in three papers authored by Sharpe (1964), Lintner (1965) and Treynor (1965).

The following sections examine each component of the CAPM in greater detail.

Risk-free rate

The risk-free rate is the return on a security that has no default risk. Theoretically, any government security in the home market (e.g., Gilts for valuing UK companies) can be used. For company valuation medium- to long-term government bonds are used to determine the risk-free rate. The most popular is the yield to maturity on the 10-year Gilt. Short-term rates such as the 3-month Treasury Bill are not used as they are strongly influenced by short-term inflation considerations.

Market risk premium (equity risk premium)

The market risk premium is the difference between the expected rate of return on the market portfolio and the risk-free rate. Historically determined risk premia can be used (and frequently are), as the long-term relationship between the stock market's returns and the risk-free return is relatively stable. Note that the short-term relationship – i.e., less than 10 years – can vary significantly.

In both the UK and the US, 4.0–5.0% above the government bond rate is typically used as the 'equity risk premium' (see the Appendix for a survey of UK corporate financiers' usage).

Beta (β)

The beta measures the extent to which the returns on a given stock move with a market index. It is a measure of relative risk.

A beta of 1 means that a company's shares are expected to move in line with the market. A beta of 1.5 means that if the index changes by 1.0%, the stock will change price by 1.5% in the same direction as the market. The beta reflects both industry- and company-specific factors.

Companies that are riskier than the overall equity market have a beta greater than 1, while those that are less risky have a beta of less than 1. The beta for most companies falls within the range of 0.6 and 1.5.

Box 9.3 Example.

In October 2005, the 10-year gilt yield (UK Government Bond) was approximately 4.75% and HSBC's beta was 0.95, reflecting the relatively low variability of its shares compared with the market. Assuming that the equity risk premium for the UK was 4%, HSBC's cost of equity was:

$$K_e = 4.75 + 0.95(4.0)$$

$$= 4.75 + 3.80$$

$$= 8.55\%$$

Health warning

The corporate financier should note that there are significant problems with using the CAPM to determine

the cost of equity of a business. Academic studies in many countries have found that the beta factor is not a good predictor of security returns. However, the formula continues to be employed by most corporate financiers in the UK because of its ease of use and the lack of any widely accepted substitute.