

CHAPTER 5

CALCULATING EVA COMPONENTS

5.1 INTRODUCTION

In this chapter the various components that make up the EVA calculation are evaluated and quantified. EVA can be calculated in different ways, as discussed in Chapter 3. If one looks at EVA from a residual income point of view, the full cost of capital (consisting of own funds and borrowed funds) is subtracted from operating profits to yield the residual income or EVA. In this case, the following formula would be appropriate:

$$\begin{aligned} \text{EVA} &= \text{NOPAT} - \text{Capital charge based on IC} \\ &= \text{NOPAT} - \text{WACC} \times \text{IC} \end{aligned}$$

If the profit after interest and tax is taken as a point of departure, only the cost of own capital needs to be subtracted in order to get the residual income, as reflected by EVA. In this instance, the formula above can also be rewritten as follows:

$$\begin{aligned} \text{EVA} &= \text{Earnings after interest and tax} - \text{cost of own capital} \\ &= \text{Earnings after interest and tax} - (k_e \times \text{book value of equity}) \end{aligned}$$

where

$$k_e = \text{component cost of equity}$$

Using a different perspective (more specifically, one that compares the actual returns with the cost of capital), the company's internal success or failure in creating value can be measured by determining the performance spread between ROIC and WACC. The formula for EVA can then be stated as follows:

$$\begin{aligned} \text{EVA} &= \text{Performance spread} \times \text{IC} \\ &= (\text{ROIC} - \text{WACC}) \times \text{IC} \end{aligned}$$

where

$$\text{ROIC} = \text{NOPAT} / \text{IC}$$

The components of this version of the EVA formula, which clearly shows whether the company is creating or destroying value, are analysed and discussed below. It is assumed that the required adjustments, as discussed in Chapter 5, have already been made. The components are:

- ROIC;
- WACC;
- the performance spread; and
- IC.

5.2 ROIC

The ROIC is calculated by taking the adjusted NOPAT and dividing it by the adjusted IC.

$$\text{ROIC} = \text{NOPAT} / \text{IC}$$

NOPAT is the profit that remains after subtracting all operating expenses, including depreciation and cash taxes, from sales revenue, but excluding interest on loans.

So, for example, assume the following financial results for a company:

	R million
Sales revenue	100
Cost of sales	<u>(32)</u>
Gross profit	68
Other operating expenses	<u>(18)</u>
Earnings before interest and tax (EBIT)	50
Less interest	<u>(10)</u>
Earnings before tax (EBT)	40
Tax (including deferred tax) 30%	<u>(12)</u>
Earnings after tax (EAT)	<u>38</u>

If it is furthermore assumed that the actual cash tax rate is 20% of EBIT, then NOPAT can be determined as follows:

EBIT	50
Less cash tax 20%	<u>(10)</u>
NOPAT	<u>40</u>

If the normal tax rate is 30%, then the tax debit in the income statement is 30% of EBIT. However, the cash tax rate is taken as 20% because tax allowances lead to a provision for deferred tax, which in turn means that the tax actually payable in the current year is less than the tax debit in the income statement. If the adjusted IC (at book value at the beginning of the period) amounts to an amount of R100 million, the ROIC can be calculated as follows:

$$\begin{aligned}
 \text{ROIC} &= \text{NOPAT} / \text{IC} \\
 &= \text{R40 million} / \text{R100 million} \\
 &= 40\%
 \end{aligned}$$

The book value of IC at the beginning of the period is used because it is the basis on which the return is earned during the year.

The calculation of ROIC can also be divided into three components, as follows:

$$\begin{aligned}\text{ROIC} &= \text{EBIT} / \text{Sales} \times \text{Sales} / \text{IC} \times (1 - \text{cash tax rate}) \\ &= 50 / 100 \times 100 / 100 \times (1 - 0,20) \\ &= 50\% \times 100\% \times 80\% \\ &= 40\%\end{aligned}$$

This indicates that ROIC can be increased by means of the following:

- an improvement in the operating margin, by generating the maximum profit per Rand of sales;
- an increase in the asset turnover, by maximizing the amount of sales generated by the assets used to generate the sales (capital efficiency); and/or
- a reduction in the effective tax rate, by ensuring that all tax allowances and subsidies are utilised optimally.

This section can be concluded by asserting that ROIC is a function of three factors, namely the operating profit margin on sales, the asset turnover and the effective tax rate (Hawawini and Viallet, 1999:493).

5.3 WEIGHTED AVERAGE COST OF CAPITAL (WACC)

The cost of a company's capital depends on the sources of finance used, as well as the combination (or weights) of each source of finance. Typical categories for financial sources are equity (own share capital and reserves), preferred share capital and debt. The term "component cost" is used to describe the cost (as a percentage) of a specific source of finance.

Suppliers of finance, such as shareholders and financial institutions, require compensation for the risk they take in investing in a given company. Since the suppliers of debt are paid their interest first (before shareholders can get dividends) and the interest expense is tax-deductible for the company, the cost of debt is usually cheaper than the cost of equity.

The appropriate weights to be used depend on the target capital structure of a company (see Section 5.3.2), which may differ from current financial gearing as reflected in the balance sheet. Furthermore, market values, rather than book values, should be used to determine the weights because they reflect the economic values of the finance used.

The calculation of the WACC is calculated as follows:

$$\text{WACC} = w_1k_e + w_2k_p + w_3k_d$$

where

w_1	=	weight of equity;
k_e	=	component cost of equity;
w_2	=	weight of preference share capital;
k_p	=	component cost of preference share capital;
w_3	=	weight of debt; and
k_d	=	cost of debt.

The determination of the weights and the component cost of each source of capital are discussed below.

5.3.1 Weighting sources of finance

It is assumed that the following summarized balance sheet represents the target capital structure of a hypothetical company.

Balance Sheet on 30 June 2002	R million
Non-current assets	75
Net current assets	<u>25</u>
	<u>100</u>
Ordinary share capital and reserves (equity)	60
Preference share capital (12%)	10
Long-term loan (15% interest)	<u>30</u>
	<u>100</u>

The capital structure (in terms of the book values) as reflected by the ratio of equity to preference capital to debt is the following:

Book value of equity : Book value of preference capital : Book value of debt

R60 million : R10 million : R30 million

If all three elements of the ratio are divided by the hypothetical company's total net assets of R100m, the ratio becomes

0,6 : 0,1 : 0,3

From the ratio above, it is clear that the use of book values would result in weights of 0,6 for equity, 0,1 for preference shares and 0,3 for debt. However, market values are preferred to book values, because new capital has to be raised at market values. Copeland *et al.* (1996:248) support this view, saying: "Employ market value weights for each financing element because market values reflect the true economic claim of each type of financing outstanding, whereas book values usually do not".

The use of market values can be applied to the previous example and illustrated as follows: if there are 10 million issued ordinary shares (at a book value of R6 per share) and the current share price is R16, then the market value of equity is R160 million, which is ten million shares multiplied by the price of R16 per share.

If it is assumed that the current market rate on preference shares is 12% and the current interest rate is 15%, then the market value of the preference shares and debt is the same as the book value, which is R10 million and R30 million respectively. In terms of the market values, the equity : preference capital : debt ratio is the following:

Market value of equity : Market value of preference capital : Market value of debt

R160m : R10m : R30m

If each component of the ratio is divided by the sum total of the market value of equity, the market value of preference capital and the market value of debt, (R200 million in total), the ratio is

0,8 : 0,05 : 0,15

Therefore the correct weights to be used to determine WACC would be 0,8 for equity, 0,05 for preference capital and 0,15 for debt.

5.3.2 Optimal capital structure

The optimal (target) capital structure is the combination of equity, preference capital and debt that will maximize the value of the business as a whole, all other things being equal. The target capital structure is the combination of long-term sources of finance that leads to the lowest WACC. In this section, the principles and guidelines used to determine the optimal capital structure are evaluated and discussed.

The capital structure of a company is usually expressed in terms of a debt effect, for example, the debt : equity ratio, or the debt : assets ratio. While it is not possible to provide a formula for the most effective (optimal) capital structure for

all companies, a framework can be provided along with the most important factors to be considered in estimating the optimal structure for a given company.

In order to approach the problem systematically, one needs to make some initial adjustments and then relax some of the assumptions in a stepwise way. The first scenario that is discussed is one where there are no taxes and no financial distress (bankruptcy) costs.

5.3.2.1 No taxes and no financial distress costs

When one compares the financial results of a fully equity-financed company with those of a company that uses debt, one sees that the financial results of a company with debt finance could be more volatile. This is so because of the interest cost, which remains unchanged, irrespective of the level of sales.

Financial gearing has the effect that when profit before interest (EBIT) is increased by a certain percentage, profit after interest (EBT) rises by an even bigger margin, because of the fact that the interest cost remains the same. If sales decrease, there is a negative gearing effect, because the interest expense again remains the same and the resulting percentage decrease in profits is more pronounced than that of sales.

The operational fixed costs have the same leverage effect as the interest expense. This is referred to as the operational leverage of the company. An astute financial manager seeks to balance the total leverage of the company, which consists of the operational leverage and the financial leverage. The effect of financial leverage is illustrated in the example below.

For example, assume a company with total assets of R200 million (100% equity-financed) and 10 million ordinary shares, forecasts the following:

State of economy	Recession	Moderate	Boom
	R million	R million	R million
Sales	80	100	120
Less variable operational costs (20%)	<u>16</u>	<u>20</u>	<u>24</u>
Contribution	64	80	96
Less fixed operational costs	<u>20</u>	<u>20</u>	<u>20</u>
Earnings before interest and tax (EBIT)	<u>44</u>	<u>60</u>	<u>76</u>
(assume there is no tax)			
Earnings per share (EBIT / 10m)	R4,40	R6,00	R7,60

If some debt is used and the following is assumed: total assets of R200 million (60% equity-financed), 6 million ordinary shares and 40% debt:

State of economy	Recession	Moderate	Boom
	R million	R million	R million
Sales	80	100	120
Less variable operational costs (20%)	<u>16</u>	<u>20</u>	<u>24</u>
Contribution	64	80	96
Less fixed operational costs	<u>20</u>	<u>20</u>	<u>20</u>
EBIT	44	60	76
Less interest at 10%	<u>8</u>	<u>8</u>	<u>8</u>
Earnings before and after tax (no tax)	<u>36</u>	<u>52</u>	<u>68</u>
EPS (EBIT / 6million)	R6,00	R8,67	R11,33

From the example it is clear that purely replacing equity finance with debt finance can increase the EPS of the hypothetical company. This financial leverage effect increases the volatility of profits (as measured by EPS). It works well when EBIT increases, but it also magnifies the decrease in EPS when EBIT drops.

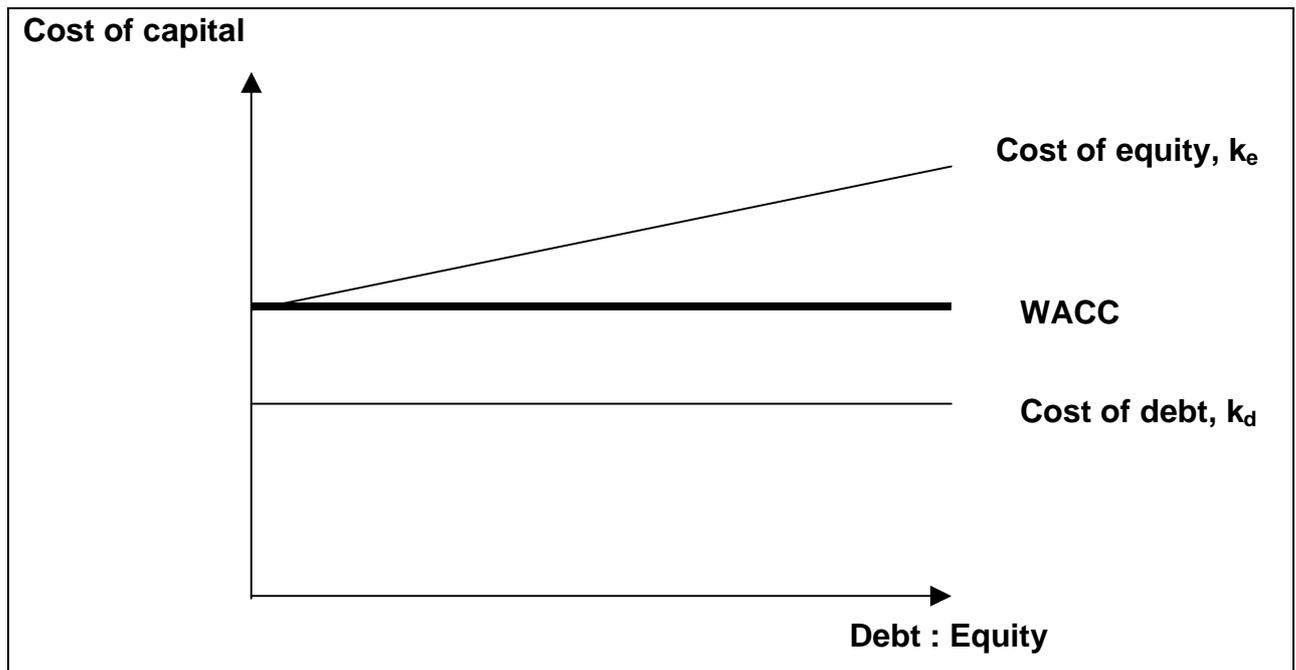
In spite of the fact that the introduction of debt financing seems to increase the profitability of a company, Nobel Prize winners Miller and Modigliani (1961:411) assert that the value of a firm is not determined by the way in which it is financed. Assuming conditions of no taxes and no financial distress costs (for example, legal

costs and losing customers because of the threat of liquidation), they argue that the component cost of equity simply adjusts upwards for the increased risk associated with higher levels of debt finance and, as a consequence, the WACC remains the same.

Since the cash flow stream generated by the assets does not change and the WACC remains the same, the value of the firm does not change. This phenomenon is in line with the so-called Pizza Theory that argues that the size of a pizza (the company) cannot be increased by slicing it into more pieces.

In the absence of taxes, the WACC at different levels of debt financing can be shown as in Figure 5.1.

Figure 5.1: WACC for different levels of financial gearing, no taxes



Source: Hawawini & Viallet (1999:350)

Figure 5.1 shows that the cost of equity increases as the debt : equity ratio increases, but that WACC remains the same for all levels of financial gearing. This is so because the increase in WACC due to the increase in k_e is offset perfectly by

the decrease in WACC due to the greater weight given to the cheaper cost of debt, k_d .

5.3.2.2 Income taxes and no financial distress costs

When income taxes are introduced, the component cost of debt (k_d) is the after-tax cost, because the receiver of revenue finances part of the interest-expense by allowing a deduction for tax purposes. If the interest rate is 15% and the tax rate is 30%, the after-tax cost of debt is 10,5%.

In this scenario, the value of the firm increases by the present value of the annual amount of tax relief received on the interest. This can be calculated as follows:

$$\text{Annual interest tax shield} = t \times k_d \times \text{Debt}$$

where

$$\begin{aligned} t &= \text{tax rate} \\ k_d &= \% \text{ cost of debt before tax} \end{aligned}$$

The value of the leveraged firm (with debt financing) relative to an unleveraged firm is calculated as follows:

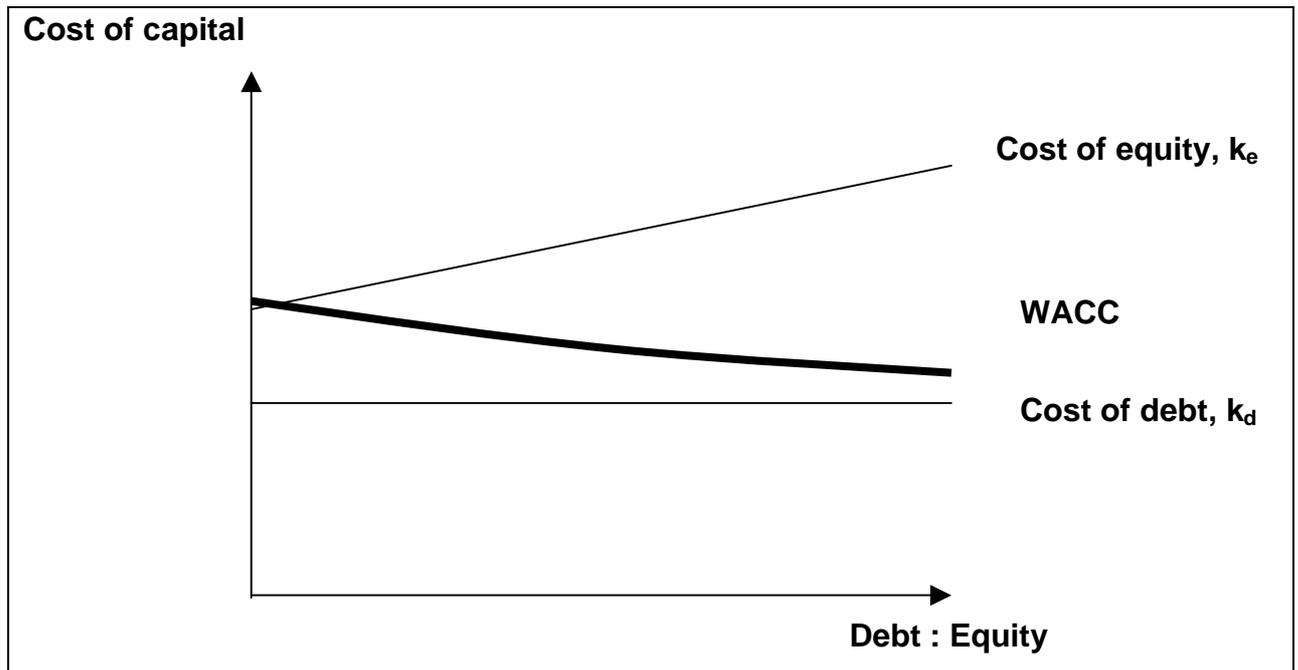
$$V_l = V_u + PV_{ITS}$$

where

$$\begin{aligned} V_l &= \text{value of leveraged firm} \\ V_u &= \text{value of unleveraged firm} \\ PV_{ITS} &= \text{present value of income tax shield} \end{aligned}$$

In this scenario, WACC does indeed decrease with higher levels of borrowed capital, as illustrated in Figure 5.2.

Figure 5.2: WACC for different levels of financial gearing, with taxes



Source: Hawawini and Viallet (1999:359)

When income tax is introduced, the lower after-tax cost of debt causes the WACC to decrease with higher levels of borrowings. If there are no financial distress costs, one can wrongfully conclude that 100% debt financing is optimal.

5.3.2.3 Taxes and financial distress costs

As a company uses more and more debt, its legal interest obligation becomes larger and larger, putting more and more pressure on the business to survive. Financial distress costs resulting from too much debt actually decrease the value of the firm (shrinks the pizza).

The direct financial distress costs are the costs of going bankrupt. They consist mostly of legal and administrative fees. There are also significant indirect costs of financial distress. These are associated with the danger that the firm may go

bankrupt and they usually cause a firm to operate at a level lower than maximum capacity.

Profitable investment opportunities may have to be given up and discretionary costs such as research and development and marketing may have to be reduced. Important employees may leave the company; customers may switch to other companies and even suppliers may be hesitant to grant credit to the company.

The negative impact of these financial distress costs increases the risk and decreases the value of the firm as a whole. Taking this into account, the value of the leveraged firm can be calculated as follows:

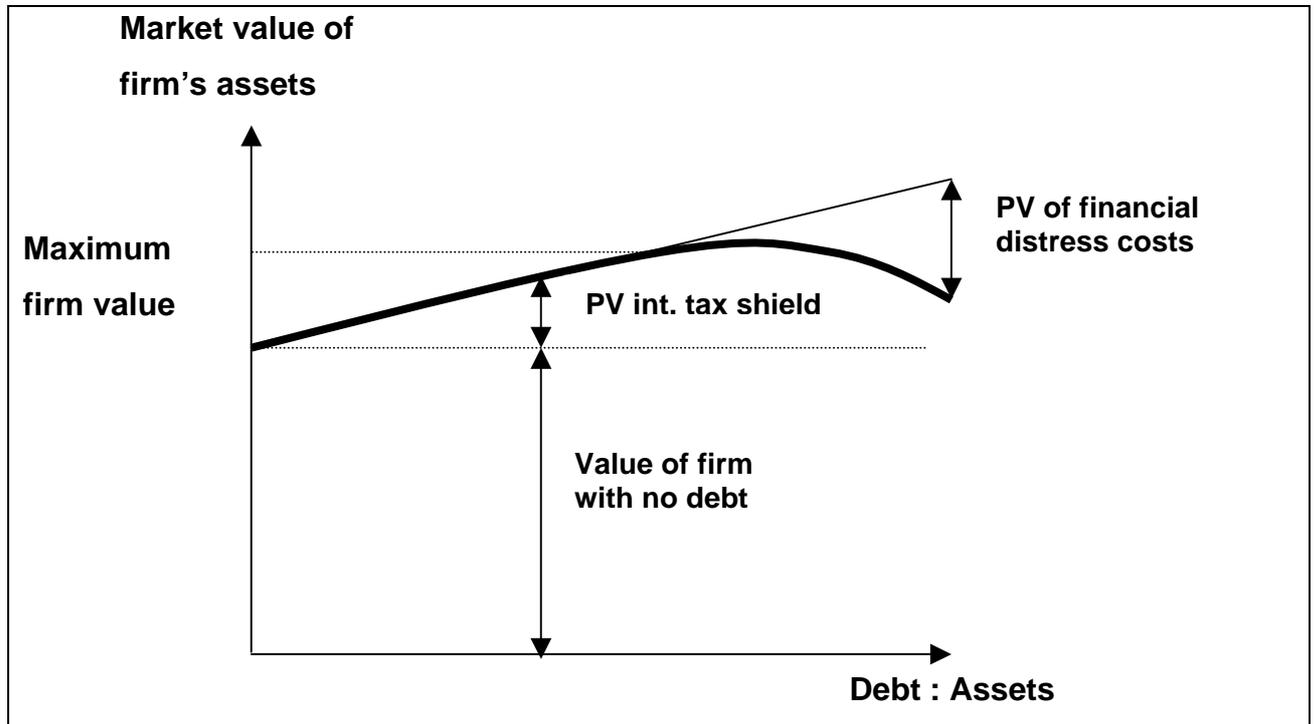
$$V_l = V_u + PV_{ITS} + PV_{CFD}$$

where

$$\begin{aligned} V_l &= \text{Value of leveraged firm} \\ PV_{ITS} &= \text{PV of income tax shield} \\ PV_{CFD} &= \text{present value of financial distress costs} \end{aligned}$$

The value of the firm relative to the level of financial gearing and in the presence of taxes and financial distress costs is illustrated in Figure 5.3.

Figure 5.3: Value of firm relative to financial gearing, with taxes and financial distress costs



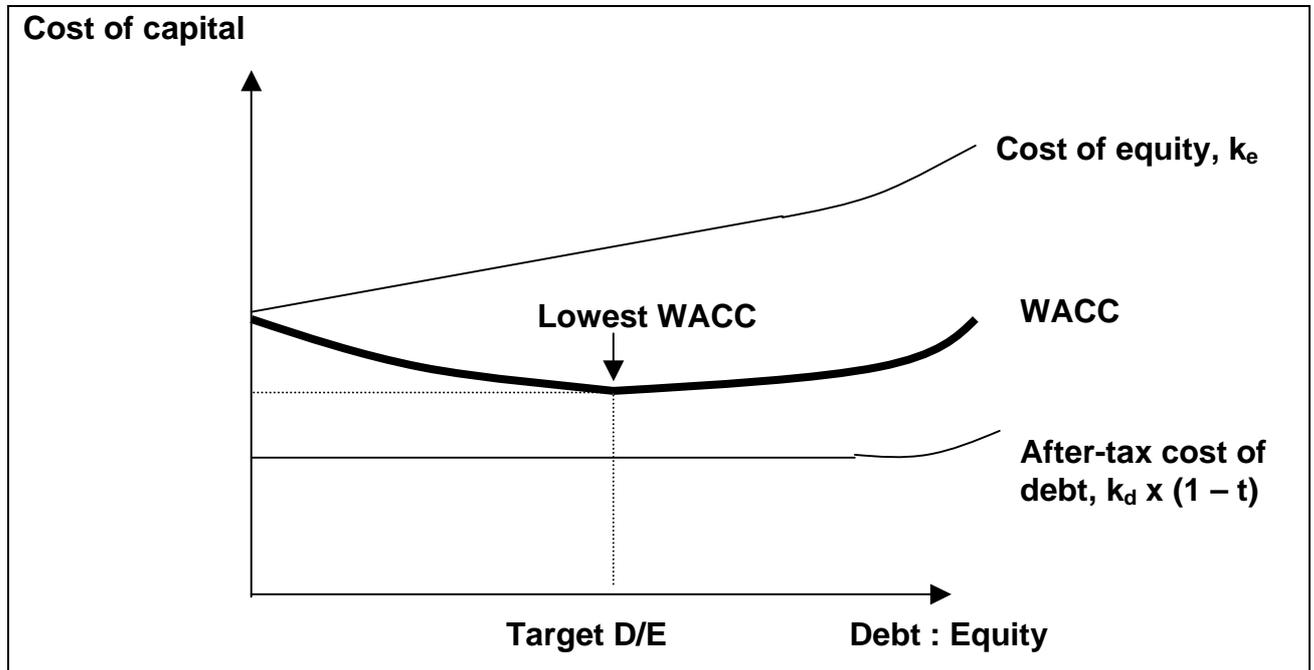
Source: Hawawini and Viallet (1999:361)

Figure 5.3 shows that the value of the firm as a whole can be increased by using higher levels of borrowings, up to a point where the benefits of gearing are offset by the disadvantages of financial distress.

Taking into account the tax benefits of debt financing on the one hand and financial distress costs on the other, one can conclude that the value of the firm is at its highest when the WACC is at its lowest. This level of financial gearing represents the optimal capital structure. This model of debt financing is known as the trade-off model of capital structure (Hawawini & Viallet 1999:362).

The cost of capital relative to the level of debt, incorporating tax and financial distress, is illustrated in Figure 5.4.

Figure 5.4: WACC for different levels of financial gearing, with taxes and financial distress costs



Source: Hawawini and Viallet (1999:362)

From the graph in Figure 5.4, it is evident that using more debt causes the WACC to decrease to a certain point (target ratio), until it starts to increase again because of the effects of financial distress. The dynamic nature of the inputs in determining the WACC must be recognized. So, for instance, the values of interest rates and tax rates change over time, and this in turn changes the WACC. It is therefore possibly more important to know in what interval of financial gearing the optimal level occurs than to know the exact level of gearing that would give the lowest WACC.

5.3.2.4 Factors affecting the capital structure decision

The factors that affect decisions about the level of financial gearing are, according to Hawawini and Viallet (1999:374), the following:

Factors in favour of borrowing:

- Income tax – the tax deduction allowed on interest payments means that the effective cost of debt is the after-tax cost of debt.
- Debt reduces the agency costs of equity – the servicing of the debt disciplines managers not to waste shareholders' funds.
- Debt allows owners to retain control of the company, because it is a means of raising finance without issuing more shares.
- Debt may prevent a possible drop in the share price when shares are issued (if outside shareholders think managers only issue shares when the share price is overvalued).

Factors against excessive borrowing:

- Financial distress costs – companies with high debt experience more financial distress.
- Agency costs of debt – lenders make borrowing agreements stricter to protect themselves against managers that do not manage debt well.
- Difficulty in maintaining a dividend policy – a huge debt burden may make it very difficult for a company to keep paying a steady, or increasing dividend.

- Loss of financial flexibility – large debt obligations may hinder a company in using value-creating investment opportunities.

Designing the right capital structure is more an art than just the application of the correct formula. There is a framework and there are some guidelines, but the process requires insight, good timing and, above all, sound judgment.

5.3.3 Component cost of equity

The cost of equity is indicated as k_e . It can be calculated or estimated using three different approaches. These approaches are:

- the dividend discount model;
- the capital asset pricing model (CAPM); and
- the arbitrage pricing model (APM).

The three approaches are discussed below.

5.3.3.1 Dividend discount model

The dividend discount model is based on the assumption that ordinary shareholders only have a residual claim against the company, once obligations (including interest and repayments of loans) have been met. Consequently, shareholders value their shares based on their expectation of future dividends, as well as their required rate of return.

According to the dividend discount model, the value of an ordinary share is equal to the present value of all the expected future cash dividends to be received. The model can be expressed as follows:

$$P_0 = D_1 / (1 + k_e)^1 + D_2 / (1 + k_e)^2 + \dots D_t / (1 + k_e)^t + \dots$$

where

$$\begin{aligned} D_1 &= \text{dividends in period 1} \\ D_t &= \text{dividends in period t} \\ k_e &= \text{required return from this share} \end{aligned}$$

If the market is in equilibrium and the shares appropriately priced according to the required risk, then the price, P_0 , can be inserted in the formula in order to calculate the required return, k_e . The required return is also the cost of the equity capital.

The formula above presents a problem, in that it is impossible to forecast all future dividends. This difficulty can be overcome by making an assumption about the future growth in dividends. If the future growth in dividends is expected to remain constant, and it is indicated by the symbol “g”, the so-called Gordon Constant Growth Model formula can be used. It is stated as follows:

$$P_0 = D_1 / (k_e - g)$$

This formula can be rearranged as follows:

$$k_e = D_1 / P_0 + g$$

When expressed like this, it is clear that the cost of equity, k_e , is a function of the next year's dividend, the current ex-dividend price per share and the future expected constant growth rate in dividends, g.

So, for example, assume that the current ex dividends share price of one ordinary share in a company is R40. The expected dividend at the end of the next year is R2 per share and the expected future constant growth rate in dividends is 15%.

The formula can be applied as follows:

$$\begin{aligned} k_e &= R2 / R40 + 15\% \\ &= 5\% + 15\% \end{aligned}$$

$$= 20\%$$

From the calculation of k_e above, it is clear that the cost of equity consists of two components. The first is the expected dividend yield, as expressed by D_1 / P_0 , and the second is the expected constant future growth rate, g .

The dividend discount model, however, has very limited application due to the underlying assumptions. While it is impossible to estimate future dividends for an indefinite period, it is also totally impractical to expect that dividends will remain constant (no growth) or that dividends will grow at a constant rate.

Further problems are encountered if it is assumed that there are no dividends and if the expected future growth rate exceeds the cost of equity. All these problems have led to the formulation of other models (discussed below) to determine a more reliable cost of equity. The first of these, namely the CAPM, is discussed below.

5.3.3.2 *Capital asset pricing model (CAPM)*

The CAPM was developed using the assumption that shareholders can only expect to be compensated for risk, which cannot be diversified away. This risk is called systematic risk. Oost (1988:5.13) and several others have expressed total risk as follows:

$$\begin{aligned} \text{Total risk} &= \text{Systematic risk} + \text{Unsystematic risk} \\ &= \text{Non-diversifiable risk} + \text{Diversifiable risk} \end{aligned}$$

An investor is able to hedge against company-specific risk (also called unsystematic risk and diversifiable risk) by holding a portfolio of shares instead of investing in one kind of share alone. Consequently, shareholders can only expect to be compensated for systematic risk and the rate of return they require should only reflect this kind of risk.

The portfolio effect of diversification on the risk of a portfolio of shares is illustrated in Figure 5.5.

Figure 5.5: Portfolio effect of diversification

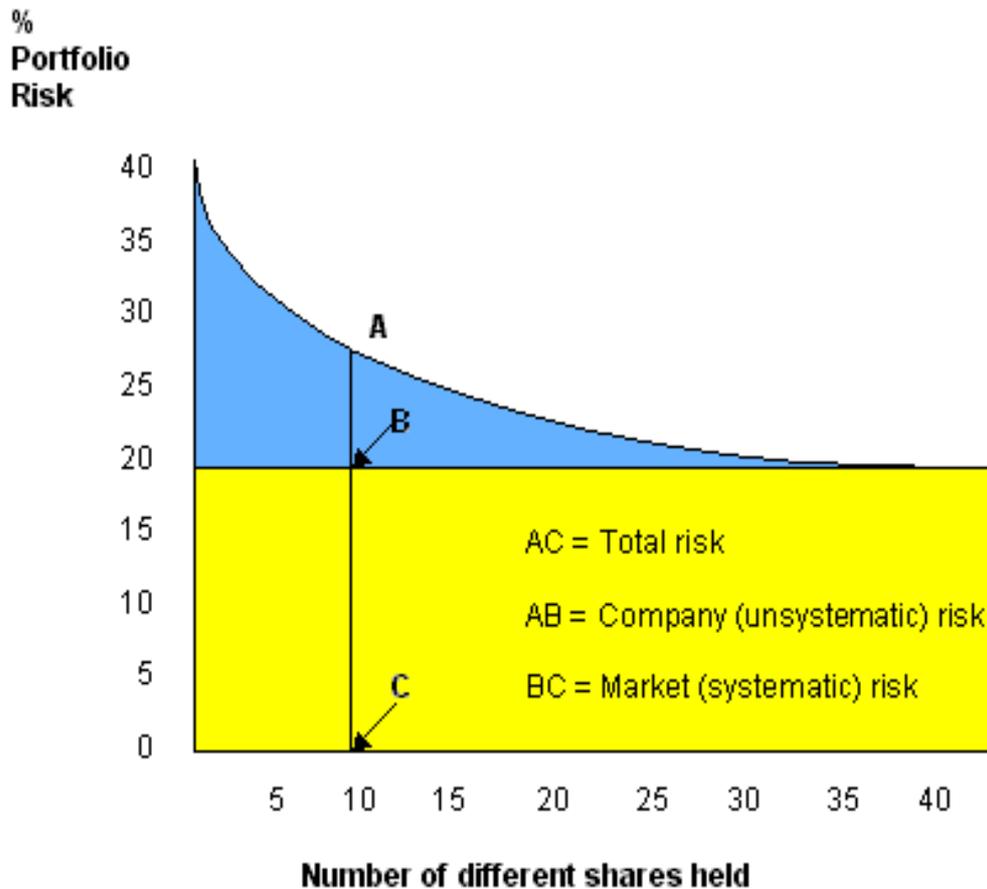


Figure 5.5 shows that increasing the number of shares in the portfolio decreases the portfolio risk, as indicated by the standard deviation of returns. However, increasing the number of shares only eliminates the company-specific risk (unsystematic risk) and not the systematic risk. Shareholders holding a fully diversified portfolio of shares expect (or require) compensation for the risk they cannot diversify away, namely systematic risk.

The CAPM calculates the cost of equity by starting off with the so-called risk-free rate and then adds a premium for systematic risk.

The CAPM formula is the following:

$$k_e = R_f + \beta(R_m - R_f)$$

where

R_f = Risk-free rate

β = beta-factor

R_m = Market rate of return

The risk-free rate can be estimated by using the rate for government bonds for an appropriate maturity date. The beta-factor is a measure of systematic risk. It is determined for a specific company or for an industry by using the statistical method of least squares and by calculating the regression. The returns of the company (or industry) are taken as the dependent variable, y , and the returns of the market as the independent variable, x .

The beta-factor is therefore a measure of the volatility of the returns of the company shares, relative to the returns of the market. The calculation of the cost of equity by using the CAPM and the beta-factor is described by many academic sources, including Beneda and Colson (2003:66).

If the returns of a given company move in harmony with the market and show exactly the same volatility as the returns of the market, the beta-factor is 1. The beta-factor is greater than 1 if the returns of the company are more volatile than those of the market. If, on the other hand, the returns of the company are less volatile than those of the market, the beta-factor is less than 1.

The market return is the average return of the market as a whole, which is normally the return of the securities exchange on which the shares are traded. The average returns of the sector in which the company operates can also be used as a proxy for the market as a whole. The market return minus the risk-free rate is the

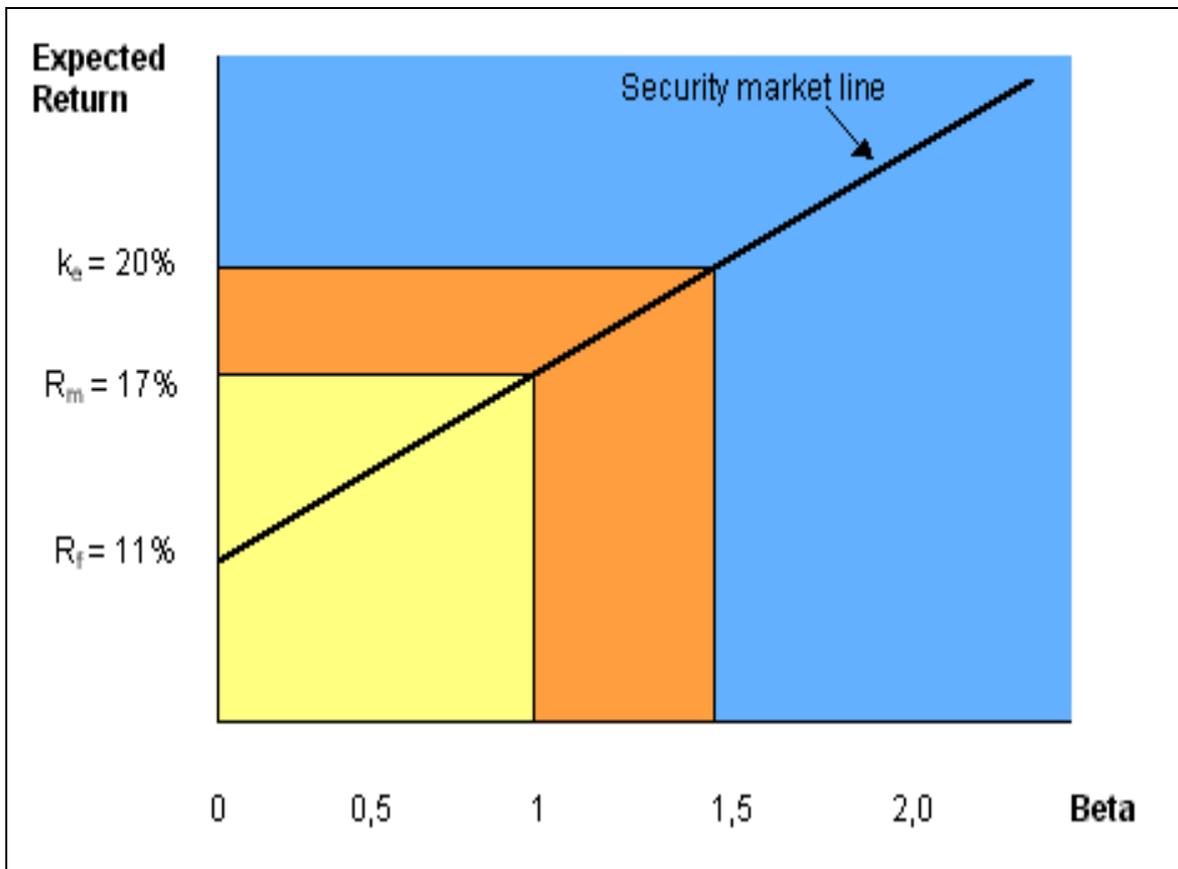
so-called market premium. The market premium multiplied by the beta-factor is added to the risk-free rate to determine the cost of equity.

So, for example, Company X has a beta-factor of 1,5 and the risk-free rate is 11%, while the market return is 17%. The cost of equity can then be determined as follows:

$$\begin{aligned}k_e &= R_f + \beta (R_m - R_f) \\ &= 11\% + 1,5 (17\% - 11\%) \\ &= 20\%\end{aligned}$$

The graph in Figure 5.6 uses the information from the example above. It shows how the risk-free rate, the beta-factor and the market premium are used to determine the cost of equity.

Figure 5.6: Beta and the security market line



From Figure 5.6 it is clear that, if the beta-factor is equal to 1, the cost of equity is the same as the market return (17%). If the beta is equal to 1,5, the cost of equity is 20%. If one uses a different beta-factor, the cost of equity changes according to the CAPM formula. In this way, the cost of equity can be determined for any beta-factor by moving along the so-called security market line, as indicated in Figure 5.6. The security market line shows the relationship between systematic risk as indicated by the beta, and the required return based on that risk.

The CAPM has been criticised by many researchers over a number of years, most notably by Fama and French (1992:464). They assert that their findings did not support the most basic assumption of the CAPM model, namely that average share returns are positively related to market betas. In the conclusion to their

article, they comment: “We were forced to conclude that the SLB model (CAPM model) does not describe the last 50 years of average stock returns.”

In spite of such criticism, the CAPM is still widely used to determine the cost of equity. Pettit (1999:113) confirms the popularity and robustness of the CAPM: “While there have been challenges to the CAPM, it remains the most practical approach available to determine the cost of equity. In fact, the perceived limitations of the model arise in large part from *applying* the model.”

The application problems of the CAPM referred to by Pettit (1999:113) centre on the difficulty of estimating the market premium and measuring the beta. In his article, he suggests ways in which the risk premium can be estimated more accurately by using a truly risk-less rate, as opposed to a risk-free rate. Pettit (1999:118) has also suggested ways in which the calculation of the beta-factor can be adjusted to obtain a more reliable value.

In an attempt to overcome the limitations of the CAPM, the arbitrage pricing theory (APT) was developed, incorporating a range of factors that affect systematic risk. The APT is discussed below.

5.3.3.3 Arbitrage pricing theory (APT) model

The APT model was developed using the same principles that underlie the CAPM. However, instead of using one factor of risk, it uses a multifactor approach. The basic assumption of the APT is that competitive forces quickly eliminate arbitrage opportunities. It means that investors cannot earn a positive expected rate of return on any combination of assets without incurring some risk and without making some net investment (Berry, Burmeister and McElroy 1988:30).

According to Copeland *et al.* (1996:274), the definition of the cost of equity, using the APT, can be expressed as follows:

$$k_s = r_f + [E(F_1) - r_f] \beta_{a1} + [E(F_2) - r_f] \beta_{a2} + \dots + [E(F_k) - r_f] \beta_{ak}$$

where

- k_s = cost of equity
- r_f = the risk-free rate
- $E(F_k)$ = the expected rate of return on a portfolio that mimics the k^{th} factor
and is independent of all others
- beta_k = the sensitivity of the stock return to the k^{th} factor

The APT uses different factors that influence the sensitivity of the share returns instead of only one factor as used by the CAPM. The five most important fundamental factors that have been identified in empirical research findings in the USA are changes in

- the industrial production index (a measure of how well the economy is doing in terms of actual physical output);
- the short-term real rate (measured by the difference between the yield on treasury bills and the Consumer Price Index);
- short-term inflation (measured by unexpected changes in the Consumer Price Index);
- long-term inflation (measured by the difference between the yield to maturity on long-and short-term USA government bonds); and
- default risk (measured by the difference between the yield to maturity on Aaa- and Baa-rated long-term corporate bonds).

The empirical evidence cited by Copeland *et al.* (1996:275) indicates that there are significant differences between the cost of equity calculated using the APM and the cost of equity calculated using the CAPM. It also shows that the APM explains expected returns better than the CAPM does. Another advantage of the

APT is that it provides more insight into the risks involved in investment in a specific share or industry. However, the application of the APT is even more difficult than that of the CAPM, because five factors for systematic risk need to be estimated when using the APT, instead of only one when using the CAPM.

The discussion above analyses the three models that can be used to determine the cost of equity, namely the dividend discount model, the CAPM and the APT. Taking into account all the available empirical evidence regarding the pros and cons of each model, one can conclude that the CAPM is still preferred as the most practical method to determine the cost of equity.

5.3.4 The component cost of preference share capital

The holders of preference shares are entitled to their preference dividends before any ordinary dividends are paid to ordinary shareholders. This legal requirement is entrenched in the South African company law, which stipulates that preference shareholders have the same voting rights as ordinary shareholders when preference dividends are in arrears.

Preference dividends are based on the nominal value of preference shares. Unlike interest payments, preference dividends are not tax-deductible. The value of preference shares depends on the percentage of preference dividends paid on the nominal value of the preference shares and that paid on current market rates.

If a preference dividend of 12% is paid on preference shares with a nominal value of R100 each and the current market rate on similar preference shares is also 12%, then the value of the preference shares is also R100. The cost of the preference capital is 12%.

If, for the same example, the current market rates on similar preference shares go up to 15%, the preference dividend received of R12 per preference share, discounted at a required rate of 15%, is calculated as follows:

$$\begin{aligned}\text{Value of preference share} &= \text{Preference dividend} / \text{Required rate} \\ &= R12 / 15\% \\ &= R80\end{aligned}$$

The cost of the preference capital to the company is always the current market rates (assuming there are no flotation costs). This is so because if the issuing company only pays a preference dividend of 12%, it is only able to sell the preference shares at a market price of R80 per share when the market rate is 15%. Therefore the component cost of the preference share capital is calculated as follows:

$$\begin{aligned}\text{Cost of preference share capital } k_p &= \text{Current dividend} / \text{value per} \\ &\quad \text{preference share} \\ &= R12 / R80 \\ &= 15\%\end{aligned}$$

If there are any flotation costs in the issue of new preference shares, the net amount to be received on the issue of the preference shares, namely the market value minus the flotation cost, is used to determine the cost of the preference share capital. Correia *et al.* (2003:6-7) suggest the following formula:

$$K_p = D_p / [V_p (1 - F)]$$

where

$$\begin{aligned}K_p &= \text{component cost of preference share capital} \\ D_p &= \text{current preference dividend per share} \\ V_p &= \text{current market value per preference share} \\ F &= \text{flotation cost as a \% of market value per preference share}\end{aligned}$$

So, for example, using the same information as in the previous example and adding the element of a flotation cost of 5% per share ($R80 \times 5\% = R4$ per share), the component cost of a new issue of preference shares is calculated as follows:

$$\begin{aligned}K_p &= D_p / [V_p (1 - F)] \\ &= R12 / [R80 (1 - 0,05)] \\ &= R12 / R76 \\ &= 15,79\%\end{aligned}$$

5.3.5 The component cost of debt

The component cost of debt is determined in a manner similar to that used for preference shares. The long-term debt can take the form of term loans, which pay a negotiated interest rate, or debentures, which have a coupon rate. Whatever the form in which the debt is issued, the effective interest rate would have to be in line with the current market rate.

If a loan for an amount of R1 million (unlimited duration) was originally acquired at 10% and the current market interest rate on similar loans is 12%, the market value of the loan drops to R833 333. This is calculated as follows:

$$\begin{aligned}\text{Market value of debt} &= \text{interest paid} / \text{current interest rate} \\ &= 10\% \text{ R1m} / 12\% \\ &= R100\,000 / 0,12 \\ &= R833\,333\end{aligned}$$

If the company wants to take out a loan for the same amount and with similar risks, it has to pay interest at the market rate of 12%. If the company wants to raise the amount by way of a bond issue and it still wants to pay 10% interest, the issue has to take place at a discount, so that the effective rate that the investor receives is the market rate of 12%.

For a company that does not have assessed losses for tax purposes, the interest paid is tax-deductible. Therefore the actual effective cost of debt is the after-tax cost, after taking into account the tax benefit derived from the fact that the interest

can be deducted in the calculation of the income tax payable. This can be expressed as follows:

$$K_d = I (1 - t)$$

where

$$\begin{aligned} K_d &= \text{the cost of debt} \\ I &= \text{the interest rate payable} \\ t &= \text{the marginal tax rate} \end{aligned}$$

So, for example, if the current interest rate on new debentures is 15% and the tax rate is 30%, the after-tax cost of debt is determined as follows:

$$\begin{aligned} K_d &= I (1 - t) \\ &= 15\% (1 - 0,3) \\ &= 10,5\% \end{aligned}$$

If there are issue costs involved in the issue of new debt, the net amount raised by the issue is lower and the effective cost of the debt is higher. Using the information from the example above, a coupon rate on the debentures of 12% and issue costs amounting to 5%, the cost of debt can be calculated as follows:

$$\begin{aligned} \text{Value of debenture} &= (\text{coupon rate} / \text{required rate}) \times \text{nominal value} \\ &= (12\% / 15\%) \times R100 \\ &= R80 \end{aligned}$$

After subtracting the issue costs, the net amount received per debenture is the following:

$$\begin{aligned} \text{Net receipt} &= V_d (1 - F) \\ &= R80 (1 - 0,05) \\ &= R76 \end{aligned}$$

The interest cost before tax is R12 / R76, which is 15,79%. The after-tax cost of debt can now be determined as follows:

$$\begin{aligned}K_d &= I(1 - t) \\ &= 15,79\% (1 - 0,3) \\ &= 11,05\%\end{aligned}$$

Using the weights and components costs determined in the examples given above, the WACC can now be calculated as follows:

$$\text{WACC} = w_1k_e + w_2k_p + w_3k_d$$

It would be unwise to generalize expectations of benchmarks for WACC, because companies differ in respect of the industries they operate in and also with regard to their sensitivity to risk. Pettit (1999:120) comments: “Based on the current 30-year government bond rate of about 5,5%, our study implies an expected long-run return on U.S. equities of about 10,5%.” This means that the average WACC of the shares included in his study was probably lower than 10,5%, because of the lower component cost of preferred capital and debt.

As far as the average WACC of South African companies is concerned, Eedes (2002:1) remarks: “A weighted average cost of equity and debt is taken to determine the overall cost of capital. This year [year ended 30 June 2002] the average cost of capital of SA’s 200 largest companies excluding banks and other financial institutions was 15,75%, down from 17,7% last year.” The higher local average WACC (compared to that of American companies) is to be expected because of the higher inflation rate and the number of risk factors in South Africa.

In this section, an attempt was made to illustrate how WACC is determined by the component cost of each source of long-term capital, as well as the weight of each source of capital. The weights to be used are determined by the optimal (target) capital structure of the company concerned.

5.4 THE PERFORMANCE SPREAD

The performance spread is a percentage differential that indicates internal value-creation (if it is positive) and value-destruction (if it is negative). It measures whether the after-tax return (before interest) earned by the company is more than its WACC and is determined as follows:

$$\text{Performance spread} = \text{ROIC} - \text{WACC}$$

Using the ROIC calculated in the example in Section 5.2 and an assumed WACC of 18,45%, the calculation of the performance spread can be calculated as follows:

$$\begin{aligned} \text{Performance spread} &= \text{ROIC} - \text{WACC} \\ &= 40,00\% - 18,45\% \\ &= 21,55\% \end{aligned}$$

The positive return spread of 21,55% means that the hypothetical company used in the example was able to generate returns higher than its cost of capital. Therefore it created value for its shareholders. The extent of the value created in terms of EVA depends on the capital invested. Once the amount of IC has been determined, the EVA can be calculated.

5.5 IC

The IC consists of all the assets employed by a company, irrespective of the nature of the assets, or how the assets have been financed. Stewart (1991:70) describes capital as follows: "Capital is a measure of all the cash that has been deposited into a company over its life without regard to its financing source, accounting name, or business purpose, much as if the company were just a savings account."

Therefore all the assets of a company are seen as cash invested in the company. The question is not whether the assets are fixed assets or current working capital

or even how the company was financed, but indeed how effectively the capital was used. The accounting values of the net assets of a company are adjusted in order to reflect the following three basic requirements:

- to convert from accrual to cash accounting (based only on actual receipts and payments);
- to convert from the liquidating perspective of lenders to the going-concern perspective of investors; and
- to convert from successful efforts to full-cost accounting.

The adjustments that are needed to the amount of net assets and operating profits in order to implement the above-mentioned requirements have been described in more detail in Chapter 3 and need not be repeated here.

From an operating perspective, the IC is the sum of the book value of the fixed assets plus the value of the company's net working capital and cash (if any). From a financial point of view, this amount of total net assets is also equal to the sum of the amounts of long-term finance used to finance the net assets. The long-term sources of funds used most often are equity and debt.

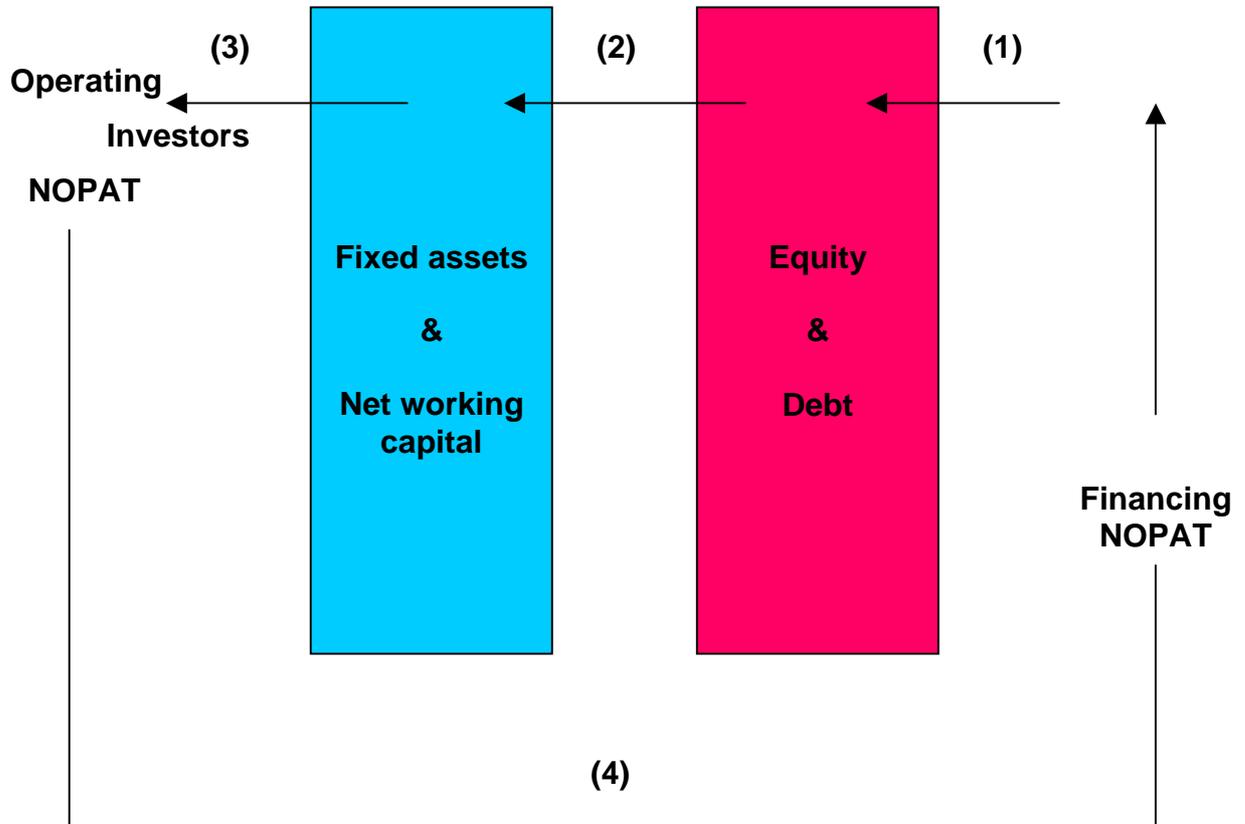
The operational perspective and the financing perspective tend to be equivalent, because changes in the amount of assets invested are also reflected in changes in the total amount of equity and debt. The following sequence of events would shed some light on this equivalence:

- As a first step [see (1) in Figure 5.7], a company raises capital using a mix of equity and debt. The capital is then invested in fixed assets and net working capital [see (2) in Figure 5.7].

- Next, the business generates sales and incurs expenses, which leads to operating profits after tax (NOPAT). This step is indicated as (3) in Figure 5.7.
- These operating profits, in turn, constitute a pool of cash, which is available to the firm [see (4) in Figure 5.7].
- This pool of cash is paid out firstly to the suppliers of debt and preference share capital and then to ordinary shareholders. The remaining cash (retained income) becomes part of reserves to be re-invested in the business.

The practical implication of this equivalence is that the IC can be determined by using fixed assets plus net working capital (the operational approach), or by using equity plus long-term debt (a financing approach). The four steps explaining the equivalence of the operating perspective and the financing perspective are set out in Figure 5.7.

Figure 5.7: Four steps tying the operating perspective to a financial perspective



Source: Stewart (1991:94)

In determining the amount of invested capital, it is helpful to use the accounting balance sheet and to summarize and transform it into a managerial balance sheet. This process is illustrated by means of the following example:

The following accounting balance sheet is available for a company (the information is an expansion of the information given in Section 5.3.1:

Balance sheet on 30 June 2002	R million	
Non-current assets		75
Land and buildings	25	
Plant and equipment (book value)	35	
Vehicles (book value)	<u>15</u>	
Current assets		45
Inventory	12	
Debtors	28	
Cash in bank	<u>5</u>	<u> </u>
		<u>120</u>
 Equity and liabilities		
Ordinary share capital		30
Share premium		10
Reserves		<u>20</u>
Equity		60
Preference share capital (12% p.a.)		10
Long-term loan (15% interest p.a.)		30
Current liabilities		20
Creditors	13	
Other accruals	4	
Tax payable	<u>3</u>	<u> </u>
		<u>120</u>

The accounting balance sheet above can be summarized and presented as a managerial balance sheet. A managerial balance sheet is presented in such a way as to facilitate the determination of the IC, after making the necessary adjustments. The adjustments have already been dealt with in Chapter 3. The managerial balance sheet looks as follows:

Balance sheet on 30 June 2002	R million
Non-current assets	75
Net current assets (45 – 20)	<u>25</u>
	<u>100</u>
Ordinary share capital and reserves (equity)	60
Preference share capital (12% p.a.)	10
Long-term loan (15% interest p.a.)	<u>30</u>
	<u>100</u>

From an operational perspective, the IC is the sum of the non-current assets and the net current assets and it is calculated as follows:

$$\begin{aligned}
 \text{IC} &= \text{Non-current assets} + \text{net current assets} \\
 &= 75 + 25 \\
 &= \text{R100 million}
 \end{aligned}$$

From a financing perspective, the IC can be determined by adding all the long-term sources of finance, as follows:

$$\begin{aligned}
 \text{IC} &= \text{Book value of (equity + pref. share capital + debt)} \\
 &= 60 + 10 + 30 \\
 &= \text{R100 million}
 \end{aligned}$$

All the components of the formula for EVA have now been discussed and calculated for a hypothetical company. The final calculation can now be done, using the formula for EVA and all the values determined for its different components. The value of the EVA for the year ended on 30 June 2003 is calculated as follows:

$$\begin{aligned}
 \text{EVA} &= \text{Performance Spread} \times \text{IC} \\
 &= (\text{ROIC} - \text{WACC}) \times \text{IC} \\
 &= (40\% - 18,45\%) \times \text{R100 million}
 \end{aligned}$$

$$\begin{aligned} &= 21,55\% \times R100 \text{ million} \\ &= R21,55 \text{ million} \end{aligned}$$

The positive amount of EVA of R21,55 million indicates that internal value has been created by the company for shareholders, over and above the cost of capital. This value is recalculated for each period (typically a financial year) and has a direct bearing on the external value of the company.

The MVA is theoretically equal to the present value of all future EVAs. If the current EVA is a good indication of what future EVAs will be, the MVA would be a multiple of the current EVA. This multiple would depend on whether the company has a positive EVA and on the WACC, as well as on the growth expectations with regard to the future EVA.

5.6 CONCLUSION

The EVA of a company consists of different components, which must be calculated separately in order to calculate the value of the EVA. These components are:

- the ROIC;
- the WACC;
- the performance spread; and
- the IC.

Each component has been discussed in this chapter, with an example to illustrate the calculation needed to determine the value of the component.

It has been shown that the ROIC is determined by dividing the NOPAT by the IC and that the ROIC is a measure of the operating returns generated by the company. In determining the WACC, the optimal capital structure of the company determines the weighting to be used in the calculation of the WACC. Research by

Hall (1998:199) on listed South African companies indicates that a company's WACC makes a sizable contribution in the determination of EVA.

After the appropriate weights have been determined according to the market value of each of the main sources of capital, one can proceed to determine the component cost of each source of capital. The main long-term sources of capital are equity and debt, and perhaps preference share capital.

The component cost of equity is the most difficult variable to estimate. In this chapter, it has been shown how either one of three methods, namely the dividend discount model, the CAPM and the APT can be used to calculate the cost of equity. The CAPM is still preferred as the most practical approach to determine the cost of equity, in spite of a lot of criticism of this model over the last few years.

With regard to the determination of the component cost of preference share capital, it has been shown that the current preference dividend percentage approximates the real cost of preference capital, even if the actual rate differs from the current rate. This is so because the value of the preference shares is adjusted according to changes in the current preference dividend rates, so that new investors effectively receive the current rate.

In this chapter, it has also been shown how the flotation costs (issue costs) of new issues of preference shares can be incorporated in the calculation of the component cost. The effect of flotation costs would be to increase the component cost of preference shares, because the amount raised is smaller.

As far as the component cost of debt is concerned, the calculation is very similar to that for preference shares, with the difference that the interest paid on debt is tax-deductible. Therefore the effective component cost of debt is the after-tax cost (taking into account that the Receiver of Revenue subsidizes a part of the interest expense). The amount of the subsidy is the interest expense multiplied by the tax percentage, and it is only available to companies that have enough taxable income against which the deduction can be claimed.

The determination of the WACC was illustrated using the weightings and the component cost for each source of capital. As a next step, the performance spread could be determined by subtracting the WACC from the ROIC. The IC was determined after transforming the accounting balance sheet into a managerial balance sheet.

Finally, the chapter illustrated how the EVA is determined by multiplying the performance spread (a percentage differential) by the IC. The discussion concluded with an illustration of the multiplying effect of the EVA on the MVA of companies with positive EVAs. In the next chapter there is a discussion of the evaluation of companies according to value creation and cash management, followed by the placement of companies on a financial strategy matrix.