

Determining the optimal capital structure: a practical contemporary approach

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Abstract

Determining an optimal capital structure for a company is a multi-faceted problem that has challenged and fascinated academics and practitioners for a long time. This study investigates capital structures used in different countries and industries and explores the different theories on capital structure that have been put forward to date. A trade-off model, incorporating taxes and financial distress costs, is applied to determine the optimal capital structure for three companies listed on the JSE South Africa. One of the conclusions drawn from the results of this analysis is that great care needs to be taken in ensuring the reasonableness of the input data and the valuation model. Secondly, significant amounts of value can be unlocked in moving closer to the optimum level of gearing. Lastly, even when one is using a model such as the one illustrated, it may be preferable to try to operate within an acceptable interval rather than to try to attain the absolute optimum capital structure.

Key words

Managerial opportunism theory

Optimal capital structure

Pecking order theory

Signalling theory

Trade-off theory

Weighted average cost of capital (WACC)

1 Introduction

Astute financial managers agree that investments in assets and managing operations create the greatest opportunities for profit-seeking companies to maximize shareholders' wealth. However, how to determine an optimal capital structure, which is in turn affected by the sources of long-term finance that are used, has been a focal point and a topic of rigorous debate for a number of decades. Even today, financial managers and researchers still grapple with the question of whether the sources of capital that are used affect the value of a company and, if so, in what way and to what extent.

Many factors influence the way in which a company raises finance. These include the existing level of operating leverage (fixed costs relative to variable costs), the cost of the particular source of capital used, the impact of this form of financing on the control of the company, the risk attached to the source of finance, various tax implications and financial distress costs. All the factors mentioned above play some role, but, in the final analysis, the impact of the capital structure on the value of the business as a whole should be considered to be of paramount importance. Maximizing the value of the firm as a whole would in turn maximize the (ordinary) share price, as well as shareholders' wealth.

The optimal (target) capital structure is the combination of the equity and debt that will maximize the value of the business as a whole, all other things being equal. According to Ehrhardt and Brigham (2003:442), the value of a business based on the going concern expectation is the present value of all the expected future cash flows to be generated by the assets, discounted at the company's weighted average cost of capital (WACC). The target capital structure is therefore that combination of long-term sources of finance that leads to the lowest WACC and, consequently, to the highest value for the business as a whole (Hawawini & Viallet 1999:376). Hsieh (1993:14) expresses a similar view, arguing that a company should choose its debt-equity ratio in such a way that it maximizes the value of the firm. He adds that the determination of the optimal capital structure involves very complex decision-making processes and a large number of interactive decision variables.

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. Numerous authors, such as Lasher (2003:426), Moyer, McGuigan and Kretlow (2003:418) and Correia, Flynn, Uliana and Wormald (2006:14-6) have indicated how increased levels of debt finance (financial gearing) can result in increased earnings per share (EPS) and return on equity (ROE). However, this does not necessarily maximize shareholders' wealth and therefore the challenge is to determine what combination of debt and equity would lead to the maximum share price.

The aims of this study were to investigate financial structures used in practice worldwide, to discuss research on capital structure theory to date, to apply a model to determine the optimal structure for three companies listed on the JSE Securities Exchange South Africa and, finally, to reach some conclusions and to make some recommendations in this regard.

2 Capital structures worldwide

A survey done by Smart, Megginson and Gitman (2004:415) of the financial leverage used by companies worldwide indicates that capital structures vary across countries. Table 1 shows the average capital structures used by companies in the seven most developed countries (the so-called G7) and in seven developing countries, including South Africa. Among the G7 countries, it seems as if companies in Japan, Italy and France use more long-term debt finance than companies in the other developed countries. The survey also reveals that, on average, companies in the developed countries borrow more than companies in developing countries do. South African companies seem to have higher average debt ratios compared to the debt ratios of companies in other developing countries.

Table 1 Capital structures in different countries

Country	Total debt to total assets (book value, %)	Long term-debt to total capital (book value, %)	Long-term debt to total capital (market values, %)
Developed (G7)			
United Kingdom	54%	28%	35%
Canada	56%	39%	35%
United States	58%	37%	28%
Japan	69%	53%	29%
Italy	70%	47%	46%
France	71%	48%	41%
Germany	78%	38%	23%
Developing			
Malaysia	42%	13%	7%
Jordan	47%	12%	19%
Turkey	59%	24%	11%
Pakistan	66%	26%	19%
India	67%	34%	35%
South Korea	73%	49%	64%
South Africa	79%	62%	35%

Source: Adapted from Smart, Megginson and Gitman (2004:415)

Table 2 contains the average capital structures in different industries in the United States and in South Africa. Table 2 shows that, for some industries, the level of gearing is very similar, even though there are some industries where the average gearing differs significantly. Ehrhardt and Brigham (2003:477) point out that there are considerable differences between the debt levels of (American) companies in the same industry.

Table 2 Capital structures in different industries

Sector	United States companies' long-term debt to total capital (book values,%)	South African companies long-term debt to total capital (book values,%)
Technology	19%	20%
Energy	30%	31%
Healthcare	32%	33%
Transportation	40%	45%
Basic materials	46%	48%
Capital goods	46%	56%
Conglomerates	54%	32%
Services	63%	35%

Source: Adapted from Ehrhardt and Brigham (2003:477)

Smart *et al.* (2004) observe that capital structures tend to display definite industry patterns, irrespective of the country involved. Companies in some industries in developed countries have high debt:equity ratios, while companies in other industries use little long-term debt. Smart *et al.* (2004:413) suggest that these patterns indicate that an industry's optimal asset

mix, plus the variability of the operating environment, 'significantly influences the capital structures chosen by firms anywhere in the world'.

3 Capital structure theory

Smart *et al.* (2004:418) mention four predominant capital structure theories that have been developed to date. These are

- the trade-off theory;
- the pecking order theory;
- the signalling theory; and
- the managerial opportunism theory.

Each theory is discussed in turn below, with the main emphasis on the trade-off theory, which is the most thoroughly documented and researched of the four theories.

3.1 Trade-off theory

The trade-off theory of capital structure postulates that managers tend to choose the mix of debt and equity that achieves a balance between the tax advantages of the debt and the various costs of using financial leverage. Besley and Brigham (2003:542) indicate that modern capital structure theory began in 1958, when Franco Modigliani and Merton Miller published an article that is considered by many to be the most influential finance article ever written. As recently as 2005, Pagano (2005:238) still hailed the work of Modigliani and Miller as 'a cornerstone of finance'. Modigliani and Miller (1958:297) showed that under certain strict assumptions, a company's overall cost of capital, and therefore its value, is unaffected by its capital structure. This is indicated by the following equation:

$$V_L = V_U = S_L + D$$

where

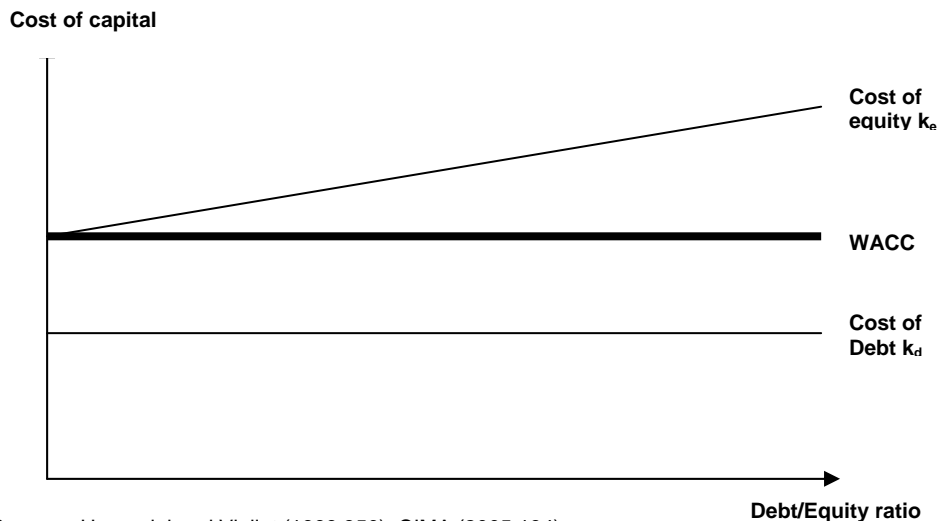
- V_L = value of a leveraged firm
- V_U = value of an identical, unleveraged firm
- S_L = value of the levered firm's stock (equity)
- D = value of the levered firm's debt

The initial assumptions made by Modigliani and Miller included that

- there are no brokerage costs;
- there are no taxes;
- there are no bankruptcy costs;
- investors can borrow at the same rate as corporations;
- all investors have the same information as management about the firm's future investment opportunities; and
- EBIT (earnings before interest and tax) is not affected by debt.

The findings of the original theory with no taxes and no financial distress costs are represented in the graph in Figure 1.

Figure 1 WACC for different levels of financial gearing, with no taxes and no financial distress costs



Sources: Hawawini and Viallet (1999:350); CIMA (2005:194)

Figure 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 .

Although some of the assumptions made by Modigliani and Miller were unrealistic, the result of the notion that a company's capital structure was irrelevant was very important. The study provided information about what is required for capital structure to be relevant and therefore to influence a firm's value. In the research that followed, some of the assumptions were relaxed in order to develop a more realistic capital structure theory.

Modigliani and Miller (1963:433) followed up their own original model with an adjusted model which incorporated company taxation. Some years later, Miller (1977:261) expanded this model to facilitate the inclusion of both corporate and personal taxes in the model. 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. 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

$$t = \text{tax rate}$$

$$k_d = \% \text{ cost of debt before tax}$$

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

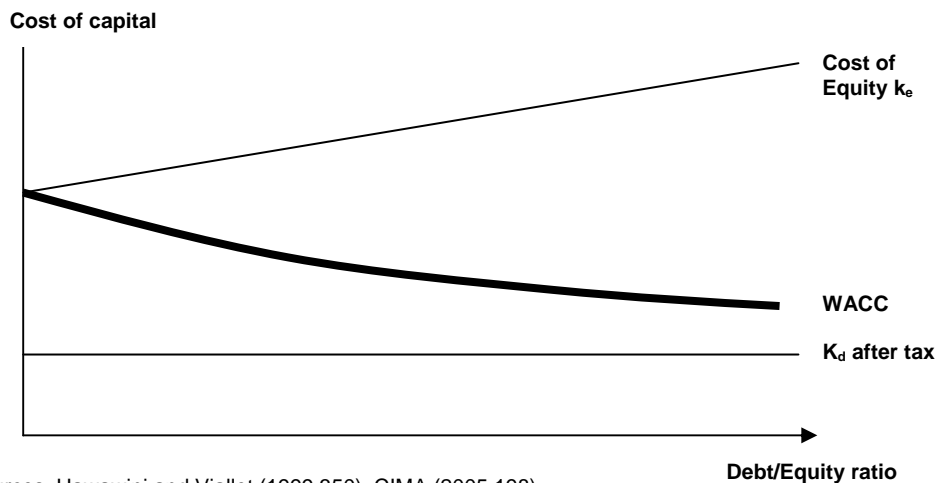
$$V_L = V_U + PV_{ITS}$$

where

PV_{ITS} = present value of income tax shield

Under this set of assumptions, WACC does indeed decrease with higher levels of borrowed capital, as illustrated in Figure 2.

Figure 2 WACC for different levels of financial gearing, with taxes and no financial distress costs



Sources: Hawawini and Viallet (1999:350); CIMA (2005:198)

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 wrongly conclude that 100% debt financing is optimal.

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. 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 associated with financial distress. These are related 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 suppliers may even be hesitant to grant credit to the company. More specific research on financial distress costs was done by Francois and Morellec (2004:404), who analysed the effect of debt-defaulting on equity value, and Mao (2003:418), who investigated the interaction of debt agency problems and optimal capital structure.

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, Hawawini and Viallet (1999:361) propose that the value of a leveraged firm can be calculated as follows:

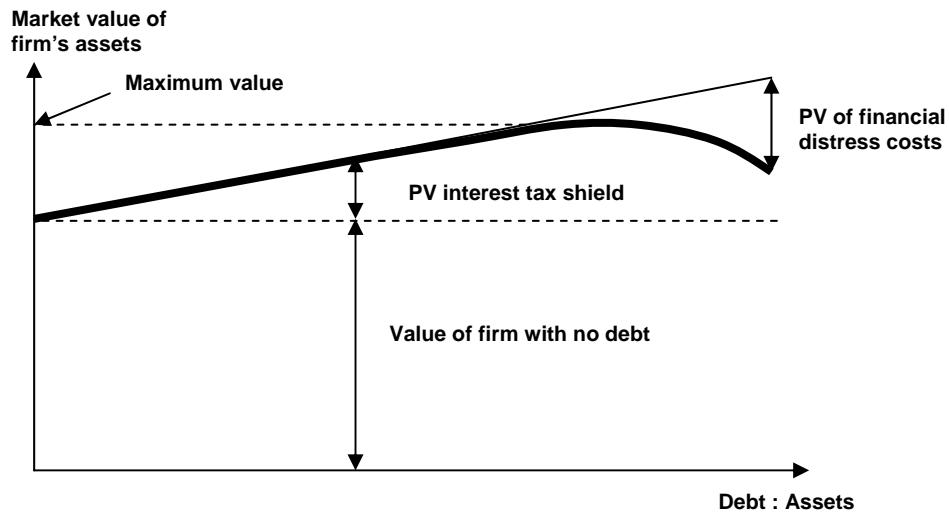
$$V_L = V_U + PV_{ITS} - PV_{CFD}$$

where

PV_{CFD} = present value of financial distress costs

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 3.

Figure 3 Value of the firm relative to financial gearing, with taxes and financial distress costs



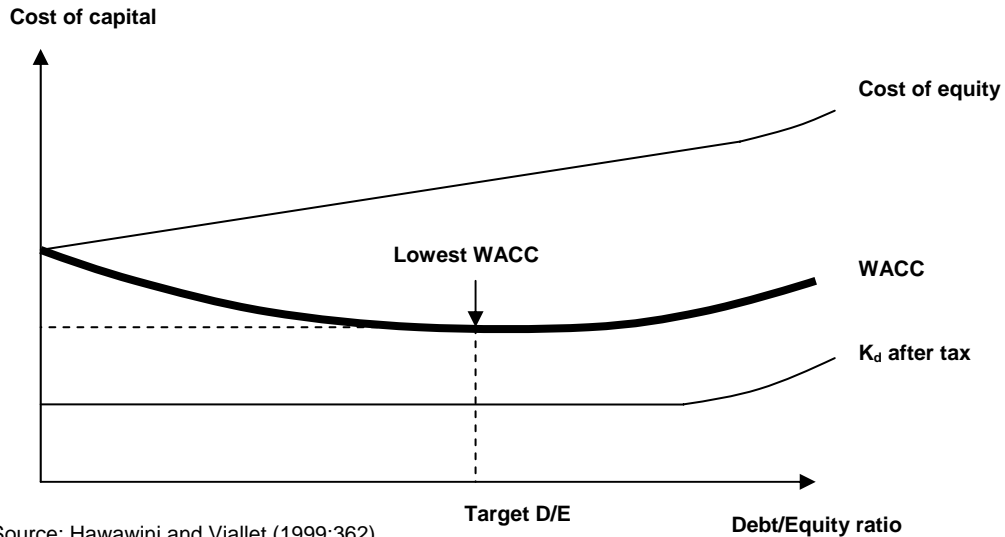
Sources: Hawawini and Viallet (1999:361); Moyer *et al.* (2003:427)

Figure 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 a 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 4.

Figure 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 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.

Numerous other studies, such as those by Ghosh (1992:425), Ghosh and Cai (1999:37) and Bancel and Mittoo (2004:131) lend support to the continuing relevance of the work of Modigliani and Miller and the trade-off theory.

3.2 Pecking order theory

Pecking order theory, as described by Correia *et al.* (2006:14-11) and Smart *et al.* (2004:419), assumes there is no target capital structure. This theory has become a strong challenger to the trade-off theory during the last two decades. It is based on the premise that managers are better informed about investment opportunities for their company than outside investors. This information asymmetry causes managers to raise finance in a certain sequence, or order (the pecking order). The order in which funds are raised is retained earnings first, then debt, then convertible debt and preference shares and last, new issues of equity.

A new issue of equity may be interpreted as a signal to the market that the share price is over-valued. Therefore companies may want to avoid new issues of equity to finance investment opportunities, because of the negative signalling effect. Companies adhering to the pecking order theory would lean towards maintaining lower debt:equity ratios than that indicated by trade-off theory, in order to take advantage of new investment opportunities without having to issue new shares. These companies would also maintain surplus cash

balances and spare borrowing capacity in order to make use of new investment opportunities.

Research support for the pecking order theory came from Pinegar and Wilbricht (1989:89), Ghosh and Cai (1999:37) and Cai and Ghosh (2003:30), who provided evidence supporting the co-existence of applications of the pecking order theory and the trade-off theory.

3.3 Signalling theory

As in the case of the pecking order theory, the signalling theory also assumes that managers know more about a company's future investment opportunities than investors do (Besley & Brigham 2003:544; Ehrhardt & Brigham 2003:491; Smart *et al.* 2004:419). According to Smart *et al.* (2004:420), investors tend to assign an 'average' valuation to each firm if there is no evidence to the contrary. A manager who knows his/her firm is worth much more than the investors think it is worth would want to communicate that information to the market. Normally, the manager of a less valuable firm would also like to persuade investors that his/her firm is undervalued. As a consequence, investors will remain sceptical about what managers say.

The reasoning behind signalling theory includes the contention that the only way in which the manager of an undervalued firm can convince investors of the 'true' value of the firm is to send a costly signal. This signal must be hard to mimic by the managers of less valuable firms. Issuing debt is such a signal. Investors would react to increased debt by bidding up the share price, thereby increasing the value of the firm.

3.4 Managerial opportunism theory

One of the latest and most appealing theories used to explain the debt:equity mix is the managerial opportunism hypothesis (Smart *et al.* 2004:420). The theory states that companies try to issue shares when share prices are high and issue debt when share prices are low. Consequently, a company's capital structure just reflects the cumulative effect of managers' past attempts to issue shares at times when prices were high.

Baker and Wurgler, cited in Greenwood (2002:127), have found some evidence that companies with high leverage raised capital when their share prices were low and that companies with low leverage raised capital when their share prices were high. A survey by Graham and Harvey (2001:187), in which corporate CEOs admitted that the level of share prices influenced their decisions to issue equity or debt, also supports this theory.

4 Optimal capital structure for three listed companies

The latest available financial statements for three companies, namely Mr Price (2006), Mittal (2005) and Tongaat-Hulett (2006) were used in the analysis in the current study. The model presented by Ehrhardt and Brigham (2003:494) was applied to determine the optimal capital structure. The five steps specified by Ehrhardt and Brigham (2003:494) to be used in the analysis are the following:

- estimate the interest rate the firm will pay;
- estimate the cost of equity;
- estimate the WACC;

- estimate the free cash flows and their present value, which is the value of the firm; and
- deduct the value of the debt to find the shareholders' wealth, which is to be maximized.

Tables 3, 4 and 5 show the analyses for the three companies selected for analysis, namely Mr Price, Mittal and Tongaat-Hulett, respectively. In the first column of each of these tables, the percentage of long-term debt financing is indicated. Intervals of 5% were used, up to a maximum of 60% debt. In the second column, the debt:equity ratio for that level of gearing is calculated; for instance, if debt is 50% and equity is 50%, then the debt:equity ratio is 50%:50%, equalling 100%. In the third column, the before-tax cost of debt is specified. This percentage was estimated by dividing the interest paid by the total interest-bearing debt for each company.

In order to adjust the interest rates for financial distress at higher levels of debt, 0.25% was added (according to the researcher's own judgment) to the before-tax interest rate for each increase of 5% in debt from a debt level of 40% for Mr Price (a retailing company); then 0.5% was added from a debt level of 50% and 1% at a debt level of 60%. For Mittal and Tongaat-Hulett (both manufacturing concerns), which have considerably higher levels of operating leverage than Mr Price, 0.25% was added to the interest rate for each increase of 5% in debt from a debt level of 30%; then 0.5% was added from a debt level of 40%; 1% from a debt level of 50% and 1.5% at a debt level of 60%. In the fourth column, the after-tax interest rate is calculated by multiplying the percentage in Column 3 by (1 – a tax rate of 29%).

All the financial data was obtained from the McGregor Bureau for Financial Analysis (BFA). For the calculation of the cost of equity, the well-known capital asset pricing model (CAPM) was used, as it is the model most widely accepted, according to Killian (2005:56). The RSA 153 government bond rate, which stood at 8.02% on 20 June 2006, was used as a risk-free rate. The market risk premium was set at 6%, which is considered appropriate for the South African share market. The beta was estimated using five years' worth of historical monthly data to 20 June 2006, and the FTSE JSE free-float overall index as the proxy for the market.

The beta for each company was first unleveraged and then leveraged for each level of gearing by using the formulae developed by Hamada (1969:19) and refined by Conine and Tamarkin (1985:55). The formulae are the following:

$$\beta_L = \beta_U [1 + (1 - T)D/S]$$
$$\beta_U = \beta_L / [1 + (1 - T)D/S]$$

where

$$\beta_L = \text{beta of leveraged company;}$$
$$\beta_U = \text{beta of unleveraged company;}$$
$$T = \text{tax rate;}$$
$$D = \text{market value of debt and}$$
$$S = \text{market value of stock value (equity).}$$

In Column 6 of Tables 3, 4 and 5, the cost of equity is calculated. In Column 7, the WACC is determined, based on the appropriate weights. In Column 8, the value of the firm is estimated using the method proposed by Ehrhardt and Brigham (2003:497), which involves dividing the net operating profit after tax by the WACC.

Table 3 Mr Price – Capital structure and value of firm

Percentage debt w_d (1)	Market debt/equity D/S (2)	Before-tax cost debt r_d (3)	After-tax cost debt $(1-t)r_d$ (4)	Estimated beta β (5)	Cost of equity r_s (6)	Weighted cost of cap. WACC (7)	Value of firm V (R mil.) (8)
0%	0%	10,20%	7,24%	0,7939	12,78%	12,78%	3356
5%	5%	10,20%	7,24%	0,8236	12,96%	12,68%	3385
10%	11%	10,20%	7,24%	0,8565	13,16%	12,57%	3414
15%	18%	10,20%	7,24%	0,8934	13,38%	12,46%	3443
20%	25%	10,20%	7,24%	0,9348	13,63%	12,35%	3473
25%	33%	10,20%	7,24%	0,9818	13,91%	12,24%	3504
30%	43%	10,20%	7,24%	1,0355	14,23%	12,14%	3535
35%	54%	10,20%	7,24%	1,0974	14,60%	12,03%	3567
40%	67%	10,45%	7,42%	1,1697	15,04%	11,99%	3578
45%	82%	10,70%	7,60%	1,2551	15,55%	(Min) 11,97%	(Max) 3584
50%	100%	11,20%	7,95%	1,3576	16,17%	12,06%	3558
55%	122%	11,70%	8,31%	1,4828	16,92%	12,18%	3522
60%	150%	12,70%	9,02%	1,6394	17,86%	12,55%	3418

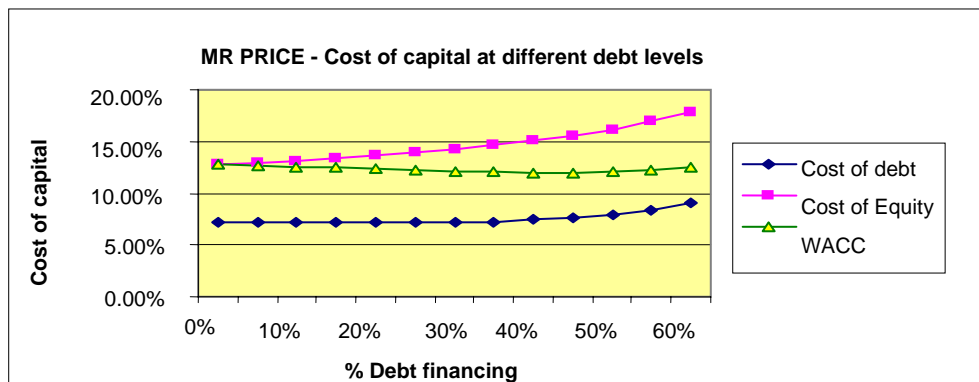
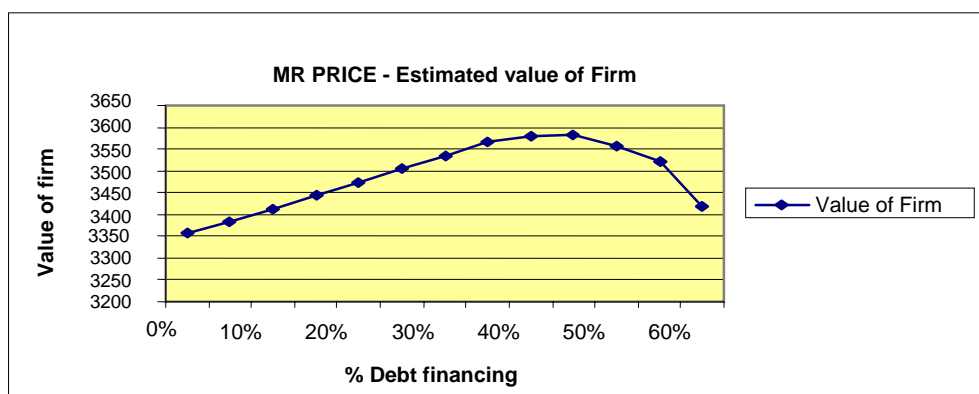
Figure 5 Mr Price – cost of capital**Figure 6 Mr Price – value of the firm**

Table 4 Mittal – capital structure and value of firm

Percentage debt w_d (1)	Market debt/equity D/S (2)	Before-tax cost debt r_d (3)	After-tax cost debt $(1 - t)r_d$ (4)	Estimated beta β (5)	Cost of equity r_s (6)	Weighted cost of cap. WACC (7)	Value of firm V (R mil.) (8)
0%	0%	11,75%	8,34%	0,4841	10,92%	10,92%	48102
5%	5%	11,75%	8,34%	0,5022	11,03%	10,90%	48217
10%	11%	11,75%	8,34%	0,5223	11,15%	10,87%	48332
15%	18%	11,75%	8,34%	0,5448	11,29%	10,85%	48448
20%	25%	11,75%	8,34%	0,5700	11,44%	10,82%	48565
25%	33%	11,75%	8,34%	0,5987	11,61%	(Min) 10,79%	(Max) 48682
30%	43%	12,00%	8,52%	0,6314	11,81%	10,82%	48559
35%	54%	12,25%	8,70%	0,6692	12,04%	10,87%	48358
40%	67%	12,75%	9,05%	0,7132	12,30%	11,00%	47770
45%	82%	13,25%	9,41%	0,7653	12,61%	11,17%	47046
50%	100%	14,25%	10,12%	0,8278	12,99%	11,55%	45489
55%	122%	15,25%	10,83%	0,9042	13,45%	12,01%	43772
60%	150%	16,75%	11,89%	0,9997	14,02%	12,74%	41239

Figure 7 Mittal – cost of capital

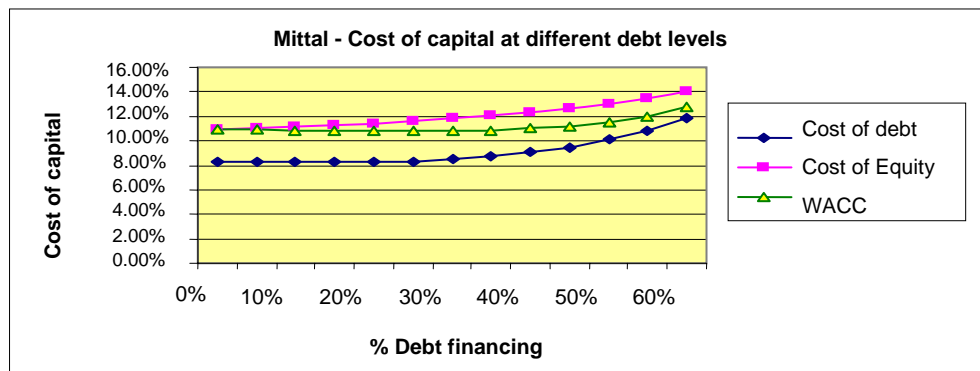


Figure 8 Mittal – value of the firm

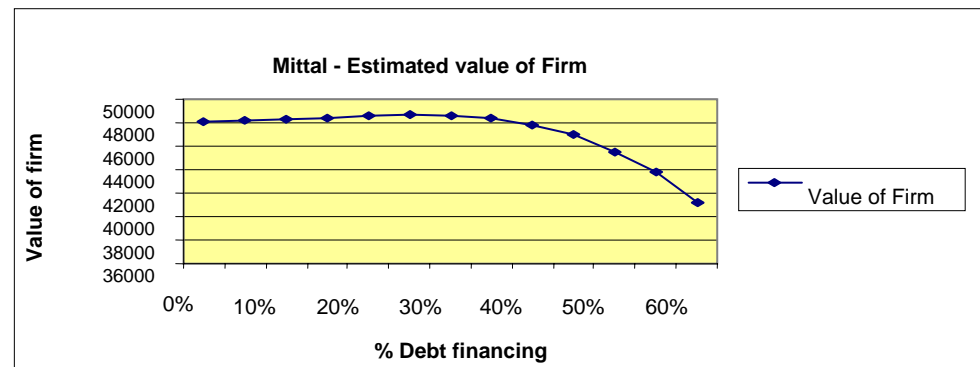
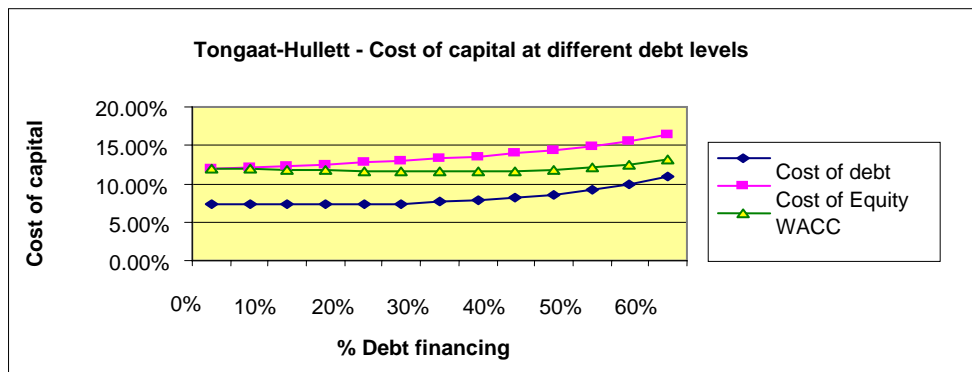
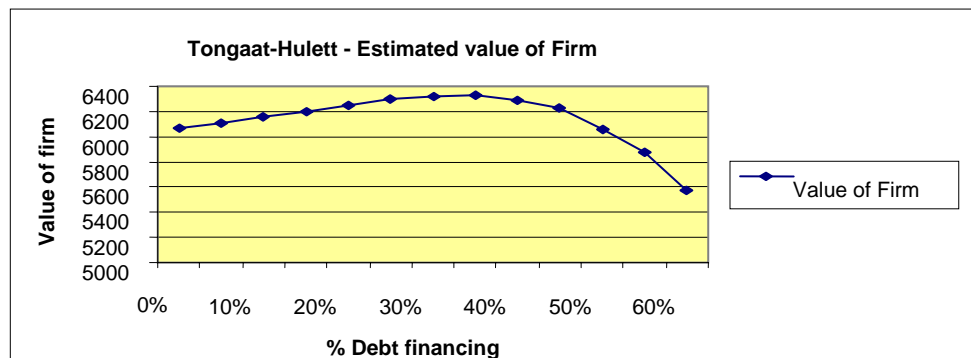


Table 5 Tongaat-Hulett – capital structure and value of firm

Percentage debt w_d (1)	Market debt/equity D/S (2)	Before-tax cost debt r_d (3)	After-tax cost debt $(1-t)r_d$ (4)	Estimated beta β (5)	Cost of equity r_s (6)	Weighted cost of cap. WACC (7)	Value of firm V (R mil.) (8)
0%	0%	10,47%	7,43%	0,6712	12,05%	12,05%	6068
5%	5%	10,47%	7,43%	0,6963	12,20%	11,96%	6112
10%	11%	10,47%	7,43%	0,7242	12,36%	11,87%	6157
15%	18%	10,47%	7,43%	0,7553	12,55%	11,78%	6203
20%	25%	10,47%	7,43%	0,7903	12,76%	11,70%	6250
25%	33%	10,47%	7,43%	0,8301	13,00%	11,61%	6297
30%	43%	10,72%	7,61%	0,8754	13,27%	11,57%	6316
35%	54%	10,97%	7,79%	0,9278	13,59%	(Min) 11,56%	(Max) 6325
40%	67%	11,47%	8,14%	0,9889	13,95%	11,63%	6286
45%	82%	11,97%	8,50%	1,0611	14,39%	11,74%	6228
50%	100%	12,97%	9,21%	1,1478	14,91%	12,06%	6063
55%	122%	13,97%	9,92%	1,2537	15,54%	12,45%	5872
60%	150%	15,47%	10,98%	1,3860	16,34%	13,12%	5570

Figure 9 Tongaat-Hulett – cost of capital**Figure 10 Tongaat-Hulett – value of the firm**

The results of the analysis for each company depicted in the graphs in Figures 5 and 6 (Mr Price), Figures 7 and 8 (Mittal) and Figures 9 and 10 (Tongaat-Hulett) clearly indicate how the value of a firm can be increased with increased levels of debt, starting from an all-equity (zero-debt) situation. At the financial structure that yields the lowest WACC, the value of the firm as a whole is also maximized. A comparison of the actual debt to total capital ratios (based on market values) for each company, as opposed to the optimal level of debt, is set out in Table 6 below.

Table 6 Differences in firm value

Company	Current debt financing %	Optimal %	Current firm value	Optimal firm value	Difference firm value
Mr Price	2%	45%	R3 356m	R3 584m	R228m
Mittal	5%	25%	R48 217m	R48 682m	R465m
Tongaat-Hulett	13%	35%	R6 203m	R6 325m	R122m

The estimates of the current values for each firm were based on the current debt financing percentage (rounded to the nearest 5%) and the estimated amounts produced by the analysis. Theoretically, the amounts shown as differences in the firm's value indicate what value could be added by each company if it changed its capital structure so that it is in line with its optimal structure.

5 Conclusions and recommendations

Determining the optimal capital structure for a company in the process of maximizing shareholder value has been an elusive target and a challenging pursuit for a number of years. An analysis of the capital structures used by companies worldwide indicates that there are significant differences between the capital structures used by companies in developed countries and those used by companies in developing countries. While there are some similarities between the capital structures used by companies in the same industries, it is also true that companies in the same industries use very different levels of debt relative to own capital.

An investigation into the research on capital structures to date reveals that there are currently four acknowledged capital structure theories. These are the trade-off theory, the pecking order theory, the signalling theory and the managerial opportunism theory. The work of Miller and Modigliani (1958:261), incorporating subsequent adjustments, is still regarded as groundbreaking and relevant in the modern business environment. The trade-off theory currently has the most support, although the pecking order theory has become a strong rival in explaining capital structures.

The application of the model suggested by Ehrhardt and Brigham (2003:494) to three companies listed on the JSE has highlighted a few practical obstacles. One of these is the determination of the cost of debt where the interest rates are not given in the financial statements. When estimates are based on interest-bearing debt yield rates that are unrealistically high or low, the analysis is doomed to failure. It must also be acknowledged that the model of Ehrhardt and Brigham (2003:497) relies on a very simplified valuation model that is based on free cash flows with no future growth.

The valuation method used multiplies the earnings before interest and tax (EBIT) by 1 minus the tax rate and divides it by the WACC to obtain a value for the business as a

whole. This approach is an almost naïve model and it produces conservative valuations that would tend to underestimate the value to be unlocked by changing the capital structure to be closer to the optimal structure. It is therefore recommended that companies that want to apply the optimal capital structure model use a more reliable free cash flow valuation model with more accurate estimates of the future free cash flows for more dependable results.

Finally, it has to be granted that there are many factors that determine the way in which a company raises finance, which in turn influences its capital structure. New loans and share issues are usually raised in ‘lumpy’ amounts, making it almost impossible for a company to remain at an optimal capital structure. The trade-off model as illustrated can be used as a point of departure to assist companies to engineer their capital structures in such a way that they remain in an optimal interval (zone) and maximize value for the companies’ shareholders.

Bibliography

- Bancel, F. & Mittoo, U.R. 2004. Cross-country determinants of capital structure choice: a survey of European firms. *Financial Management*, 30(4), Winter:103-132.
- Besley, S. & Brigham, E.F. 2003. *Principles of finance*. 2nd edition. Gainesville: South-Western.
- Cai, F. & Ghosh, A. 2003. Tests of capital structure theory: a binomial approach. *The Journal of Business and Economic Studies*, 9(2), Fall:20-32.
- CIMA. 2005. *Management accounting – Financial strategy*. Study text. London: BPP Professional education.
- Conine, T.E. & Tamarkin, M. 1985. Divisional cost of capital estimation: adjusting for leverage. *Financial Management*, 14(1), Spring:54-58.
- Correia, C., Flynn, D.K., Uliana, E. & Wormald, M. 2006. *Financial Management*. 6th edition. Cape Town: Juta.
- Ehrhardt, M.C. & Brigham, E.F. 2003. *Corporate finance – a focused approach*. Mason: Thomson.
- Francois, P. & Morellec, E. 2004. Capital structure and asset prices: some effects of bankruptcy procedures. *The Journal of Business*, 77(2), April:387-411.
- Ghosh, D.K. 1992. Optimal capital structure redefined. *The Financial Review*, 27(3), August:411-429.
- Ghosh, D.K. & Cai, F. 1999. Capital structure: new evidence of optimality and pecking order theory. *American Business Review*, January:32-38.
- Graham, J.R. & Harvey, C.R. 2001. The theory and practice of corporate finance: evidence from the field. *Journal of Financial Economics*, 60(2):3.
- Greenwood, R.M. 2002. *Essays in Financial Economics*. Boston, Massachusetts: Harvard University Press.
- Hamada, R.S. 1969. Portfolio analysis, market equilibrium and corporation finance. *The Journal of Finance*, 24(1), March:13-31.
- Hawawini, G. & Viallet, C. 1999. *Finance for executives*. Cincinnati: South Western.

- Hsieh, C. 1993. Some potential applications for artificial neural systems. *Journal of Systems Management*, April:12-15.
- Killian, T.W. 2005. Designing an optimal capital structure. *US Banker*, September:54-58.
- Lasher, W.R. 2003. *Practical financial management*. 3rd edition. Mason: Thomson.
- Mao, C.X. 2003. Interaction of debt agency problems and optimal capital structure: theory and evidence. *Journal of Financial Quantitative Analysis*, 38(2), June:399-423.
- Miller, M.H. 1977. Debt and taxes. *Journal of Finance*, 32, May:261-275.
- Modigliani, F. & Miller, M.H. 1958. The cost of capital, corporation finance, and the theory of investment. *American Economic Review*, June:261-297.
- Modigliani, F. & Miller, M.H. 1963. Corporate income taxes and the cost of capital: a correction. *American Economic Review*, 53, June:433-443.
- Moyer, R.C., McGuigan, J.R. & Kretlow, W.J. 2003. *Contemporary financial management*. 9th edition. Mason: Thomson.
- Pagano, M. 2005. The Modigliani-Miller Theorems: a cornerstone of finance. *Banca Nazionale del Lavoro Quarterly Review*, June-September:237-247.
- Pinegar, J.M. & Wilbricht, L. 1989. What managers think of capital structure theory: a survey. *Financial Management*, 18(4), Winter:82-91.
- Smart, S.B., Megginson, W.L. & Gitman, L.J. 2004. *Corporate finance*. Mason: Thomson.