

**THE RELATIONSHIP BETWEEN
SUSTAINABLE VALUE CREATION AND
DYNAMIC CAPITAL STRUCTURE
MANAGEMENT**

ELIZE VAN DEN HEEVER

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Study Leader: Prof Ines Nel

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ABSTRACT

In this paper the case for the relationship between dynamic capital structure management and sustainable value creation has been argued. The dissertation addresses the need for dynamic rather than static capital structure management. Research has been done on capital structure dynamics with the intention of developing a model for improved and dynamic capital structure management for sustained value creation.

The author has provided a theoretical overview of the two Modigliani and Miller (M&M) propositions, capital structure models and the most important factors determining an appropriate capital structure for a company. Empirical research has been done on JSE listed companies in the industrial sector for the period 1997-2006. The relationship between capital structure determinants and sustainable value creation, as reflected in company share prices, has been investigated as part of the empirical study. The results from the statistical analyses have been used to develop a model for dynamic capital structure management. It has been expected that the value of a firm and certain capital structures would be strongly correlated, but research has shown that capital structure variables and change in share price are weakly correlated for companies listed in the industrial sector. Therefore, a change in the share price model does not make sense and has not been developed. On the contrary, empirical research has found a statistically significant relationship between capital structure variables and companies' debt to equity ratios. Based on this knowledge/research, four multi factor models have been developed for debt to equity at a 5% level of significance.

The idea behind the multi factor models is to determine which variables have been the best predictors (individually and combined) of the expected direction of movement of companies' debt to equity ratios. The results from testing the model confirmed that the four debt to equity variables (return on equity, return on

assets, debt to asset ratio and net profit margin) are significant indicators of the direction of movement of a company's debt to equity ratio. The models become stronger predictors of the expected direction of movement of debt to equity ratios as the number of variables included in the model increases.

Three of the most significant explanatory variables in the four factor model of debt to equity are profitability ratios, which mean that industrial companies are managed, using financial ratios instead of value based management variables. Therefore, it can be argued that industrial companies listed on the JSE are far from practising value based management.

Capital structure decisions are important not only because of the need to maximise returns to various organisational constituencies, but also because of the impact such decisions have on an organisation's ability to deal with its competitive environment. Therefore, the four factor model suggests a practical and dynamic way for companies in the industrial sector to manage an optimal capital structure to ensure sustainable value creation.

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LIST OF ABBREVIATIONS

BTA:	Beta
CAPM:	Capital asset pricing model
CR:	Capital requirements
CRR:	Capital requirement ratio
DCF:	Discount cash flow
DTA:	Debt to assets
DEQ:	Debt to equity
EROIC:	Expected return on invested capital
EVA:	Economic value added
FINDIS:	Financial distress
FCF:	Free cash flow
JSE:	Johannesburg Stock Exchange
g:	Growth rate
M&M:	Modigliani and Miller
NOPAT:	Net operating profit after taxes
NPAT:	Net profit after interest and taxes (also known as Net income)
NPM:	Net profit margin
OP:	Operating profitability
ROA:	Return on assets
RTE:	Return on equity (also known as ROE)
ROIC:	Return on invested capital
SFAS:	Statement of financial accounting standards

SG:	Sustainable growth
SMEs:	Small and medium enterprises
TATO:	Total asset turnover
VBM:	Value based management
WACC:	Weighted average cost of capital
YTM:	Yield-to-maturity
Yrs:	Number of years to pay of debt

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Is your stock price raising concerns among investors? Are you worried about your company's financial performance? Warning: Taking on more debt to solve management problems can be dangerous for the long-term health of your firm! An appropriate capital structure is a critical decision for any business organisation. In this dissertation the words *stocks* and *shares* are used interchangeably and are considered synonyms.

Capital structure is defined as the relative amount of debt and equity used to finance a firm. Minimising cost of capital and/or maximising company value remain the objective of every firm that seeks to optimise its capital structure (Cohen, 2004: 89). Capital structure decisions are complex ones that involve weighing a variety of factors. In general, companies that tend to have stable sales levels, assets that make good collateral for loans, a high growth rate and firms with a high tax rate can use debt more heavily than other companies. On the other hand, companies that have conservative management, high profitability, higher operating risk or poor credit ratings may wish to rely on equity capital instead. Capital structure decisions are important not only because of the need to maximise returns to various organisational constituencies, but also because of the impact such decisions have on an organisation's ability to deal with its competitive environment (Jones, 2005). It is therefore obvious that managers should make capital structure decisions designed to maximise the firm's value.

The Modigliani-Miller's (M&M) (1958: 267) theory forms the basis for modern thinking on capital structure. The basic theorem states that, in the absence of taxes, bankruptcy costs, and asymmetric information, and in an efficient market,

the value of a firm is unaffected by how that firm is financed. It does not matter if the firm's capital is raised by issuing stock or selling debt. M&M showed that debt is useful because interest is tax deductible, but also that debt brings with it costs associated with actual or potential bankruptcy.

The optimal capital structure strikes a balance between the tax benefits of debt and the costs associated with bankruptcy (Wikipedia, 2007). Despite all the propositions of the M&M world, when the real world is considered, it seems as if all firms and branches behave "as if" an optimal capital structure exists. There are several extensions of the M&M capital structure theory that may explain the existence of an optimal capital structure (Mathiesen, 2007).

Capital structure policy involves a trade-off between risk and return. It is known that the riskiness of the firm's earnings stream increases as more debt is used. A higher proportion of debt generally leads to a higher expected rate of return and the higher risk associated with greater debt tends to lower the stock's price. At the same time, however, the higher expected rate of return makes the stock more attractive to investors, which, in turn, ultimately increases the stock's price (Jones, 2005). The capital structure of a firm refers to its debt-to-equity ratio, which provides insight into how risky a company is. Usually a company more heavily financed by debt possesses greater risk, as this firm is relatively highly levered (Investopedia, 2007).

Weighted average cost of capital (WACC) depends on the percentages of debt and equity, the cost of debt, the cost of stock and the corporate tax rate (Brigham & Ehrhardt, 2005: 547). A company's WACC is a function of the mix between and the cost of debt and equity. Investors use WACC as a tool to decide whether or not to invest. It represents the minimum rate of return at which a company produces value for its investors (Investopedia, 2007). The capitalisation formula with WACC as nominator is the backbone of most valuation methods today (Adhikari, 2003).

Cost of capital would include the cost of debt and the cost of equity. The cost of capital determines how a company can raise money (through a stock issue, borrowing, or a mix of the two). This is the rate of return that an investor would receive if it invested its money someplace else with similar risk (Investopedia, 2007). The cost of debt is the effective rate that a company pays on its current debt. This can be measured in either before- or after-tax returns; however, because interest expense is deductible for tax purposes, the after-tax cost is most often used (Investopedia, 2007). In financial theory, the cost of equity is the return that stockholders require to make them willing to invest in a company.

John H. Hall in Nguyen and Ramachandran (2006: 194) when referring to start-up and small companies, said, "Initially, profitability ratios are the most important factors in the wealth creating process." As companies become established capital structure plays a very important role and profitability ratios become less important. Efficient financing of the balance sheet, efficient fixed asset and working capital management then become top priorities in creating shareholder value. Marsh (1982: 138) finds that large firms more often prefer long-term debt, while small firms prefer short-term debt. Therefore, the cost of issuing debt and equity is negatively related to firm size. In addition, larger firms are often diversified and have more stable cash flows, and so the probability of bankruptcy for larger firms is less, relative to smaller firms. This suggests that size could be positively related with leverage (Nguyen & Ramachandran, 2006: 195).

It can be interpreted that a high debt-to-equity ratio means a company has been aggressive in financing its growth with debt. High debt levels can cause volatile earnings as a result of the additional interest expense. Volatility leads to a higher required return on equity because of the higher risk involved for equity-holders. If a high percentage of debt is used to finance growth in operations (high debt to equity), the company could potentially generate more earnings than it would have without external funds. If earnings increase by a greater amount than the cost of debt (interest), shareholders benefit as more earnings are being realised for the

same amount of shareholders' investment. However, the cost of debt financing may outweigh the return that the company generates. This situation might lead to bankruptcy, which could leave shareholders with nothing. A high debt ratio raises the threat of bankruptcy, which carries a cost, but which also forces managers to be more careful and less wasteful with shareholders' money (Investopedia, 2007). A firm's debt to equity ratio, measured at market value, not book value, is an indication of its leverage (Wikipedia, 2007). Financial leverage indicates what proportion of equity and debt the company is using to finance its assets. It reflects the extent to which fixed-income securities are used in a firm's capital structure.

Theoretical principles underlying the capital structure can be described either in terms of a static trade-off choice or pecking order framework. Asymmetric information and the pecking order theory state that there is no well-defined target debt ratio. The latter model suggests that there tends to be a hierarchy in firms' preferences for financing: first using internally available funds, followed by debt, and finally external equity. These theories identify a large number of attributes influencing a firm's capital structure (Nguyen & Ramachandran, 2006: 193).

Robert Hamada in Brigham & Ehrhardt (2005: 575) used the underlying assumptions of the Capital Asset Pricing Model (CAPM) along with the Modigliani-Miller's (1958) theory to develop the Hamada Equation, which shows the effect of financial leverage on beta. According to CAPM, beta is a measure of market risk considered to be the only relevant measure of a stock's risk. It measures a stock's relative volatility - that is, it shows how much the price of a particular stock moves up and down compared with how much the "stock market as a whole" moves up and down (McClure, 2006).

According to the theory of financial distress, higher business risk increases the probability of financial distress. So firms have to trade off between tax benefits and bankruptcy cost (Nguyen & Ramachandran, 2006: 194). Business risk is the

risk a firm's common stockholders would face if the firm had no debt. It arises from uncertainty in projections of the firm's cash flows, which, in turn, means uncertainty about its operating profit and its capital requirements. The return on invested capital (ROIC) combines these two sources of uncertainty and its variability can be used to measure business risk on a stand-alone basis (Brigham & Ehrhardt, 2005: 550). A firm's business risk, its tax position, its need for financial flexibility, its managerial conservatism or aggressiveness and its growth opportunities are factors that influence its capital structure (Brigham & Ehrhardt, 2005: 575). The value of a firm is defined as the present value of its expected future free cash flows (FCFs), discounted at its WACC.

The Du Pont equation defines relationships between profit margin, total asset turnover and change in financial leverage and is able to tie these factors together to determine return on equity (ROE). The ratios referred to are defined as: Profit margin (Net income/Sales), Total asset turnover (Sales/Total assets) and Equity multiplier (Total assets/Common equity). The Equity multiplier specifically deals with using financial leverage. The Du Pont equation allows management to monitor performance in the mentioned three areas. The Du Pont equation is also a good tool to use for a comparison of the company's performance against other organisations in the same industry. As the objective of financial management is the maximisation of wealth, a structured analysis should aim towards measuring how effectively this objective is achieved. The Du Pont model uses the return on equity as the overall indicator of success. While profit maximisation would not be a primary objective, a satisfactory return on shareholders' funds would be to maximise wealth (Wikipedia, 2007).

It is often argued in practice that the number of years it takes to settle debt out of net income influence the value of the share price. Profit is dependent on certain Du Pont variables. Thus, the higher the profit, the more free cash flow exists to pay off debt. Therefore, it can be assumed that a correlation exists between profit to debt and the number of years to pay off debt. The higher the net income, the

quicker debt will be paid off, which means that debt will be settled in less time/fewer years. Thus, net income becomes the value determinant of debt financing – how much debt a firm can incur and not just a preconceived percentage.

The optimal capital structure strikes a balance between risk and return to achieve the ultimate goal of maximising the price of the stock and simultaneously minimises the cost of capital (where WACC is the lowest). A firm establishes a target capital structure it believes is optimal, which is then used as a guide for raising funds in the future. This target capital structure might change over time as conditions vary. At any given moment the firm's management has a specific capital structure in mind, and individual financing decisions should be consistent with this target capital structure. If the actual proportion of debt is below the target level, new funds will probably be raised by issuing debt, whereas if the proportion of debt is above the target, stock will probably be sold to bring the firm back in line with the target debt/assets ratio (Jones, 2005).

Managers should choose the capital structure that maximises shareholders' wealth. The basic approach is to consider a trial capital structure, based on the market values of the debt and equity, and then estimate the wealth of shareholders under this capital structure. This approach is repeated until the optimal capital structure is identified (Brigham & Ehrhardt, 2005: 564). The problem, though, is that a firm's capital structure should be managed dynamically and not statically.

1.2 PROBLEM STATEMENT

It is known that although each firm has a theoretically optimal capital structure, in practice it cannot be estimated with precision. In the opinion of the researcher capital structure management becomes dynamic as soon as it is assumed that debt will be settled from net profit and if we consider "the number of years it will

take to pay off debt from profits". The problem is that capital structure decisions in firms are currently managed statically. It could be argued that it should be managed dynamically to ensure sustainable value creation.

1.3 OBJECTIVE

1.3.1 Main objective

The main objective of this study is to research capital structure dynamics with the intention to develop a model for improved and dynamic capital structure management for sustained value creation.

1.3.2 Sub-objectives

- To thoroughly research capital structure dynamics in a theoretical context,
- To investigate the relationship between capital structure determinants and sustainable value creation as reflected in company share prices; and
- To develop and test a model for dynamic capital structure management.

1.4 RESEARCH DESIGN AND METHODOLOGY

The research comprises a literature and an empirical study. Empirical research will, among others, consist of statistical analyses including multiple regressions. The aim is to determine which factors are correlated with capital structure and maximum value of companies.

A statistical data analysis will be done for all the JSE Industrial listed companies for the period 1997 - 2006 to determine the relationship/correlation between the dependent research variables, ***change in share price*** and the ***debt to equity ratio*** and the independent capital structure variables. Multiple regression analyses will be done to determine whether variation in the observed values of ***change in share price*** and the ***debt to equity ratio*** can be explained by an

overall regression model. For each of the dependent variables, ***change in share price*** and the ***debt to equity ratio***, two regression models have been developed. Model 1 includes all independent explanatory variables and model 2 only includes variables at a 5% level of significance. The results from the above statistical analysis will be used to develop a model as a tool for dynamic capital structure management.

1.5 LIMITATIONS

A limitation in developing such a model is that only listed companies in the industrial industry are considered in this study. Therefore, sectors and sub-sectors of all industrial companies considered are ignored. All data for all companies has not been available at all times. The focus is on the development of a general, rather than a specific model. The financial information to be used will be standardised according to the McGregor criteria (both limitation and benefit).

CHAPTER 2

THEORETICAL FRAMEWORK

2.1 INTRODUCTION

The purpose of this chapter is to present theories concerning capital structure, value maximisation and how to ensure sustainable value creation. Knowledge of these theories is essential for understanding which factors determine a firm's capital structure and why capital structure matters to the firm. It also discusses prior research conducted by other researchers within this area, depending on the relevance to this study.

The Modigliani and Miller (M&M) propositions have created a starting point for capital structure theories. This chapter starts off by discussing the different propositions (with and without taxes) on capital structure made by M&M as well as the trade-off model, pecking order hypothesis and the signalling hypothesis that have made it into the mainstream of corporate finance. The most important factors determining an appropriate capital structure for a company are considered. The ultimate goal of a firm is to maximise the price of the stock (value of firm) and simultaneously minimises the cost of capital. Steps for the analysis of each potential capital structure are discussed. Value based management and how it can help management to focus on value creation and motivation toward this end are also discussed in this chapter.

2.2 MODIGLIANI AND MILLER'S PROPOSITIONS

Surveys of the theory of capital structure always start with the Modigliani and Miller (1958) proof that financing does not matter in perfect capital markets. The propositions on capital structure made by Modigliani and Miller (M&M) are among the most important contributions in the theory of corporate finance. The

generalised M&M theorems may seem complicated when looking at the mathematics thereof.

2.2.1 M&M Proposition I with taxes

M&M published a follow-up paper in 1963 in which taxes are excluded from the assumption. The tax code allows corporations to deduct interest payments as an expense. This differential treatment encourages corporations to use debt (levered) in capital structures. Figure 2.1 indicated that interest payments of levered firms reduce the taxes paid by a corporation and more of its cash flow is available for its investors (Brigham & Ehrhardt, 2002: 558). In other words, a levered company pays less tax than an all-equity company does, because of its lower earnings before taxes (EBT). Thus, the value (sum of debt plus equity) is greater for the levered firm, which can be seen in Figure 2.1.

Figure 2.1: Income statement: leveraged and unlevered firms

<u>Income statement</u>		
	Unlevered	Levered
EBIT	1,500,000	1,500,000
Less: Interest payment	-	(500,000)
EBT	1,500,000	1,000,000
Less: Tax payment @ 30%	(450,000)	(300,000)
Net earnings	1,050,000	700,000
Value of equity	10,500,000	7,000,000
Value of debt	-	5,000,000
Total value	10,500,000	12,000,000

Source: Own

The value of the levered firm is equal to the value of an unlevered firm plus the present value of the tax shield provided by debt, as seen in equation 2.1.

$$V_L = V_U + T_C \quad (\text{Eq. 2.1})$$

When the assumption of no taxes is relaxed, the market value of the company increases by taking on more risk-free debt. As a result, under M&M with taxes the WACC falls as debt is added. Consequently the company should take on 100% debt to optimise company value – a firm's value is maximised where WACC is the lowest. This is M&M Proposition I with taxes (Modigliani & Miller, 1963: 438).

2.2.2 M&M Proposition I with no taxes

Modern capital structure theory began in 1958 when Franco Modigliani and Merton Miller published what has been called the most influential finance article ever written. M&M demonstrate that, in a frictionless world, financial leverage is unrelated to firm value, but in a world with tax-deductible interest payments, firm value and capital structure are positively related (Hatfield *et al.*, 1994: 3). The value of the firm will be the same, regardless of the type of capital structure is chosen. This is a strong argument where the authors explicitly or implicitly assume that:

- Capital markets are frictionless, which means that securities can be purchased and sold costless and instantaneously.
- Individuals can borrow and lend at the risk-free rate.
- There are no costs to bankruptcy.
- Corporations can issue only two types of securities: risky equity and risk-free debt.
- All corporations are assumed to be in the same risk class.
- There are no corporate or personal income taxes.
- There is no growth – all cash flow streams are perpetuities.

- Corporate insiders and the public have the same information; no signalling opportunities.
- There are no agency costs and managers always maximise shareholders' wealth.

When all the above assumptions are fulfilled, equation 2.2 holds.

$$V_L = V_U \quad (\text{Eq. 2.2})$$

where

V_L = Value of levered firm

V_U = Value of unlevered firm

This model is called the M&M Proposition I, which says that V is a constant, regardless of the proportions of debt and equity (D and E), provided that the assets and growth opportunities on the left-hand side of the balance sheet are held constant.

Proposition I also says that each firm's cost of capital is a constant, regardless of the debt ratio (Myers, 2001: 93). This proposition states that the market value of a firm is independent of its capital structure. Hence, the firm's average cost of capital is also independent of its capital structure. Any degree of leverage is as good as any other (Prasad *et al.*, 2001: 8). Financial leverage is irrelevant. This means that the value of the unlevered firm is the same as the value of the levered firm (Modigliani & Miller, 1958: 269).

2.2.3 M&M Proposition II with no taxes

An implication of M&M Proposition I is that the expected return on a portfolio consisting of all the firm's debt and equity is constant, as seen in equation 2.3.

$$r_A = \frac{D}{D+E} * r_D + \frac{E}{D+E} * r_E \quad (\text{Eq. 2.3})$$

where

D and E are the amount of the firm's debt and equity respectively, and the return on asset (r_A) is constant, regardless of capital structure. Copeland and Weston in Eriksson & Hede (1999: 18) argued that in this context, r_A is also called *Weighted Average Cost of Capital* (WACC). By rearranging the terms, M&M Proposition II is obtained, as seen in equation 2.4.

$$r_E = r_A + \frac{D}{E} * (r_A - r_D) \quad (\text{Eq. 2.4})$$

M&M Proposition II implies a linear relationship between shareholders' rate of return and firm leverage (Prasad *et al.*, 2001: 9). Proposition II argues that the expected return on equity is positively related to leverage, and also that risk increases with leverage. Since it is known that r_A is constant for any capital structure, and that the return on debt (r_D) is assumed to be constant, one can calculate the return on equity (r_E) for different kinds of capital structure. The larger the amount of debt, the larger the required return on equity (Eriksson & Hede, 1999: 18).

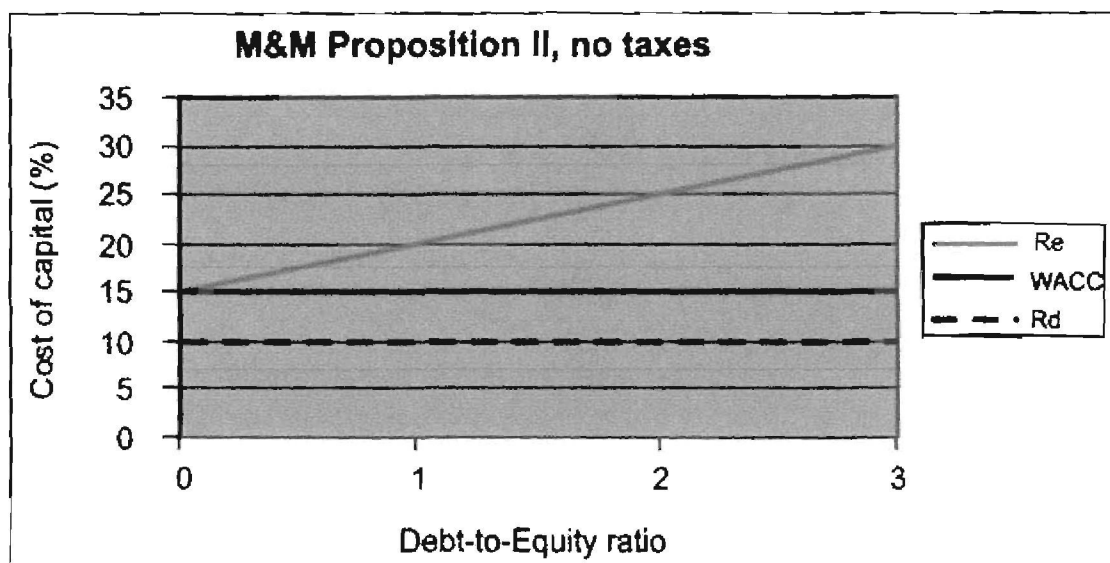
The cost of equity (the expected rate of return demanded by equity investors) increases with the market-value debt-equity ratio D/E . The rate of increase depends on the spread between the overall cost of capital (r_A) and the cost of debt (r_D). Equation 2.3 (M&M Proposition II) shows why "there is no magic in financial leverage" (Myers, 2001: 94).

It is known from Proposition I that the company's WACC (r_A) is constant and that changing the capital structure cannot affect its value. The rate of return on equity increases as leverage increases, according to proposition II. How can this be? What happens is that risk increases as leverage increases. It is argued that (in the case of a share buy-back) when the firm moves from an unlevered structure to a levered structure, the operating income is divided on a smaller amount of

outstanding shares, which gives a larger r_E . Return on equity (r_E) has increased, but risk (beta) has also increased (Modigliani & Miller, 1958: 276).

Figure 2.2 shows that r_E is not important when determining an optimal capital structure. R_E can always be increased by borrowing, but the increase in r_E is offset by the higher risk. WACC remains constant even when firms change capital structure, consequently firms are not better off with leverage.

Figure 2.2: M&M Proposition II with no taxes



Source: Own

The conclusion of the M&M Propositions is that the overall cost of capital cannot be reduced by changing from equity to debt, which seems to be cheaper. As firms add debt, the remaining equity becomes more risky and the cost of equity capital increases. The increase in the cost of equity capital is offset by the higher proportion of the firm financed by low-cost debt. The value of the firm and the firm's overall cost of capital are invariant to leverage, which is shown by the constant WACC (Eriksson & Hede, 1999: 25). The M&M propositions are benchmarks, not results. The propositions say that financing does not affect value except for specifically identified costs or imperfections (Myers, 2001: 89).

2.2.4 M&M Proposition II with taxes

M&M Proposition II with *no* taxes shows a positive relationship between the expected return on equity and leverage. The same intuition holds when corporate taxes are added, as seen in equation 2.5.

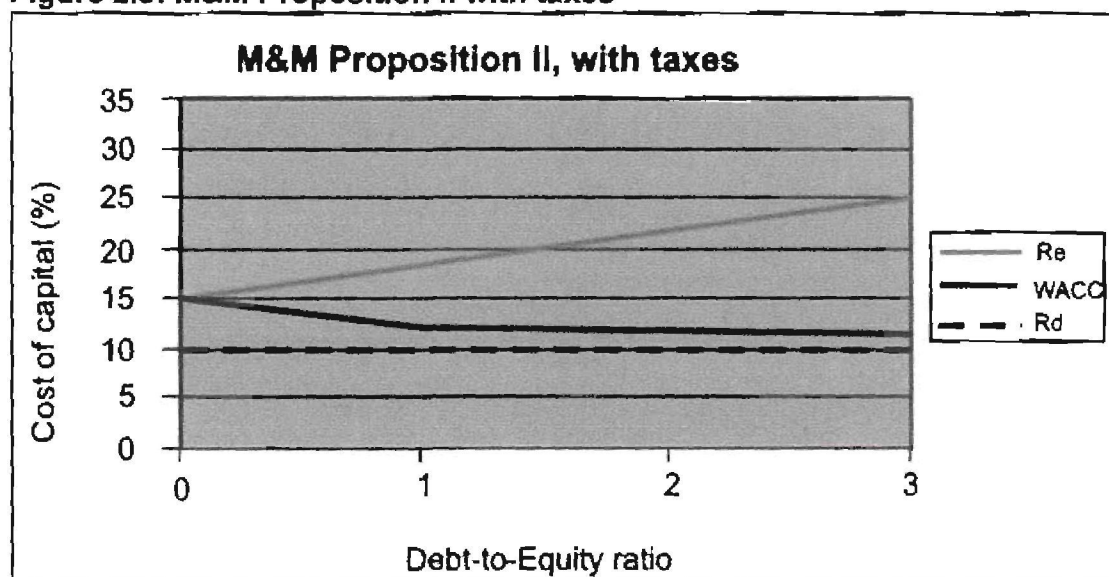
$$r_E = r_A + \frac{D}{E} * (1 - T_C) * (r_A - r_D) \quad (\text{Eq. 2.5})$$

The new WACC, including taxes, is seen in equation 2.6.

$$WACC = \frac{D}{D + E} * r_D * (1 - T_C) + \frac{E}{D + E} * r_E \quad (\text{Eq. 2.6})$$

Figure 2.3 shows that a higher leverage level provides the firm with a lower WACC when corporate taxes exist. This can be compared to figure 2.2 where WACC is constant even though leverage is increased. This suggests that the firm value will increase with higher leverage since WACC will decrease, assuming that corporate taxes exist. Copeland and Weston in Eriksson & Hede, (1999: 20) said that the larger the amount of debt, the higher the value of the firm, which implies that a 100% debt financing should be implemented.

Figure 2.3: M&M Proposition II with taxes



Source: Own

It is important to keep in mind the restrictive assumptions that must be fulfilled for the M&M propositions to hold. The most important assumption is that the M&M propositions ignore bankruptcy costs, which have been found to exist in reality.

2.3 MODELLING CAPITAL STRUCTURE DYNAMICS

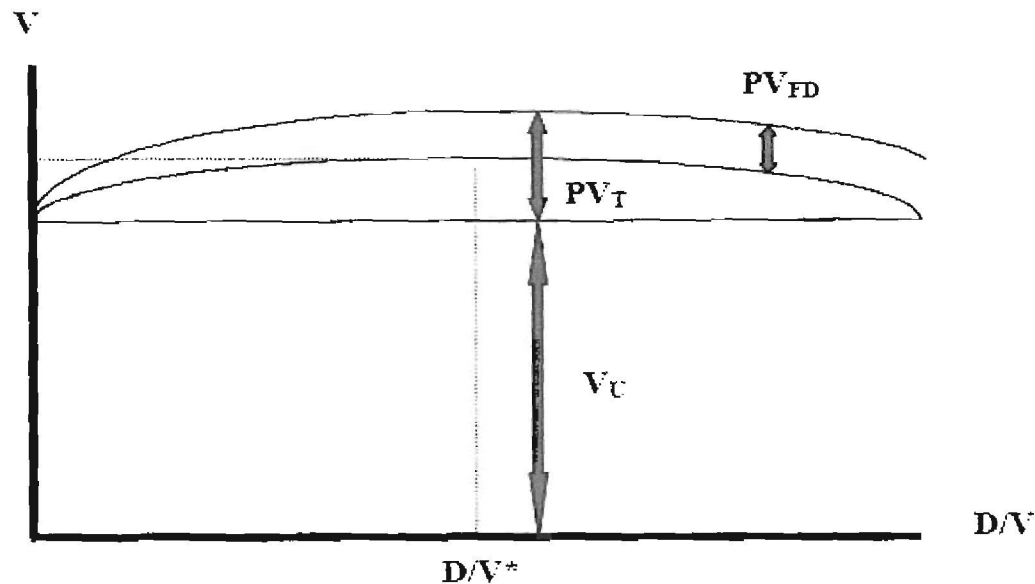
The M&M propositions have created a starting point for capital structure theory and today there are three models that have made it into the mainstream of corporate finance. Out of these models it is only the trade-off model that provides an actual formula for calculating the optimal capital structure. The pecking order hypothesis and the signalling hypothesis only try to explain observed patterns, not calculate an optimal capital structure level according to Copeland and Weston in Eriksson & Hede, (1999: 21)

“One of the most contentious issues in the theory of finance during the past quarter century has been the theory of capital structure” (Bradley *et al.*, 1984: 859). Even Stewart Myers, one of the foremost researchers in the field, has concluded as recently as 2001 that “there is no universal theory of the debt-equity choice, and no reason to expect one” (Myers, 2001: 81).

2.3.1 The trade-off model

The trade-off theory justifies moderate debt ratios. It says that the firm will borrow up to the point where the marginal value of tax shields on additional debt is just offset by the increase in the present value of possible costs of financial distress (Myers, 2001: 88). The trade-off model is based on the value of an unlevered firm, where the optimal capital structure is found at the trade-off point where the gain from adding additional debt is offset by the extra incurred cost of financial distress, as seen in figure 2.4

Figure 2.4: The trade-off model



Source: Eriksson & Hede (1999: 22)

where

V = Value of the firm

V_U = Value of unlevered firm

PV_T = Present value of the tax deductibles value

PV_{FD} = Present value of the risk for financial distress

The upper curve (PV_{FD}) in figure 2.4 shows the value of the company without considering the cost of the risk for financial distress. When financial distress is taken into account and deducted from the upper curve, the lower (PV_T) curve is applicable. The optimal capital structure is where the PV_T curve has its highest point. The benefits of the trade-off model are typically tax savings and the costs are typically direct bankruptcy, agency and financial distress costs (Titman & Tsyplakov, 2005: 14)

2.3.1.1 Financial distress

Debt provides tax benefits to the firm, but it also puts pressure on the firm, since interest and principal payments are obligations, according to the trade-off model (Eriksson & Hede, 1999: 35). Increasing leverage by taking on more debt means that the firm can profit more from debt tax shields, which will increase its value (Modigliani and Miller's (1963: 438) Proposition I under corporate taxes). On the other hand, higher leverage leads to higher (expected) direct and indirect costs of financial distress, decreasing the firm's value.

Direct costs include the legal and administrative costs of liquidation or reorganisation. Indirect costs refer to the impaired ability to conduct business and to agency costs of debt that are specifically related to periods of high bankruptcy risk (such as the incentive for stockholders to select risky projects) (Eriksson & Hede, 1999: 35). Altman (1984: 1071) has estimated that both indirect and direct costs together are frequently greater than 20% of firm value, and arithmetic indirect bankruptcy costs to be 10.5% of firm value. These findings give us reason to believe that bankruptcy costs are sufficiently large to support a theory of optimal capital structure that is based on the trade-off between gains from the tax shield and losses that come with costs of bankruptcy. Warner (1977: 338) has found that direct costs of bankruptcy decrease when the size of the firm increases, which implies that for large companies bankruptcy costs are less important when determining capital structure than it is for smaller firms.

The closer the firm is to bankruptcy, the larger is the cost of financial distress. The ultimate financial distress is bankruptcy, where ownership of the firm's assets is legally transferred from the stockholders to the bondholders (Haugen & Senbet, 1978: 387).

2.3.1.2 Agency costs

There is also another argument for how capital structure may be influenced by asymmetries between managers and investors. Not only do managers have different information about the prospects of the firm than shareholders do, but managers also have interests that diverge from those of shareholders (Frielinghaus *et al.*, 2005: 10). Agency costs are a good reason for firms to increase the amount of debt in capital structure, as debt “enables managers to bond promises to pay out future cash flows” (Jensen, 1986: 324). According to agency cost theory, firms use more debt in their capital structure when investors seek to pressure management to use funds efficiently.

Fosberg (2004: 35) found that the debt ratio decreases as agency costs decrease because of an increasing proportion of ownership by management, and that those firms with fewer shareholders have more debt than firms with many shareholders. The link between fewer shareholders and more debt suggests that shareholders who are able to influence capital structure in their favour, do so in a way that increases the level of debt (Frielinghaus *et al.*, 2005: 11).

Since equity and debt both incur agency cost, the optimal debt-equity ratio involves a trade-off between the two types of cost. Agency costs associated with equity are at a maximum when the owner-manager's share of equity is zero and the firm is wholly owned by outside stakeholders. These costs fall to zero as the owner-manager's equity share rises to 100%. Similarly, the agency costs of debt are at a maximum when all capital is obtained externally, using debt. As the level of debt falls, debt agency costs are reduced. First, the amount of wealth that can be reallocated away from debt-holders falls. Second, since the fraction of equity held by the owner-manager is being reduced, the owner-manager's share of any reallocation also falls (Prasad *et al.*, 2001: 8).

2.3.2 Pecking order hypothesis

The emphasis of pecking order models is on the costs associated with the issuance and repurchase of equity (Titman & Tsyplakov, 2005: 16). The pecking order hypothesis suggests that firms have a particular preference order to finance the firm (Myers, 1984: 578). Due to asymmetric information between managers and investors firms prefer internal financing to debt financing and debt financing to issuing shares (Donaldson, 1961: 29; Myers, 1984: 579). In pecking order models a firm's history plays an important role in determining its financial structure. Information asymmetries between the firm and the market imply firms prefer to finance using retained earnings, followed by debt, and finally by equity (Prasad *et al.*, 2001: 44).

In its pure form the pecking order hypothesis does not mention a target leverage as such. In particular, a firm that realises a reduction in value because of very poor profits may become more highly levered because of a reluctance to issue equity to offset the decrease in the market value of its stock (Titman & Tsyplakov, 2005:17). Trade-off behaviour and pecking order considerations need not be mutually exclusive (De Haas & Peeters, 2006: 135). Additional empirical studies show that, although trade-off considerations may be important in the longer term, pecking order behaviour may matter or even dominate in the short-term (Hovakimian *et al.*, 2001: 11; Kayhan & Titman, 2004; Mayer & Sussman, 2004: 12; Remolona, 1990: 35). Donaldson (1961: 30) has found a pecking order for how firms establish long-term financing.

- Firms prefer internal financing to external financing of any sort (debt or equity) when financing positive NPV projects.
- When a firm has insufficient cash flow from internal sources, it sells off part of its investment in marketable securities.
- As a firm is required to obtain more external financing, it will work down the pecking order of securities, starting with very safe debt,

progressing through risky debt, convertible securities, preferred stock, and lastly common stock.

The pecking order hypothesis does not provide a formula for calculating an optimal capital structure but it helps to explain observed patterns regarding financing preferences.

2.3.3 Signalling hypothesis

When valuing a company it is not sure that the market knows the return stream of the firm and can value this stream to set the value of the firm. What is valued in the marketplace is the perceived stream of returns for the firm. Ross (1977: 23) has developed the information asymmetry theory of capital structure by removing another assumption underlying Modigliani and Miller's value invariance theory, namely that "the market possesses full information about the activities of firms". If instead it is assumed that managers possess information about the firm's future prospects that the market does not have, then managers' choice of a capital structure may signal some of this information to the market (Ross, 1977: 24).

The signalling hypothesis suggests that a higher financial leverage can be used by managers to signal an optimistic future for the firm (Ross, 1977: 32). Increasing leverage, he reasons, would signal to the market that the firm's managers are confident about being able to pay interest in future, and hence they are confident about future earnings prospects. Increasing leverage would, therefore, increase the value of the firm by signalling to investors the size and stability of future cash flows (Ross, 1977: 32).

Fama and French (1988: 839), on the other hand, have countered by pointing to the fact that more profitable firms tend to have lower levels of debt. They have argued that increasing debt actually signals poor prospects for future earnings and cash flow as there will be less internal financing available to fund development.

Therefore, while it has been argued that information asymmetries decrease over the lifetime of a firm (Baeyens & Manigaart, 2003: 53) there is insufficient clarity on exactly how signalling, within the context of information asymmetries, affects capital structure decisions. Information asymmetries and how they change over time, cannot be looked at directly as an explanation of why capital structure might change over a firm's life cycle.

2.4 CONCLUDING COMMENTS ABOUT THE MODELS

The pecking order hypothesis and the signalling hypothesis explain observed capital structure patterns and how these structures are financed.

These models do not help us to predict an optimal capital structure. However, the trade-off model provides a formula for calculating an optimal capital structure.

2.5 FACTORS DETERMINING CAPITAL STRUCTURE

So far the theoretical models behind an optimal capital structure have been introduced. The difference in the different models is that, in a 'trade-off world', information asymmetry costs are one of many factors that influence firms' capital structure decisions, whereas in a "pecking order world" these costs are basically the only determinant (De Haas & Peeters, 2006: 145). By combining the knowledge from these sources, one can conclude which factors are the most important ones when determining an appropriate capital structure for a company.

2.5.1 Making use of the tax shield

A major reason for using debt is that interest is tax deductible, which lowers the effective cost of debt. The more money a firm borrows, the greater the benefit of the tax shields. Furthermore, the higher a firm's corporate tax rate, the greater the advantage of debt (Modigliani & Miller, 1963: 442). Very profitable firms use the tax shield to a smaller extent, because these firms do not need much debt financing. Earning a high rate of return enables firms to finance most projects

with retained earnings (Donaldson, 1961: 32). From a trade-off model point of view this observed pattern is not optimal.

2.5.2 Non-debt tax shield

If much of a firm's income is already protected from taxes by accelerated depreciation or tax loss carry-forwards, its tax rate will be low, and in this case debt will not be as advantageous as it would be to a firm with a higher effective tax rate (Eriksson & Hede, 1999: 31). A negative association between non-debt tax shields and target leverage is expected (DeAngelo & Masulis, 1980: 25).

2.5.3 Profitability

The hypothesised relationship between firm profitability and capital structure is founded in Myers' (1984: 579) pecking order hypothesis. Given the information asymmetries between the firm and outsiders, firms have a preference for internal financing over external financing, as the cost of external capital should be greater to the firm (Cassar & Holmes, 2003: 123). Therefore, profitable firms which have access to retained profits can use these for firm financing rather than accessing outside sources. Even though more profitable firms would be more likely to get access to external capital, these firms will prefer internal funds to finance operations and investments. Empirical evidence from previous studies examining small and medium enterprises (SMEs) is consistent with pecking order arguments with leverage being found to be negatively related to profitability (Van der Wijst & Thurik, 1993: 59; Chittenden *et al.*, 1996: 62; Jordan *et al.*, 1998: 25; Coleman & Cohn, 2000: 84; Mishra & McConaughty, 1999: 61).

2.5.4 Income variability

Higher income variability increases the risk that a firm may not be able to cover its interest payments, leading to higher expected costs of financial distress. This implies a negative relationship between income variability and target leverage. At the same time, higher income volatility will make the underinvestment problem

less severe, lowering the related agency costs of debt (Myers, 1977: 148). Cools in De Haas & Peeters (2006: 147) said, "If this latter effect dominates, there will be a positive relationship between income volatility and leverage."

2.5.5 Trade credit

Since creditors are excluded from the leverage measure, trade credit can be included as an explanatory variable. Trade credit may be an important alternative financing source for firms that are confronted with a prohibitive external financing premium in case of the usual sources of external finance. To the extent that trade credit substitutes for 'normal' debt, it is expected that a negative relationship will be found between the trade credit variable and target leverage (De Haas & Peeters, 2006: 147).

2.5.6 Limitations to borrowing

Lending and rating agencies play an important role when determining how much debt a firm can issue and to what extent the tax shield can be used (Eriksson & Hede, 1999: 32). Banks might not want to issue loans to firms that are already exposed to a high leverage level.

2.5.7 Size

There are several theoretical reasons why firm size would be related to the capital structure of the firm. Firstly, smaller firms may find it relatively more costly to resolve informational asymmetries with lenders and financiers (Cassar & Holmes, 2003: 124). Consequently, smaller firms are offered less capital, or are offered capital at significantly higher costs to larger firms. This discourages the use of external financing. Large firms tend to be more diversified and therefore they have a lower risk of bankruptcy costs. Also, for large firms, fixed direct bankruptcy costs constitute a smaller portion of firm value, leading to relatively lower costs of leverage (Titman & Wessels, 1988: 14). The relationship between size and target leverage will then be positive.

2.5.8 Growth

The pecking order theory suggests that a firm's growth is negatively related to its capital structure. A firm's growth is negatively related if low debt financing constitutes high growth and vice versa. The agency problem also suggests a negative relationship between capital structure and a firm's growth (De Haas & Peeters, 2006: 145). Myers (1977: 148) has argued that high-growth firms might have more options for future investment than low-growth firms. Thus, highly leveraged firms are more likely to pass up profitable investment opportunities. Consequently firms with high growth opportunities may not issue debt in the first place and leverage is expected to be negatively related to growth opportunities.

2.5.9 Age

It is expected that older firms will, all else being equal, have a higher target leverage ratio. Older firms have a longer track record and have had more time to build up relationships with suppliers of finance (Gertler, 1988: 573). Because of the resulting smaller information asymmetries and larger reputational value, older firms face a lower external financing premium on debt.

2.5.10 Business risk

Business risk is the riskiness inherent in the firm's operations. The greater fluctuation in Return on Assets (ROA), the larger the firm's business risk (Eriksson & Hede, 1999: 32). The larger the firm's business risk, the lower its optimal leverage level. Business risk is therefore one of the most important factors when making the capital structure decision. A firm will have little business risk if the demand for its products is stable, if the prices of its inputs and products remain relatively constant, if it can adjust its prices freely if costs increase, and if a high percentage of its costs are variable and hence will decrease if sales decrease. Other things being the same, the lower a firm's business risk, the higher its optimal debt ratio (Brigham & Ehrhardt, 2002: 558).

Business risk could either be determined by fundamental factors as stated below or by an unlevered beta. An unlevered beta is derived from beta equity. Beta equity consists of a firm's business and financial risk; consequently the beta equity must be unlevered in order to refine the business risk, using equation 2.7. Copeland and Weston in Eriksson & Hede (1999: 32) have argued that a higher levered company will have a higher equity beta since a larger financial risk is used.

$$B_U = \frac{E}{D * (1 - T_c) + E} * B_E + \frac{D}{D * (1 - T_c) + E} * B_D \quad (\text{Eq. 2.7})$$

where

B_U = Unlevered beta

D = Debt

E = Equity

B_E = Beta equity

T_c = Corporate tax rate

B_D = Levered beta

The unlevered beta, calculated in Equation 2.7, is only one of the measures used when estimating business risk.

2.5.10.1 Industry

It can be assumed that companies belonging to the same industry face the same economic conditions, but the economic conditions may vary among industries (Eriksson & Hede, 1999: 33). Asgharin in Eriksson & Hede (1999: 33) said, "Different industries experience different capital structure patterns, which prove that industry classification can be used as a proxy for business risk."

2.5.10.2 Growth rate

Capital-intensive firms with few growth opportunities should be highly levered while technology-based industries with many growth opportunities should have relatively little debt. This is due to the fact that growing firms have more flexibility in investment choices and may accept risky projects (Myers, 1977: 156).

2.5.10.3 Asset structure

The type of assets the firm holds plays a significant role in determining that firm's capital structure. The reason can be that when a large fraction of the firm's assets is tangible, assets can serve as collateral for debt, which diminishes the risk of the lender suffering agency costs of debt. Both theory of financial distress and agency theory propound that tangibility has a positive relation to capital structure (Nguyen & Ramachandran, 2006: 202). A firm's asset structure is positively related if low debt financing constitutes low tangibility of assets and vice versa. Construction, transport and forestry, which are highly leveraged industries, are also industries with large tangible assets according to Asgharin Eriksson & Hede (1999: 33). Therefore, it can be assumed that tangible assets reduce business risk and therefore also the cost of financial distress.

2.5.10.4 Factors that cause stability or variance in future earnings

Demand variability

The more stable the unit sales of a firm's products are, other things held constant, the lower is its business risk as previously discussed. With stable sales a firm can more safely accept more debt and incur higher fixed charges than a company with unstable sales.

Sales price variability

It is known that firms whose products are sold on highly volatile markets are exposed to higher business risk than similar firms whose output prices are relatively stable (Eriksson & Hede, 1999: 33).

2.5.11 Financial risk

Financial risk is the added risk borne by stockholders as a result of financial leverage (Brigham & Ehrhardt, 2002: 558). Debt financing increases the variability of earnings before taxes (but after interest); thus, along with business risk, it contributes to the uncertainty of net income and earnings per share. The following factors can be used in order to estimate financial risk:

2.5.11.1 Leverage level

A company experiencing a larger leverage level is also experiencing a larger level of required fixed interest payments. Compared to equity financing there are no obligatory fixed payments. Consequently, a larger leverage level is equivalent to a larger financial risk (Eriksson & Hede, 1999: 34).

2.5.11.2 Debt coverage ratio

The fixed charges on debt include principal and interest payments on debt and lease payments. If the firm wants to take on additional debt, which increases fixed charges, the firm should analyse its expected future cash flow since fixed charges must be met with cash. The inability to meet these charges may result in financial insolvency and bankruptcy. To gain knowledge of the debt capacity of a firm the debt coverage ratio is helpful. When the debt coverage ratio is equal to one, it means that the firm is just able to pay its interest expenses (Eriksson & Hede, 1999: 34). Van Horne in Eriksson & Hede (1999: 34) said, "Consequently, a ratio below one means that the firm will not be able to pay its interest expenses. The larger the debt coverage ratio is, the lower is the company's financial risk."

2.5.11.3 Financial beta

A company's total risk is a combination of business and financial risk. In section 2.4.10 business risk was estimated by using an unlevered beta. To refine financial risk from the total risk it is necessary to subtract a company's business

risk from the total risk (Eriksson & Hede, 1999: 35). Consequently, financial risk is estimated by subtracting unlevered beta (beta asset) from beta equity (total risk). Evidently, what is left is a measure of a company's financial risk.

2.5.11.4 Financial flexibility

It is crucial for firms not to be forced to turn down promising projects because funds are not available. The firm should always be in a position to raise money, even when times are bad. In bad times suppliers of capital are more willing to make funds available through bonds to firms with a strong balance sheet and secured positions. The greater the probable future need for capital and the worse the consequences of a capital shortage, the stronger the balance sheet should be. Weston and Brigham in Eriksson & Hede (1999: 35) said, "The goal of the firm is to maintain financial flexibility, which means maintaining adequate reserve borrowing capacity. The lower the firm's financial flexibility, the higher is the firm's financial risk."

2.5.12 Management attitudes

The last factor to consider when determining an optimal capital structure is managerial attitudes. Some managers are simply more aggressive financing with debt than others. Therefore, Weston and Brigham in Eriksson & Hede (1999: 37) have argued that some firms are more inclined to use debt in an effort to boost profits, whereas some managers are very conservative and prefer the capital structure that has always been used, even if it is not optimal.

2.6 VALUE BASED MANAGEMENT AND VALUE CREATION

Value Based Management (VBM) involves transforming behaviour in a way that encourages employees to think and act like owners. A key aspect of VBM is making sure that managers focus on the goal of stockholder wealth maximisation (Brigham & Ehrhardt, 2002: 508).

2.6.1 Objective in decision-making and value creation

The objective in decision-making is to maximise firm value. In practice conventional corporate financial theory argues that there are three ways of creating value:

- Make better investment decisions. The net present value of the projects taken on must increase the value of the firm.
- Use the right financing mix for the firm, which translates into a lower cost of capital.
- Establish an optimal reinvestment policy, which implies reinvesting as long as projects earn a return greater than the cost of capital.

Value creation involves much more than merely monitoring firm performance. Value creation requires management to be effective at identifying, growing and harvesting investment opportunities (Martin & Petty, 2001: 3). A company creates value if the spread between expected return on invested capital (EROIC) and WACC is positive; that is, when $\text{EROIC} - \text{WACC} > 0$ (Brigham & Ehrhardt, 2002: 508).

2.6.2 Value drivers

VBM involves the systematic use of the corporate valuation model to evaluate a company's potential decisions (Brigham & Ehrhardt, 2002: 535). The four value drivers are:

- The growth rate in sales (g);
- Operating profitability (OP), which is measured by the ratio of net operating profit after taxes (NOPAT) to sales;
- Capital requirements (CR) as measured by the ratio of operating capital to sales; and
- The weighted average cost of capital (WACC).

How do these drivers affect the value of a firm? First, the sales growth rate has a positive effect on value, provided the company is profitable enough. However, the effect can be negative if growth requires a great deal of capital and the cost of that capital is high. Second, operating profitability, which measures the after-tax profit per dollar of sales, always has a positive effect – the higher the better. Third, the capital requirements ratio, which measures how much operating capital is needed to generate a dollar/rand of sales, also has a consistent effect – the lower the CR the better since a low CR means that the company can generate new sales with smaller amounts of new capital. Finally, the fourth factor, the WACC, also has a consistent effect – the lower it is, the higher the firm's value (Brigham & Ehrhardt, 2002: 518). By managing the value drivers to achieve an optimal capital structure, companies are one step closer to sustainable value creation.

2.7 THE OPTIMAL CAPITAL STRUCTURE AND MAXIMISING FIRM VALUE

The optimal capital structure is the one that strikes a balance between risk and return to achieve the ultimate goal of maximising the price of the stock and simultaneously minimises the cost of capital (where WACC is the lowest) (Jones, 2005). Determining the value of a firm involves discounting the firm's real asset after-tax cash flows (those flows that the firm can distribute to its bondholders and shareholders) at the firm's WACC. Assuming the firm's real asset cash flows are fixed, managers achieve an optimal capital structure by minimising the WACC and maximising the value of the firm's stock price (Pagano & Stout, 2004: 17). The optimal capital structure for a firm is a function of numerous factors (as discussed in 2.4) including the firm's marginal tax rate, the amount of other non-interest tax shields, the variability of the firm's operating earnings, and the likelihood and magnitude of the costs of financial distress for that firm.

Managers should choose the capital structure that maximises shareholders' wealth. A firm establishes a target capital structure it believes is optimal, which is

then used as a guide for raising funds in the future (Jones, 2005). There are five steps for the analysis of each potential capital structure.

2.7.1 Estimating the cost of debt

Cost of debt is the effective rate that a company pays on its current debt. The rate applied to determine the cost of debt (r_d) should be the current market rate the company is paying on its debt. If the company is not paying market rates, an appropriate market rate payable by the company should be estimated.

As companies benefit from the tax deductions available on interest paid, the net cost of the debt is actually the interest paid less the tax savings resulting from the tax-deductible interest payment. Therefore, the after-tax cost of (interest-bearing) debt is $r_d (1 - \text{corporate tax rate})$. This can be measured in either before- or after-tax returns; however, because interest expense is tax deductible, the after-tax cost is seen most often. If a company's only debt was a single bond at which it paid 5% interest, the before-tax cost of debt would simply be 5%. If, however, the company's marginal tax rate was 40%, the company's after-tax cost of debt would be only 3% [$5\% \times (1-40\%)$]. Notice that the cost of debt goes up as leverage and the threat of bankruptcy increases (Brigham & Ehrhardt, 2002: 564).

Some firms such as Microsoft, however, have no debt (or even preferred stock) in its capital structure. So, estimating Microsoft's WACC is simplified greatly because only its cost of equity capital is required. In fact, for an "all-equity" firm (a company with no debt or preferred stock), the weight of debt and preferred stock, w_d & $w_{ps} = 0$, the weight of its equity, $w_s = 1.0$ (100% equity). Therefore, when firms have only equity in its capital structure, $WACC = r_s$ (Pagano & Stout, 2004: 17).

For most companies, however, the capital structure includes at least some form of long-term interest-bearing debt. For these companies an after-tax cost of debt as well as debt's weight within the capital structure should be estimated. When

determining the weights of debt and equity, companies' market values rather than book values should be used because market values are more reflective of the true worth of the company. Yet the market value of a firm's debt can be difficult to obtain, especially if the firm has privately issued debt such as bank loans and private placements of long-term debt. Thus, it is common for analysts to use book values for long-term debt in the capital structure while also using market values for the firm's common equity – assuming the firm is publicly traded. The effective rate that a company pays on its current debt (cost of debt) can give investors an idea as to the riskiness of the company compared to others, because riskier companies generally have a higher cost of debt (Investopedia, 2007).

2.7.2 Estimating the cost of equity

The cost of equity can be a bit tricky to calculate as share capital carries no "explicit" cost (McClure, 2003). Unlike debt, which the company must pay in the form of predetermined interest, equity does not have a concrete price that the company must pay, but that does not mean no cost of equity exists. Common shareholders expect to obtain a certain return on equity investments in a company. The equity holders' required rate of return is a cost from the company's perspective because if the company does not deliver this expected return, shareholders will simply sell shares, causing the price to drop. The cost of equity is basically the rate of return the company has to generate to maintain a share price theoretically satisfactory to investors (McClure, 2003).

There are two models that can be used to estimate cost of equity (r_s): a single-factor model called the Capital Asset Pricing Model (CAPM) and the Discount Cash Flow (DCF) approach. These models are briefly outlined below as well as a third model, the Bond Yield Plus Risk Premium model that financial analysts frequently use.

2.7.2.1 Estimating the cost of equity with CAPM

An asset-pricing model such as the CAPM can provide a convenient and theoretically consistent set of return estimates. The standard CAPM method says the required return on a risky asset such as common stock is related linearly to a non-diversifiable risk, otherwise known as *systematic risk* (Pagano & Stout, 2004: 14). Systematic risk is the riskiness of the “market portfolio” of all risky marketable assets. On this basis, the most commonly accepted method for calculating cost of equity comes from the Nobel Prize-winning capital asset pricing model (McClure, 2006).

$$\text{CAPM: } r_s = r_{ff} + \beta (r_m - r_{ff}) \quad (\text{Eq. 2.8})$$

But what does that mean?

- **r_{ff} – Risk-free rate** - This is the amount obtained from investing in securities considered free from credit risk, such as government bonds from developed countries. The interest rate of U.S. Treasury Bills is frequently used as a proxy for the risk-free rate (McClure, 2006).
- **β – Beta** - This measures how much a company's share price reacts against the market as a whole. A firm's beta can be estimated from a regression using historical data for the returns on the stock (r_s) and a market portfolio proxy (r_m). Typically, monthly return data are used when determining this regression. A beta of one, for instance, indicates that the company moves in line with the market (McClure, 2006). If the beta is in excess of one, the share is exaggerating the market's movements. Less than one means the share is more stable. Occasionally, a company may have a negative beta, which means the share price moves in the opposite direction to the broader market. For public companies one can find database services that publish betas of companies (McClure, 2006).

In 1969 Robert Hamada published his paper, *Portfolio Analysis, Market Equilibrium, and Corporation Finance*, in which he combined the traditional

CAPM and the Modigliani and Miller capital structure theory to create what is now called the *Hamada equation* (Quicken, 2002). The Hamada equation seeks to illustrate how financial leverage (by increasing debt) increases a firm's risk, and by extension the firm's beta.

Robert Hamada has developed the following equation (Hamada equation) to specify the effect of financial leverage on beta (Quicken, 2002):

$$\beta_L = \beta_U \left[1 + (1 - T) \left(\frac{D}{E} \right) \right] \quad (\text{Eq. 2.9})$$

where

D = The market value of debt

S = The market value of equity

β_U = The firm's unlevered beta coefficient; that is, the beta it would have if it has no debt.

The equation is used to determine the effects of financial leverage on a firm, as measured by the Hamada coefficient. The higher the coefficient, the higher the risk associated with the firm. The Hamada equation shows how increases in the market value debt/equity ratio increase beta (Brigham & Ehrhardt, 2002: 565). For example, say a firm has a debt to equity ratio of 0.60, a tax rate of 33% and a debt free beta of 0.95. Using the Hamada equation the expected beta is calculated to be about 1.33 $\{0.95[1+(1-0.33)(0.60)]\}$. This means that financial leverage for this firm increases the overall risk by a factor of 0.38, or by 40%.

A firm can take its current beta, tax rate and debt/equity ratio, and calculate its unlevered beta (β_U) by simply transforming equation 2.9 as follows:

$$\beta_U = \frac{\beta_L}{[1 + (1 - T)(D / E)]} \quad (\text{Eq. 2.10})$$

where

β_L = The firm's levered beta coefficient; that is, the beta it would have with debt.

Then, once β_U is determined, the Hamada equation can be used to estimate how changes in the debt/equity ratio would affect the leveraged beta (β_L) and thus the cost of equity (r_s).

- $(r_m - r_{rf}) = \text{Equity market risk premium}$ - The equity market risk premium (EMRP) represents the returns investors expect to compensate them for taking extra risk by investing in the stock market over and above the risk-free rate. In other words, it is the expected market return minus the risk-free rate (McClure, 2006). Since most investors are averse to risk, a higher expected return is required to induce the investors to invest in risky equities versus relatively low-risk investments. The premium can be estimated on the basis of historical data or forward-looking data (Brigham & Ehrhardt, 2002: 313; McClure, 2006).

2.7.2.2 The Discounted Cash Flow (DCF) approach

The DCF approach expresses the cost of common equity as the dividend yield (the expected dividend divided by the current price) plus the expected growth rate.

$$r_s = \frac{D_1}{P_0} + \text{expected } g \quad (\text{Eq. 2.11})$$

where

r_s = The expected rate of return

D_1 = The dividend expected to be paid at the end of Year 1

P_0 = The current price of the stock

The growth rate can be estimated from historical earnings and dividends or by use of the retention growth model, $g = (1 - \text{payout}) (\text{return on equity})$, or it can be

based on analysts' forecasts. Recent surveys found that only 16% of analysts use the DCF approach, down from 31% in 1982 (Brigham & Ehrhardt, 2002: 313).

2.7.2.3 The Bond Yield Plus Risk Premium method

The other technique for estimating r_s is the Bond Yield Plus Risk Premium (BY+P) method. The BY+P method is popular among some practitioners (most notably multibillionaire investor Warren Buffett) because of its simplicity and limited number of assumptions. The BY+P method is essentially an ad hoc empirical relation with no solid theoretical justification (Pagano & Stout, 2004: 15). Yet, there appears to be some empirical validity in the notion that the return on a company's stock can be estimated by taking the firm's bond yield-to-maturity (YTM) and adding a fixed risk premium to this yield. For example, a firm with a current bond YTM of 7% would lead to an estimated r_s of 10% once a fixed 3% risk premium is added to the YTM. Although there is no theoretical reason for adding a 3% premium, it appears that this relation is just as good or better for many stocks than using a formal model such as the CAPM.

2.7.2.4 Comparison of the CAPM, DCF and BY+P methods

The capital asset pricing model is by no means a perfect theory. But the spirit of CAPM is correct. Surveys found that the CAPM approach is by far the most widely used method estimating the cost of equity (r_s) (Brigham & Ehrhardt, 2002: 320). It provides a usable measure of risk that helps investors determine what return was deserved for putting money at risk. Recent surveys found that almost 74% in one survey and 85% in the other, used the CAPM. The Bond Yield Plus Premium approach is used primarily by companies that are not publicly traded (Brigham & Ehrhardt, 2002: 320).

2.7.3 Estimating the cost of preferred stock

Cost of preferred stock is the rate of return required by an investor who owns preferred stocks – it is used to calculate WACC. In order to calculate the cost of preferred stock the formula

$$r_{ps} = \frac{D_{ps}}{P_n} \quad (\text{Eq. 2.12})$$

is used where

D_{ps} = Preferred dividends

P_n = Issuing price of preferred stock

A number of firms use preferred stock as part of the permanent financing mix. In some parts of the world preferred dividends are not tax deductible. Therefore, companies bear full cost and no tax adjustment is used when calculating the cost of preferred stock (Brigham & Ehrhardt, 2002: 310).

2.7.4 Estimating the weighted average cost of capital (WACC)

Conceptually, a firm's cost of capital is an investor's opportunity cost of investing capital in that firm. An estimate of the firm's WACC is an attempt to quantify the average return expected by all investors in the firm: creditors of short-term and long-term interest-bearing debt, preferred stockholders and common stockholders. The firm's cost of capital is a weighted average where the weights are determined by the market values of the various sources of capital (Pagano & Stout, 2004: 17). Considering weighted averages allow companies to see how much interest a company has to pay for every dollar used to finance its operations. A firm's WACC is the overall required return for the firm as a whole and, as such, it is often used internally by company directors to determine the economic feasibility of expansionary opportunities and mergers. It is the

appropriate discount rate to use for cash flows with risk that is similar to that of the overall firm (Investopedia, 2007).

When it comes to financing a project, for example, a firm can finance it in many different ways. Some may choose to finance projects using debt, others by issuing preferred stocks and others may use retained earnings or any combination of the mentioned. Nevertheless, depending on the financing decision, the firm will have to discount the projects cash flows accordingly. Those who chose debt financing have to use the cost of debt to discount cash flows. Those who used preferred stocks will need to use the cost of preferred stocks. Those who used a combination of sources of capital will have to use what is known as the weighted average cost of capital (De Boyrie, 2003).

WACC is calculated by multiplying the cost of each capital component by its proportional weight as seen in equation 2.13.

$$WACC = (w_d)(r_d)(1 - T) + (w_{ps})(r_{ps}) + (w_s)(r_s) \quad (\text{Eq. 2.13})$$

where

r_d = The expected cost of long-term debt

r_{ps} = The expected cost of preferred stock

r_s = The expected cost of common stock

w_d = The weights of long-term debt

w_s = The weights of common stock

w_{ps} = The weights of preferred stock

T = The firm's marginal income tax rate

One must remember that when the weights of debt and equity are determined, market values rather than book values must be used because market values are more reflective of the true worth of the company.

According to De Boyrie (2003) the cost of capital is an important issue for financial managers because:

- In order to maximise the value of the firm the financial manager must minimise all costs.
- In order to make capital budgeting decisions, the financial manager must discount the cash flows of the project by the cost of capital.
- Other investment decisions such as short-term financing, bond refunding and more require the estimation of the cost of capital.

Various factors affect a firm's cost of capital. Some of these factors are determined by the financial environment, but the firm influences others through its financing, investment and dividend policies (Brigham & Ehrhardt, 2002: 334).

Finance and accounting professionals need to be able to estimate the weighted average cost of capital, because it pervades professionals' work. Professionals need WACC estimates for implementing the asset-impairment requirements of Statement of Financial Accounting Standards (SFAS) No. 144, *Accounting for the Impairment of Long-Lived Assets*, for example. Professionals also need WACC for capital budgeting and equity valuation analyses, and for computing financial performance metrics such as economic value added (EVA) and residual income.

2.7.5 Estimating the firm's value

Each firm has an optimal capital structure, defined as that mix of debt, preferred and common equity that causes its stock price to be maximised. Therefore, a value-maximising firm will establish a target (optimal) capital structure and then raise new capital in a manner that will keep the actual capital structure on target over time.

The following equation can be used to estimate a firm's value which has zero growth. The zero growth version of Equation 2.14:

$$V = \frac{FCF}{WACC} \quad (\text{Eq. 2.14})$$

where

FCF = Free Cash Flows

WACC = Weighted Cost Of Capital

2.7.5.1 Free cash flow (FCF)

Free cash flow (FCF) is the cash flow actually available for distribution to investors after the company has made all the investments in fixed assets and working capital necessary to sustain ongoing operations. Thus, free cash flow represents the cash flow that is actually available for distribution to investors. The value of a firm primarily depends on its expected future free cash flows. Therefore, for managers to make companies more valuable, it is necessary to increase free cash flow (Brigham & Ehrhardt, 2002:107).

How is free cash flow calculated? An algebraically equivalent expression for free cash flow is:

$$FCF = (\text{NOPAT} + \text{Depreciation}) - \text{Net Investment in operating capital} \quad (\text{Eq 2.15})$$

According to Brigham & Ehrhardt (2002: 108), there are five good uses for FCF namely to determine whether sufficient funds are available to:

- ✓ Pay interest to debt-holders, keeping in mind that the net cost to the company is the after-tax interest expense.
- ✓ Repay debt-holders, that is, pay off some of the debt.
- ✓ Pay dividends to shareholders.
- ✓ Repurchase stock from shareholders.
- ✓ Buy marketable securities or other non-operating assets.

Unfortunately, there is evidence to suggest that some companies with high FCF tend to make unnecessary investments that don't add value. Thus, high FCF can cause waste if managers fail to act in the best interest of shareholders

2.7.5.2 Net operating profit after taxes (NOPAT)

Net operating profit after taxes (NOPAT) is the after-tax profit a company would have if it had no debt and no investments in non-operating assets. Because it excludes the effects of financial decisions, it is a better measure of operating performance than net income (Brigham & Ehrhardt, 2002: 118).

$$\text{NOPAT} = \text{EBIT} (1 - \text{Tax rate}) \quad (\text{Eq 2.16})$$

where

EBIT = Earnings before interest and taxes

Brigham and Ehrhardt (2002: 108) said that “a negative free cash flow is not necessarily bad. If FCF is negative because NOPAT was negative, that is a bad sign. However, many high-growth companies have positive NOPAT but negative free cash flow because companies are making large investments in operating assets to support growth. There is nothing wrong with profitable growth, even if it causes negative cash flows.”

2.7.5.3 Return on invested capital (ROIC)

One way to determine whether growth is profitable is by examining the return on invested capital (ROIC), which is the ratio of net operating profit after taxes (NOPAT) to total operating capital, as seen in Equation 2.17.

$$\text{ROIC} = \frac{\text{NOPAT}}{\text{Operating Capital}} \quad (\text{Eq 2.17})$$

If ROIC is greater than the rate of return investors require, which is the weighted average cost of capital, WACC, then the firm is adding value (Brigham & Ehrhardt, 2002: 108). If WACC exceeds ROIC, then new investments in operating capital will reduce the firm's value.

2.8 CONCLUDING COMMENTS

The prevailing argument, originally developed by Modigliani & Miller (1958) is that an optimal capital structure exists which balances the risk of bankruptcy with the tax savings of debt. Proposition I also says that each firm's cost of capital is a constant, regardless of the debt ratio (Myers, 2001:96). This proposition states that the market value of a firm is independent of its capital structure. Proposition II (1963) argues that the expected return on equity is positively related to leverage, and also that risk increases with leverage. It is important to keep in mind the restrictive assumptions (to ignore bankruptcy costs) must be fulfilled for the M&M propositions to hold.

The different models (Pecking Order hypothesis, Trade-off model and the Signalling Hypothesis) do not help us to predict an optimal capital structure. Out of these models it is only the Trade-off model that provides an actual formula for calculating the optimal capital structure. The Pecking Order Hypothesis and the Signalling Hypothesis only try to explain observed patterns, not calculate an optimal capital structure level.

The optimal capital structure for a firm is a function of numerous factors including the firm's marginal tax rate, tax shields, income variability, size, growth, profitability, the likelihood and magnitude of the costs of financial distress and other factors as discussed previously in this chapter. It can be assumed that there exists a correlation between profit to debt and the number of years to pay off debt. Thus, net income becomes the value determinant of debt financing, which will be illustrated in the next section, of empirical research.

Managers should choose the capital structure that maximises shareholders' wealth. A firm establishes a target capital structure it believes is optimal, which is then used as a guide for raising funds. The five steps for the analysis of each potential capital structure have been explained in detail in this chapter.

A key aspect of value based management is making sure that managers focus on the goal of stockholder wealth maximisation. The higher the profit the more free cash flow exists to pay off debt. The value of a firm primarily depends on its expected future free cash flows. Therefore, for managers to make companies more valuable, it is necessary to increase free cash flow.

CHAPTER 3

EMPIRICAL STUDY

3.1 INTRODUCTION

Each firm has an optimal capital structure, defined as *a firm's relative mix of long-term sources of funds*. Debt and equity, however, represent the two largest sources of financing for most firms. As discussed previously, it seems that changes in the debt-equity financing mix affect the value of the firm. Therefore, a value-maximising firm will establish an optimal capital structure that causes its stock price to be maximised.

This chapter presents the results of the empirical study. The relationship between capital structure determinants and sustainable value creation, as reflected in company share prices, has been investigated. The variables included in the data analysis and the reasons for inclusion in the investigation will be discussed first. The results from the financial data of the industrial companies investigated, together with the various regression models will then be presented and discussed. Coefficients of determination (adjusted R^2) have been determined for each of the annual regression models to determine the proportion of variation of the dependent/response variables, ***change in share price*** and ***the debt to equity ratio*** that is explained by the range of explanatory (independent) variables. From these results the most important criteria have been identified and the results used as the foundation for the development of the analysis model.

3.2 DESCRIPTION OF RESEARCH SAMPLE

This research focuses on the total population of industrial companies listed under the industrial section on the Johannesburg Securities Exchange (JSE) only. Ninety two JSE industrial listed companies have been included in this analysis,

which in turn can be divided into five super sectors, twelve sectors and twenty five sub-sectors. Company data has been collected and analysed for a period of ten years (1997-2006) for empirical research purposes. The data analysis process has been adjusted to provide for the fact that all the data of all the companies has not always been available in all the years.

3.3 DATA ANALYSIS

All data has been compiled from the McGregor BFA database, using Microstation as the interface tool. A statistical data analysis has been done to determine the relationship between the dependent variables (***change in share price*** and ***the debt to equity ratio***) and the independent variables that have been considered to have an impact on the dependent variables for the period 1997-2006. Calculations have been done annually for each of the years in the investigation period. A regression analysis is used primarily for the purpose of prediction.

3.4 VARIABLES INCLUDED IN THE DATA ANALYSIS

The optimal capital structure for a firm is a function of numerous factors including the firm's business risk, its marginal tax rate, the amount of non-interest tax shields, the variability of the firm's operating earnings, and the likelihood and magnitude of the costs of financial distress for that firm (Brigham & Ehrhardt, 2002: 572). It is therefore critical that managers choose the capital structure that maximises shareholders' wealth. Capital structure should be managed dynamically to ensure sustainable value creation.

Therefore, two response variables and seventeen independent capital structure related variables have been selected (from 1997-2006) for all industrial companies to investigate the relationship between capital structure determinants and sustainable value creation.

3.4.1 Dependent variables

The values of the response variables, ***change in share price*** and the ***debt to equity ratio***, used to determine the relationship with independent variables have been calculated on an annual basis, using data for the companies listed in the industrial section of the JSE for the period 1997-2006. The results from this relationship can be used as a tool for effective capital structure management and to ensure sustainable value creation.

3.4.1.1 Change in share price

The change in share price (value) of all industrial companies has been calculated for each of the years 1997-2006 and used as one of the dependent variables.

- Change in share price = JSE price of company at current year end *less* JSE price of company at previous year end

3.4.1.2 Debt to equity ratio

The debt to equity ratio has been calculated for each of the years 1997-2006 to determine each company's capital structure and used as one of the dependent variables.

- Debt to equity ratio = $\frac{\text{Total Liabilities}}{\text{Owners Equity}}$

A higher debt-to-equity means a company has been aggressive in financing its growth with debt.

3.4.2 Independent variables

It is known that there are a lot of factors that influence the selection of an optimal capital structure for a firm as discussed in the literature study. Based on knowledge gained from the literature study, seventeen independent variables have been considered to be the most important factors related to a company's optimal capital structure.

3.4.2.1 Number of years to pay off debt

Number of years to pay off debt is defined as *number of years it takes to settle debt out of net income*. It is argued that it influences the value of the share price as discussed in previous sections. It is therefore assumed that a correlation exists between capital structure and the number of years to pay off debt. Mathematically, number of years to pay off debt is defined as:

$$\text{➤ Number of years to pay off debt} = \frac{\text{Long Term Loans}}{\text{Net Income}}$$

3.4.2.2 Net operating profit after taxes (NOPAT)

It is the after-tax profit a company would have if it had no debt and no investments in non-operating assets. The after-tax profit is a better measure of operating performance than is net income, because it excludes the effects of financial decisions (Brigham & Ehrhardt, 2002: 118). NOPAT is defined as:

$$\text{➤ NOPAT} = \text{EBIT}(1-T)$$

3.4.2.3 Net profit after interest and taxes (NPAT)

It is argued that the higher the net profit after interest and taxes, the quicker it is possible to pay off debt. Net profit after interest and taxes (also known as *net*

income) thus becomes a determinant of debt financing as discussed in previous sections. NPAT is defined as:

- Net profit after taxes = Sales + other income – expenses – taxes – interest

The higher the profit, the more free cash flow exists to pay off debt.

3.4.2.4 Free cash flow (FCF)

Free cash flow is the cash available for distribution to investors, as previously discussed. The value of a firm primarily depends on its expected future free cash flows. Therefore, the way for managers to make companies more valuable is to increase free cash flow (Brigham & Ehrhardt, 2002: 107). FCF is mathematically defined as:

- Free cash flow = (NOPAT + depreciation) –
Net investment in operating capital

3.4.2.5 Du Pont variables

The Du Pont equation defines relationships between profit margin, total asset turnover and change in financial leverage. The Du Pont model uses the return on equity as the overall indicator of success, as discussed in previous sections. Management can use the Du Pont system to analyse ways of improving performance. The definitions of the Du Pont variables follow.

- Net profit margin = $\frac{\text{Net Income}}{\text{Sales}}$
- Total asset turnover = $\frac{\text{Sales}}{\text{Total Assets}}$

- Equity multiplier $= \frac{\text{Total Assets}}{\text{Common Equity}}$
- Return on assets $= \text{Net profit margin} \times \text{Total asset turnover}$
 $= \frac{\text{Net Income}}{\text{Total Assets}}$
- Return on equity $= \frac{\text{Net Income}}{\text{Common Equity}}$

If a company had been financed only with common equity, the rate of return on assets (ROA) and the return on equity (ROE) would be the same, because the total assets would equal the common equity (Brigham & Ehrhardt, 2002: 461). It is also known that operating profitability, which measures the after-tax profit per monetary unit of sales, always has a positive effect on the value of a firm – the higher the better.

3.4.2.6 Capital structure variables

The Hamada equation, as discussed in Brigham & Erhardt (2002: 565), demonstrates the effect of financial leverage on beta. Beta is a relevant measure of a stock's relative volatility in relation to the volatility in the market – it shows how much the price of a particular stock moves up and down in relation to up and down movements in the stock market. Betas have been calculated four weekly for a 60 month period.

3.4.2.7 Variables – Definitions

- Beta = The slope of the regression line that best fits the market – company return relationship graph for a stated 60 month period

$$\text{Debt/assets} = \frac{\text{Total Liabilities}}{\text{Total Assets}}$$

The debt ratio measures the percentage of funds provided by sources other than equity.

$$\text{Financial distress} = 0.12x_1 + 0.14x_2 + 0.33x_3 + 0.06x_4 + 0.0999x_5$$

where

x_1 = Net working capital/Total assets

x_2 = Retained earnings/Total assets

x_3 = EBIT/Total assets

x_4 = Market value of common and preferred stock/Book value of debt

x_5 = Sales/Total assets

Financial distress refers to the deterioration in the firm's performance brought on by increases likelihood that the firm will default on its debt.

$$\text{Return on invested capital (ROIC)} = \text{NOPAT/Operating capital} \times 100$$

[see Eq 2.17]

ROIC is a performance measure that indicates how much NOPAT is generated by each dollar/rand of operating capital.

$$\text{Capital requirement ratio (CRR)} = \text{Operating capital/Sales} \times 100$$

$$\text{Capital requirement (CR)} = \text{Operating capital/Sales}$$

The capital requirement ratio, which measures how much operating capital is needed to generate a dollar/rand of sales, also has a consistent effect on the value of a firm.

Capital requirement (CR) is the physical amount needed. The lower the capital requirement the better, since a low CR means that the company can generate new sales with smaller amounts of new capital.

- WACC = Weighted average cost of capital [see Eq 2.13]

A company's WACC is a function of the mix between and the cost of debt and equity. Investors use WACC as a tool to decide whether or not to invest. WACC also has a consistent effect on the value of a firm – the lower it is, the higher the firm's value.

- Return on invested capital (ROIC) less Weighted average cost of capital (WACC)

It is known that the company is adding value if ROIC is greater than WACC.

The above independent variables have been calculated to determine multiple regression models per year for each of the two dependent variables.

3.5 DETERMINATION OF THE MULTIPLE REGRESSION MODELS

The regression models have been determined after the financial data has been compiled and verified. The regression models have been determined with statistical software and the results are summarised in tables 3.1-3.4. Two multiple regression tables have also been compiled: one for ***change in share price*** and one for the ***debt to equity ratio***. Two multiple regressions have been done for each dependent variable. The first multiple regression considers all the independent explanatory variables that have correlated positively with the

dependent variable. The second multiple regression has considered only the independent variables that have tested significantly at a 5% level of significance for the same dependent variable.

The regression coefficients in the regression equations give an indication of the correlation between the independent and the dependent variable for the ***change in share price*** and ***the debt to equity ratio***.

Adjusted R^2 determines what percentage of variation in the two dependent variables (Y) can be explained by the multiple regression model.

3.5.1 Multiple regression model

Multiple linear regression uses more than one explanatory variable to explain or predict a single response (dependent) variable. The general statistical multiple regression model with k independent variables is:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \dots + \beta_k X_{ki} + \varepsilon \quad (\text{Eq. 3.1})$$

where

β_0 = Y intercept

β_1 = Slope of Y with variable X_1 hold variables $X_2, X_3, \dots, X_k$ constant

β_2 = Slope of Y with variable X_2 hold variables $X_1, X_3, \dots, X_k$ constant

β_3 = Slope of Y with variable X_3 hold variables $X_1, X_2, \dots, X_k$ constant

β_k = Slope of Y with variable X_k hold variables $X_1, X_2, X_3, \dots, X_{k-1}$ constant

ε_i = Random error in Y for observation i

Beta (β) in the general model (Eq 3.1) is also referred to as *the coefficient*

The regression model has been used in this study to explain the change in share price and debt to equity ratio, using several explanatory variables such as number of years to pay off debt, net operating profit after taxes, free cash flow and more.

3.6 RESULTS: MULTIPLE REGRESSION – ALL EXPLANATORY VARIABLES

Results are obtained from statistical data analyses done for each year under investigation for each of the dependent variables. The multiple regression analysis has been done to determine the value of the various coefficients, to determine the relevance of the model and to determine the proportion of the total variation in the observed values of (Y), *change in share price* and the *debt to equity ratio* that are explained by the overall regression model.

3.6.1 Change in share price: Multiple regression models – all explanatory variables

Table 3.1 include the multiple regression equations/models and coefficients of multiple determinations (adjusted R^2) for all the explanatory variables that correlate with the *change in share price* for each of the years (1997-2006) listed below.

Table 3.1: Change in share price: All variables multiple regression and adjusted R²

Year	Multiple Regression Equation	Adjusted R ²
1997	Change in share price (Y) = 0.763555 (NPAT) - 0.758328 (FCF) + 0.294063 (ROIC-WACC) - 0.205194 (RTE)	0.33555494
1998	Change in share price (Y) = -0.140177 (FCF) + 0.197923 (DTA) - 0.173210 (NPAT)	0.42867720
1999	Change in share price (Y) = -3.14209 (NOPAT) + 2.32762 (NPAT) + 0.52370 (DEQ) - 0.27506 (DTA) - 0.11061 (BTA) + 0.17778 (FCF) + 0.26996 (CR)	0.63141791
2000	Change in share price (Y) = 0.54540 (NPM) + 0.73808 (NPAT) + 0.10914 (DTA) + 0.30371 (CR) - 1.59721 (NOPAT) + 0.99175 (RTE) - 0.72147 (ROIC)	0.60101287
2001	Change in share price (Y) = 0.299083 (NPM) - 0.370568 (FCF) + 0.303271 (CR)	0.17487190
2002	Change in share price (Y) = -0.178252 (SG)	0.01448384
2003	Change in share price (Y) = 0.325386 (BTA) - 0.490057 (DTA) - 0.417688 (ROA) + 0.161017 (Yrs) + 0.242297 (ROIC-WACC)	0.25046763
2004	Change in share price (Y) = 0.460593 (FCF) + 0.166276 (ROA)	0.26094233
2005	Change in share price (Y) = -0.00158 (FCF) + 3.67022 (NOPAT) - 2.90866 (NPAT) - 0.37614 (CR) + 0.33573 (FINDIS) - 0.13336 (SG) - 0.20966 (NPM)	0.37778677
2006	Change in share price (Y) = 1.32431 (NOPAT) + 0.67889 (ROIC) - 0.21738 (SG) - 0.84359 (ROA) + 0.27577 (FINDIS) - 0.09069 (TATO) - 1.04789 (NPAT) + 0.31407 (NPM)	0.33379927

Source: Own

3.6.1.1 Change in share price: Discussion of regression equations

The 1997 regression model, as indicated in table 3.1, is used as an example to discuss the meaning of the regression equation for change in share price:

- Change in share price (Y) = 0.763555 (NPAT) - 0.758328 (FCF) + 0.294063 (ROIC-WACC) - 0.205194 (RTE)

The coefficient of net profit after interest and taxes (NPAT), computed as 0.763555, means that, for a given amount of NPAT, the expected change in share price is estimated to change by R0.763555 per year for every R1 change

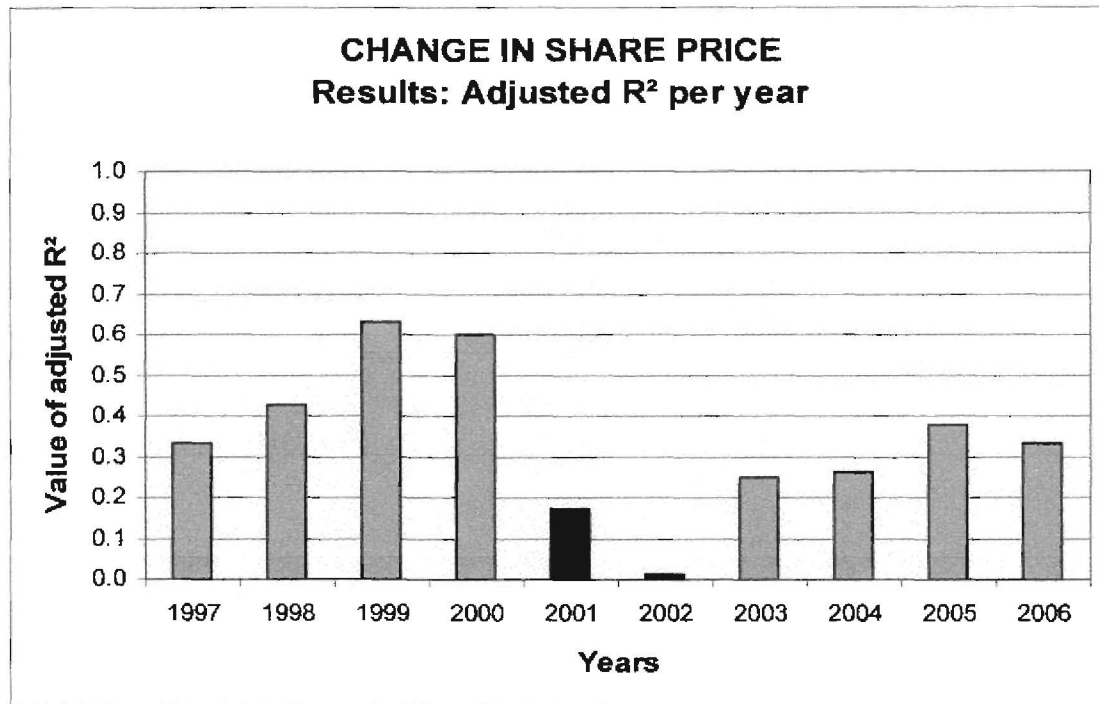
in NPAT. The positive coefficient of NPAT and ROIC-WACC indicate that these variables are expected to move in the same direction as the change in share price.

The coefficient of FCF, computed as -0.758328, means that, for a given amount of FCF, the expected change in share price is estimated to change by R0.758328 per year for every R1 change in FCF. The same explanation is valid for RTE, except that an expected change in share price is expected to change by R0.205194 per year for every R1 change in RTE.

It is known that if the dependent variable (Y) increases for every increase in the independent variable, it means that the two variables are positively related/correlated. If the dependent variable (Y) decreases for every increase in the independent variable, it means that the two variables are negatively correlated.

3.6.2 Change in share price: Results of the multiple coefficient of determination

Graph 3.1: Change in share price: All variables adjusted R^2



Source: Own

Graph 3.1 indicates a relative low overall adjusted R^2 for most of the years. The years 1999 and 2000 can be considered to have a relatively significant predictability of the change in share price explained by the considered independent variables. The latter makes the development of a model, based on debt to equity related variables as indicators of change in share price virtually impossible.

3.6.3 Debt to equity: Multiple regression models – all explanatory variables

Table 3.2 includes the multiple regression equations/models and coefficients of multiple determinations (adjusted R^2) for all the explanatory variables that

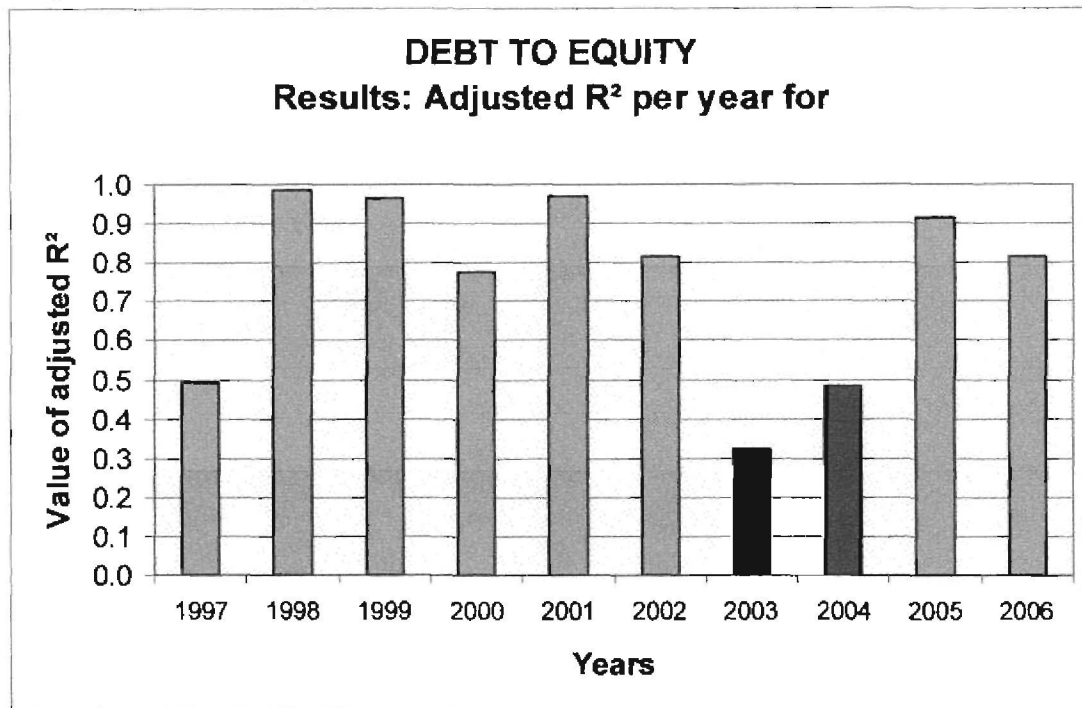
correlate with debt to equity for each of the years (1997-2006) for JSE listed companies in the industrial sector.

Table 3.2: Debt to equity: All variables multiple regression and adjusted R²

Year	Multiple Regression Equation	Adjusted R ²
1997	Debt to equity (Y) = -1.51211 (ROA) + 1.04898 (RTE) + 1.01152 (DTA) + 1.18400 (FINDIS) - 0.83818 (ROIC-WACC) + 0.19645 (FCF) - 1.12919 (CR) + 1.03444 (NPAT) - 0.22785 (Yrs) + 0.24713 (TATO)	0.49331693
1998	Debt to equity (Y) = 0.979169 (RTE) - 0.115553 (FINDIS) + 0.094459 (DTA) - 0.381106 (ROA) + 0.102205 (ROIC) + 0.146250 (NPM) - 0.109826 (CR)	0.98665130
1999	Debt to equity (Y) = 0.521074 (DTA) + 1.113466 (RTE) - 0.528446 (FINDIS) - 0.449571 (ROIC) - 0.066397 (NPAT) - 0.047412 (TATO) - 0.045641 (BTA) + 0.126997 (ROIC-WACC)	0.96424192
2000	Debt to equity (Y) = 0.563740 (DTA) - 0.34913 (FCF) - 0.65349 (ROIC) + 1.44395 (ROA) + 0.08591 (SG) - 1.36560 (NPAT) + 1.20922 (NOPAT) - 0.77104 (FINDIS)	0.77515686
2001	Debt to equity (Y) = -2.32294 (RTE) + 1.33401 (ROIC-WACC) + 0.86735 (SG) - 0.63735 (FINDIS) + 0.38445 (ROA) - 0.12428 (TATO) + 0.11300 (WACC)	0.96931166
2002	Debt to equity (Y) = 0.930616 (RTE) - 0.968562 (ROIC) + 0.208350 (DTA) - 0.075409 (CR) + 0.623451 (ROIC-WACC)	0.81546531
2003	Debt to equity (Y) = -0.580340 (ROIC-WACC) + 0.728335 (DTA) + 0.712339 (NPM) + 0.475703 (ROA) + 0.2402725 (BTA) + 0.357616 (RTE) - 0.134490 (WACC)	0.32157605
2004	Debt to equity (Y) = -1.21058 (SG) + 0.76258 (RTE) - 0.17309 (FINDIS) + 0.17091 (CR) - 0.13569 (FCF) + 0.09377 (BTA)	0.48100313
2005	Debt to equity (Y) = 1.235485 (RTE) - 0.779914 (ROA) + 0.816484 (NPM) - 0.166084 (CRR) - 0.513458 (FINDIS) - 0.061610 (FCF) - 0.152841 (DTA) - 0.055339 (TATO) + 0.061151 (WACC) - 0.322969 (NPAT) + 0.275878 (CR)	0.91767326
2006	Debt to equity (Y) = 0.932391 (RTE) - 0.825970 (ROA) - 0.288449 (SG) + 0.068546 (BTA) + 0.321300 (CR) + 0.484533 (NPM) - 0.344070 (NOPAT) - 0.148595 (CRR)	0.81497401

Source: Own

Graph 3.2: Debt to equity: All variables adjusted R^2



Source: Own

Graph 3.2 indicates the values of the multiple coefficient of determination of the various models for debt to equity. This graph indicates that all the regression models except 1997, 2003 and 2004 can be considered to have a relatively significant (above 77%) predictability in debt to equity. The model for 2003 and 2004 explains 32.2% and 48.1% of the total variation of the debt to equity ratio respectively. It has been decided to include the models for 1997, 2003 and 2004 even though the models have only contributed to a smaller percentage of the total variation in debt to equity.

3.6.4 Results of the criteria identified by the multiple regression – all explanatory variables

Tables 3.3 and 3.4 indicate the number of times each independent variable appears as an explanatory variable for the dependent variables *change in share price* and *the debt to equity ratio* for the period 1997-2006. Each table represents all the explanatory variables considered within a specific year. The

adjusted R^2 included in the tables below for the period 1997-2006 is the calculated adjusted R^2 for the model derived for the specific year.

Table 3.3: Change in share price: All variables appearances per year

Independent variable	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Count
<i>Adjusted R^2</i>	0.336	0.429	0.631	0.601	0.175	0.145	0.251	0.261	0.378	0.334	
FCF	X	X	X		X			X	X		6
NPAT	X	X	X	X					X	X	6
NOPAT			X	X					X	X	4
CR			X	X	X				X		4
NPM				X	X				X	X	4
DTA		X		X			X				3
ROA							X	X		X	3
SG						X			X	X	3
ROIC - WACC	X						X				2
BTA			X				X				2
RTE	X			X							2
FINDIS									X	X	2
ROIC				X						X	2
YEARS							X				1
TATO										X	1
DEQ			X								1
DTA			X								1

Source: Own

Table 3.3 indicates that free cash flow (FCF) and net profit after interest and taxes (NPAT) appear six times as an explanatory variable of the change in share price. Net operating profit after taxes (NOPAT), capital requirement (CR) and the net profit margin (NPM) appear four times for the period 1997-2006. The low adjusted R^2 s in table 3.3 lead to a situation of low predictability.

Table 3.4: Debt to equity: All variables appearances per year

Independent variable	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Count
<i>Adjusted R²</i>	0.493	0.987	0.964	0.775	0.969	0.815	0.322	0.481	0.918	0.815	
RTE	X	X	X		X	X	X	X	X	X	9
ROA	X	X	X	X	X		X		X	X	8
DTA	X	X	X	X		X	X		X		7
FINDIS	X	X	X	X	X			X	X		7
CR	X					X		X	X	X	5
ROIC - WACC	X		X		X	X	X				5
FCF	X			X				X	X		4
ROIC		X	X	X		X					4
NPM		X					X		X	X	4
TATO	X		X		X				X		4
SG				X	X			X		X	4
BTA			X				X	X		X	4
NPAT	X		X	X					X		4
CRR		X							X	X	3
WACC					X		X		X		3
NOPAT				X						X	2
YEARS	X										1

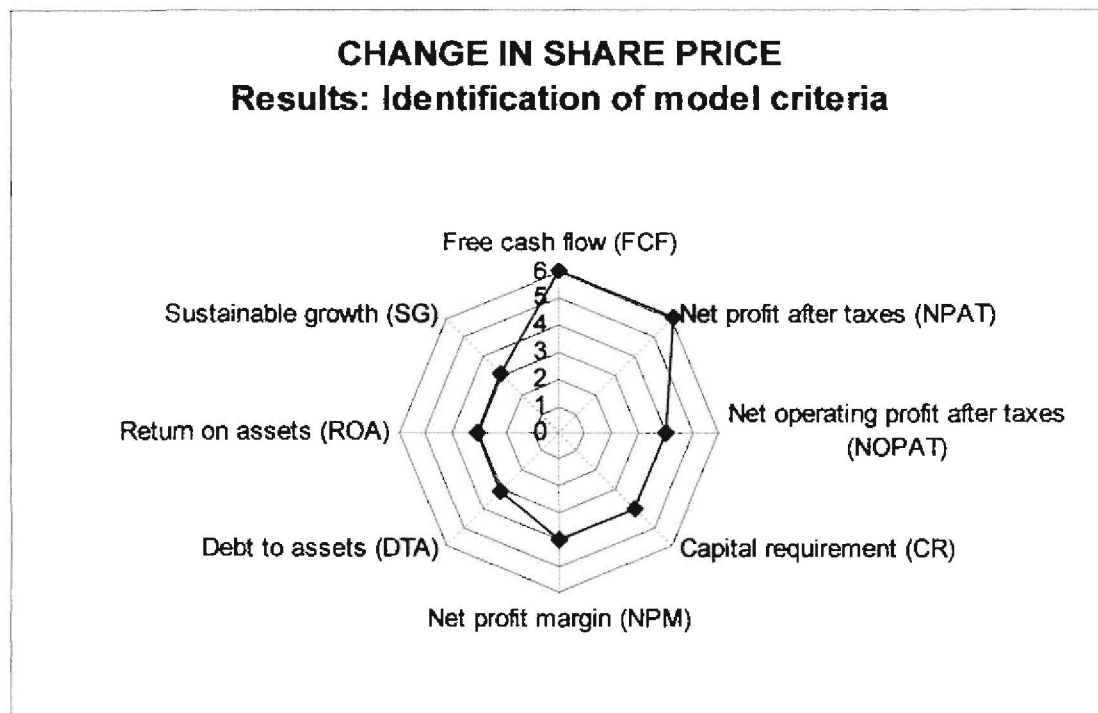
Source: Own

Table 3.4 indicates that return on equity (RTE), return on assets (ROA), debt to assets (DTA) and financial distress (FINDIS) appear seven and more times in ten years (1997-2006) as explanatory variables of debt to equity. The debt to equity models in table 3.4 have higher adjusted R^2 s than change in share price (as seen in table 3.3), which indicates better predictability.

3.6.5 Results of the model criteria – all explanatory variables

The radar graphs, graphs 3.3 and 3.4, indicate the results of tables 3.3 and 3.4 clearly. Graph 3.3 indicates that the two most important or most represented criteria with regards to change in share price are free cash flow (FCF) and net profit after taxes (NPAT).

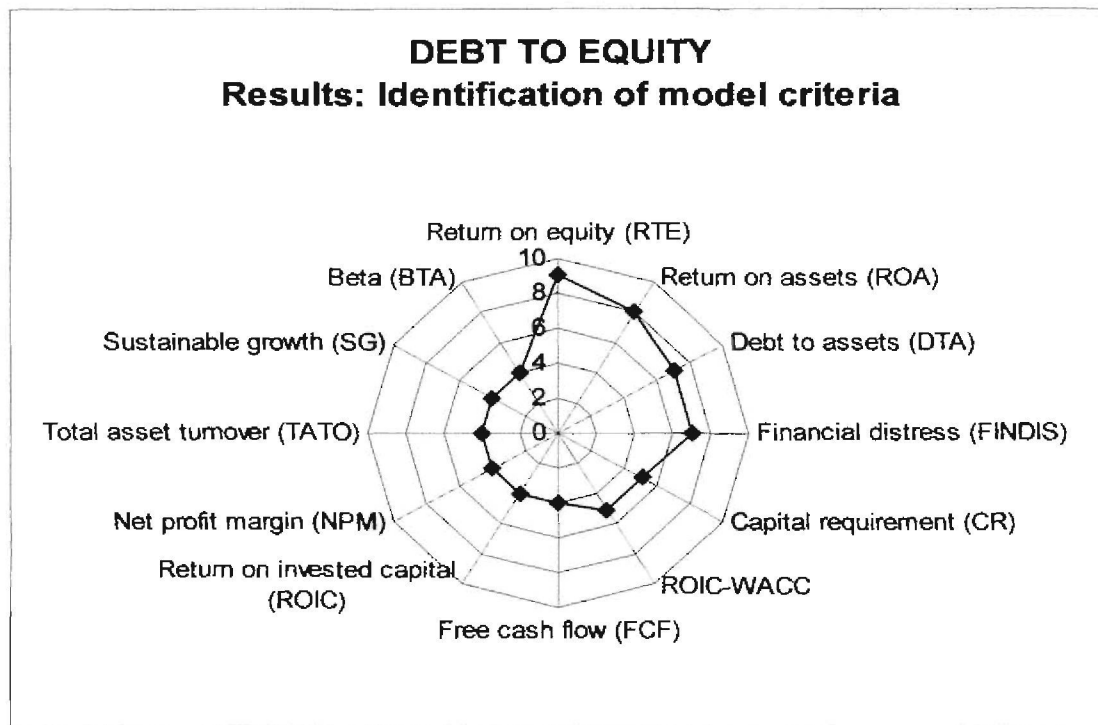
Graph 3.3: Change in share price: All variables model identification criteria



Source: Own

Graph 3.4 indicates that RTE, ROA, DTA and FINDIS are considered as the four most important criteria with regard to debt to equity. All the other variables on the graph appear at least four times as an explanatory variable during the period 1997-2006.

Graph 3.4: Debt to equity: All variables model identification criteria



Source: Own

3.7 MULTIPLE REGRESSION ANALYSIS AT A 5% LEVEL OF SIGNIFICANCE

In this section multiple regression models that include independent variables that are correlated at a 5% level of significance for ***change in share price*** and ***debt to equity***, are considered.

3.7.1 Results of multiple regression models

Tables 3.5 and 3.6 include the multiple regression equations and coefficient of multiple determination (adjusted R^2) for explanatory variables at a 5% level of significance with regards to the ***change in share price*** and ***debt to equity*** respectively for JSE industrial listed companies for the period 1997-2006.

Table 3.5: Change in share price: Multiple regression models and adjusted R² per year at 5% level of significance

Year	Multiple Regression Equation	Adjusted R ²
1997	Change in share price (Y) = 0.763555 (NPAT) - 0.758328 (FCF) + 0.294063 (ROIC-WACC)	0.33555494
1998	No regression equation at 5% level of significance	0.4286772
1999	Change in share price (Y) = -3.14209 (NOPAT) + 2.32762 (NPAT) + 0.52370 (DEQ)	0.63141791
2000	Change in share price (Y) = 0.54540 (NPM) + 0.99175 (RTE) - 0.72147 (ROIC)	0.60101287
2001	Change in share price (Y) = 0.299083 (NPM) - 0.370568 (FCF) + 0.303271 (CR)	0.17487190
2002	No regression equation at 5% level of significance	0.01448384
2003	Change in share price (Y) = 0.325386 (BTA) - 0.490057 (DTA) - 0.417688	0.25046763
2004	Change in share price (Y) = 0.460593 (FCF)	0.26094233
2005	Change in share price (Y) = + 3.67022 (NOPAT) - 2.90866 (NPAT)	0.37778677
2006	Change in share price (Y) = 1.32431 (NOPAT) + 0.67889 (ROIC) - 0.21738 (SG) - 0.84359 (ROA)	0.33379927

Source: Own

All the models in tables 3.5 and 3.6 indicate significant predictability of change in share price and debt to equity respectively. It is known from previous discussions that a low adjusted R² leads to a situation of low predictability. Table 3.5 indicates that there are only two regression models (for 1999 and 2000) that indicate a relevantly significant predictability in change in share price at a 5% level of significance. For 1998 and 2002 there are no significant variables predicting change in share price, and therefore no regression models, as seen in table 3.5 above.

Table 3.6: Debt to equity: Multiple regression models and adjusted R² per year at 5% level of significance

Year	Multiple Regression Equation	Adjusted R ²
1997	Debt to equity (Y) = -1.51211 (ROA) + 1.04898 (RTE) + 1.01152 (DTA) - 0.83818 (ROIC-WACC) - 1.12919 (CR) + 1.03444 (NPAT)	0.49331693
1998	Debt to equity (Y) = 0.979169 (RTE) + 0.094459 (DTA) - 0.381106 (ROA) + 0.102205 (ROIC) + 0.146250 (NPM) - 0.109826 (CR)	0.98665130
1999	Debt to equity (Y) = 0.521074 (DTA) + 1.113466 (RTE) - 0.528446 (FINDIS) - 0.449571 (ROIC) - 0.066397 (NPAT)	0.96424192
2000	Debt to equity (Y) = 0.563740 (DTA) - 0.34913 (FCF) - 0.65349 (ROIC) + 1.44395 (ROA)	0.77515686
2001	Debt to equity (Y) = -2.32294 (RTE) + 1.33401 (ROIC-WACC) + 0.86735 (SG) - 0.63735 (FINDIS) + 0.38445 (ROA) - 0.12428 (TATO) + 0.11300 (WACC)	0.96931166
2002	Debt to equity (Y) = 0.930616 (RTE) + 0.208350 (DTA)	0.81546531
2003	Debt to equity (Y) = -0.580340 (ROIC-WACC) + 0.728335 (DTA) + 0.712339 (NPM) + 0.475703 (ROA) + 0.2402725 (BTA)	0.32157605
2004	Debt to equity (Y) = -1.21058 (SG) + 0.76258 (RTE)	0.48100313
2005	Debt to equity (Y) = 1.235485 (RTE) - 0.779914 (ROA) + 0.816484 (NPM) - 0.166084 (CRR) - 0.513458 (FINDIS) - 0.322969 (NPAT) + 0.275878 (CR)	0.91767326
2006	Debt to equity (Y) = 0.932391 (RTE) - 0.825970 (ROA) - 0.288449 (SG) + 0.321300 (CR) + 0.484533 (NPM) - 0.344070 (NOPAT) - 0.148595 (CRR)	0.81497401

Source: Own

Table 3.6 indicates a much more clear picture for the debt to equity models at a 5% level of significance. All the models in table 3.6 explain a significant variation in debt to equity. Therefore, the regression models in table 3.6 indicate better predictability of debt to equity as table 3.5's predictability of change in share price. In table 3.5 only two models' adjusted R² values have been above 60%, whereas in table 3.6 seven models' adjusted R²s are above 77%. The adjusted R² values for all variables, indicated in tables 3.1 and 3.2, have not contributed to an increase in adjusted R² values compared to tables 3.5 and 3.6 at a 5% level of significance.

3.7.2 Results of the criteria identified by the multiple regression

Tables 3.3 and 3.4 indicate the number of times each independent variable appears as an explanatory variable of change in share price and debt to equity. Tables 3.7 and 3.8 differ from tables 3.3 and 3.4 in that only explanatory variables at a 5% level of significance are indicated. The tables indicate the number of times each of the explanatory variables appears as a significant variable of change in share price and debt to equity. The adjusted R^2 for each year is also included in each table.

Table 3.7: Change in share price: Appearances per year at 5% level of significance

Independent variable	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Count
<i>Adjusted R²</i>	0.336	0.429	0.631	0.601	0.175	0.145	0.251	0.261	0.378	0.334	
FCF	X				X			X			3
NOPAT			X						X	X	3
NPAT	X		X						X		3
NPM				X	X						2
ROA							X			X	2
ROIC				X						X	2
BTA							X				1
CR					X						1
DTA							X				1
DEQ			X								1
RTE				X							1
ROIC - WACC	X										1
SG										X	1
DTA											0
FINDIS											0
TATO											0
YEARS											0

Source: Own

Table 3.7 indicates that free cash flow (FCF), net operating profit after taxes (NOPAT) and net profit after taxes (NPAT) are considered as the only significant explanatory variables of change in share price that appear three times and more during the period 1997-2006.

Table 3.8: Debt to equity: Appearances per year at 5% level of significance

Independent variable	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Count
<i>Adjusted R²</i>	0.493	0.987	0.964	0.775	0.969	0.815	0.322	0.481	0.918	0.815	
RTE	X	X	X		X	X		X	X	X	8
ROE	X	X		X	X		X		X	X	7
DTA	X	X	X	X		X	X				6
NPM		X					X		X	X	4
ROIC		X	X	X							3
CR		X							X	X	3
CRR			X		X				X		3
FINDIS					X			X		X	3
TATO	X		X						X		3
SG	X				X		X				3
FCF				X							1
BTA				X							1
NPAT					X						1
ROIC-WACC							X				1
YEARS										X	1
NOPAT					X						1
WACC											0

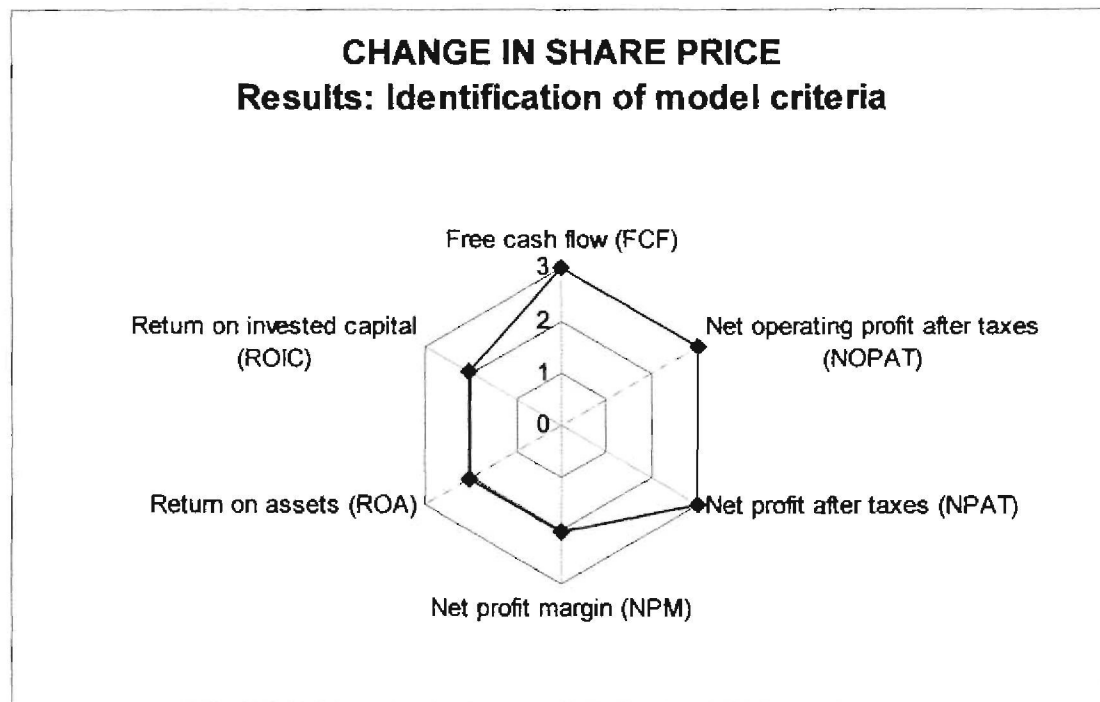
Source: Own

Table 3.8 indicates that return on equity (RTE), return on assets (ROA) and debt to assets (DTA) are the significant explanatory variables of debt to equity that appear six times and more from 1997-2006. From this table it is clear that RTE and ROA are the variables most featuring as significant explanatory variables of debt to equity with an appearance of eight and seven times respectively.

3.7.3 Results of the model criteria

The radar graphs, graphs 3.5 and 3.6, again confirm the results of tables 3.7 and 3.8, just more clearly. The model criteria in these two graphs represent only the significant explanatory variables. The most important or most represented criteria with regard to change in share price are free cash flow (FCF), net operating profit after taxes (NOPAT) and net profit after taxes (NPAT), as indicated in graph 3.5.

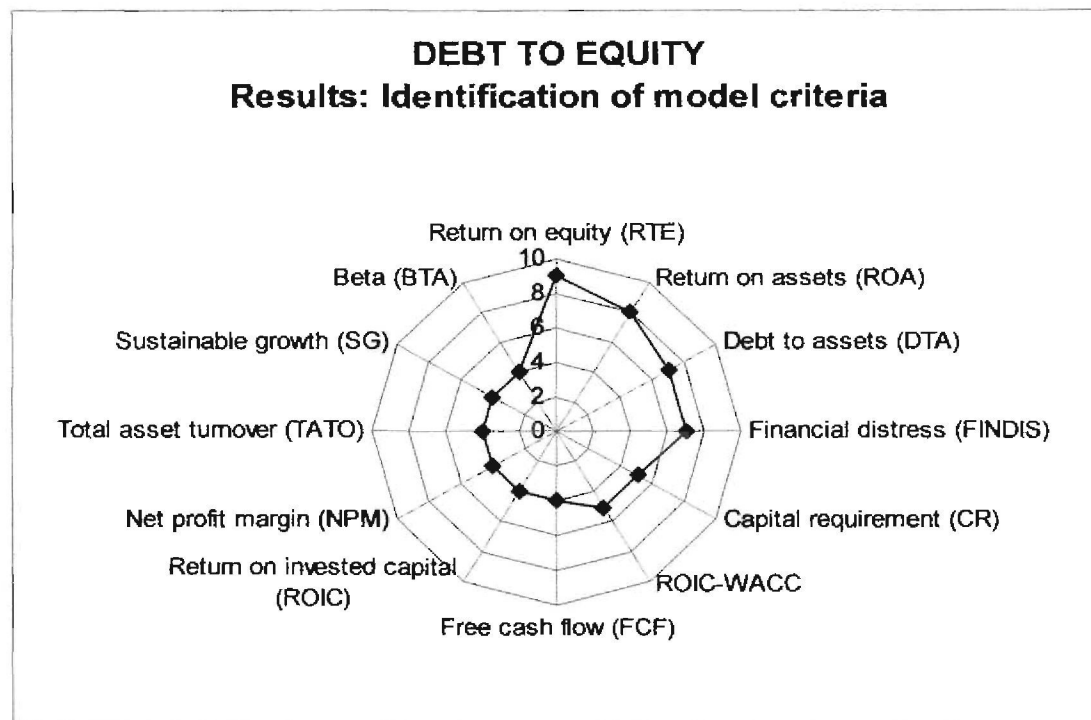
Graph 3.5: Change in share price: Identification of the model criteria at a 5% level of significance



Source: Own

The radar graph below, graph 3.6, indicates that the most important or most represented criteria at a 5% level of significance related to debt to equity are return on equity (RTE), return on assets (ROA) and debt to assets (DTA). At a 5% level of significance these variables represent a much lower appearance than in graph 3.3 where all variables are represented.

Graph 3.6: Debt to equity: Identification of the model criteria at a 5% level of significance



Source: Own

Table 3.8 indicates that RTE appears eight times, ROA seven times, DTA six times and NPM four times in ten years as significant explanatory variables of debt to equity. Therefore, these variables are anticipated to be significant indicators of the direction of movement of a company's debt to equity ratio.

After consideration of all above discussed tables, regression models and graphs it is derived that following variables are important and need to be included in the analysis model:

- Return on equity (RTE);
- Return on assets (ROA);
- Debt to assets (DTA); and
- Net profit margin (NPM).

The average adjusted $R^2 = 75.4\%$ for the period 1997-2006 for debt to equity and for change in share price the average adjusted $R^2 = 34.1\%$. Variables for change in share price and debt to equity have been tested at 5% significance, but debt to equity variables occur more times over the number of years under discussion (1997-2006). Therefore, a change in share price model does not make sense and will not be developed. All debt to equity variables have been considered, but only variables at a 5% level of significance have been selected for model criteria. It was also decided that only significant variables that appear four times and more during the period 1997-2006 will be included in the development of an analysis model.

The analysis model for debt to equity will be developed using the significant variables return on equity (RTE) occurring eight times, return on assets (ROA) occurring seven times, debt to assets (DTA) occurring six times and the net profit margin (NPM) occurring four times, as the important criteria.

3.8 DEVELOPMENT OF THE DEBT TO EQUITY ASSESSMENT MODEL

From the empirical research and findings it is clear that a 5% significance model developed, based on debt to equity makes sense for assessment of company capital structures. The intention is to develop a model based on the *general situation*. Therefore, data used to develop the model has been standardised. JSE listed companies for which no 2007 data is available, have been excluded from the development and testing of the model.

3.8.1 Standardise data of all listed companies for the period 1997-2006

Determine the average of each variable per year for all JSE listed companies in the industrial sector for the period 1997-2006. Calculate the standard deviation of each variable for all companies by the using the STDEVPA formula on excel from 1997-2006. Standard deviation is a measure of how widely values are dispersed

from the average value (mean). An average and standard deviation per variable will be calculated for each of the ten years. The annual average value of each variable (all companies) is linked to the standard deviation for that year. The bigger the value of the standard deviation, the more widely the values are dispersed from the mean.

Data can now be standardised by subtracting the variable average for the year from the value of the company for that specific year, and divided by the standard deviation for that year. This process should be repeated for all companies for the period 1997-2006. All data with z-values bigger than +3 and smaller than -3 has been deleted for all companies for the ten years. Therefore, standardised data excludes data which exceeds three standard deviations from the mean/normality. Only standardised data will be used in the development of the model.

3.8.2 Steps: Development of the model

The model developed within this study is a step by step model describing how the variables identified above should be evaluated. The model consists of three steps which will be repeated for each of the above four significant variables.

1. Determine the variables' average for each year for all companies.
2. Determine the industry average/benchmark of each variable.
3. Determine the direction of movement of the companies' debt to equity ratio.

The three steps identified above can be described as follows:

Step 1 – Determine the variables' average for each year for all companies

Period: 10 years (1997-2006)

Calculation

Use the standardised data and calculate each variable's (RTE, ROA, DTA and NPM) average for all JSE companies included in the industrial industry for all years from 1997-2006.

Description

The average is an indication of one mean value for each year for all JSE listed companies. The ten (1997-2006) averages per variable will be used to determine one industry average per variable.

Measurement

The number of averages for each variable equal the number of JSE companies in the industrial industry for which data is available.

Step 2 – Determine the industry average/benchmark of each variable

Period: 10 years (1997-2006)

Calculation

Calculate the common average of companies in the industrial sector for each variable (RTE, ROA, DTA and NPM) from 1997-2006 to arrive at the industry average per variable.

Description

In this study the industry average indicates each variable's average for all JSE listed companies in the industrial industry specifically.

Measurement

There is one industry average per variable (four in total), which should be used as a benchmark to evaluate and predict the direction of movement in companies' debt to equity ratio.

Step 3 – Determine the direction of movement of all companies' debt to equity ratio

Period: 2 years – 2006 and 2007

Calculation

For each variable (RTE, ROA, DTA and NPM) – Compare each company's 2006 value with the variable's industry average to determine the movement of direction.

Description

This step indicates the direction of movement of companies' 2007 debt to equity ratios.

Measurement

If the value of a specific company's variable is below the industry average, it means that the debt to equity ratio of that specific company is expected to increase and vice versa.

Therefore, these three steps describe the process to be followed in order to evaluate the effect of each contributing variable on a company's debt to equity ratio, specifically in the industrial industry.

3.9 TESTING OF THE MODEL DEVELOPED

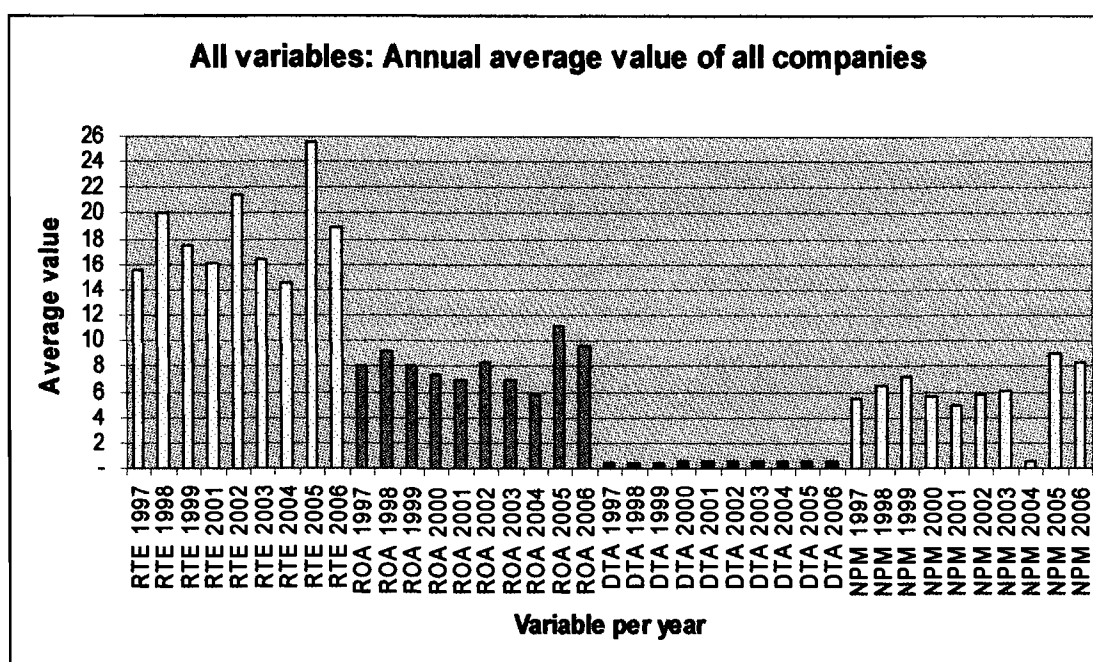
The model developed in this study has been tested on the industrial JSE companies used in the empirical study. The methodology has been to follow the three steps of the model to identify the variables that satisfy the requirements. Finally, the companies that have met the various criteria have been identified and it was compared to the 2007 debt to equity ratios (where data has been available).

The results of these steps are as follows:

3.9.1 Results: Standardised data

The annual average for the variables RTE, ROA, DTA and NPM for all companies is illustrated in graph 3.7. JSE companies included in the industrial sector, used in the analysis model, can be found in Appendix 1. Annual averages for return on equity (RTE) are indicated by the first nine averages from left on the graph. Return on assets (ROA), debt to assets (DTA) and net profit margin (NPM) then follow. The 2000 average value for RTE has been excluded from the graph since the average value of all companies equals 72.77. The reason for excluding this is to ensure a proper graph scale representation for the other years. If the 2000 average for RTE would have been included in the graph, the averages for the other years would not have been visible on the graph.

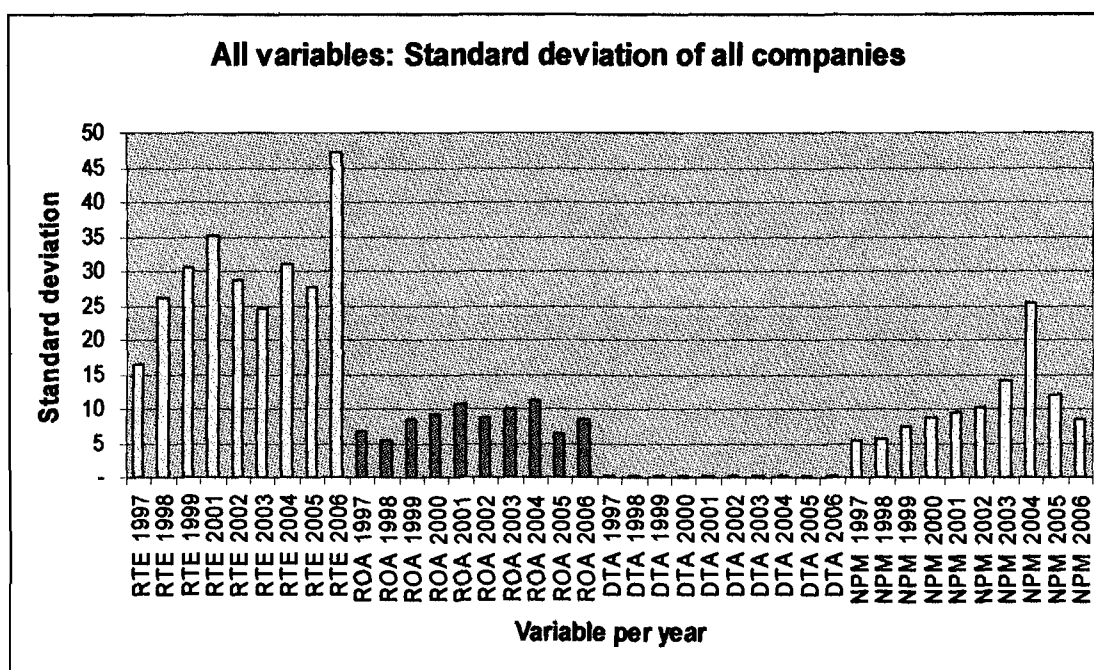
Graph 3.7: RTE, ROA, DTA and NPM – Annual averages for all companies



Source: Own

The annual standard deviation for RTE, ROA, DTA and NPM of all companies is illustrated in graph 3.8, left to right respectively. The standard deviation value of 505.19 for 2000 has also been excluded from the graph. This high value should be excluded from the graph to ensure all the values for other years are visible. The bigger the value of the standard deviation, the more widely the values are dispersed from the mean.

Graph 3.8: RTE, ROA, DTA and NPM – Annual standard deviation for all companies



Source: Own

3.9.2 Steps: Testing the model

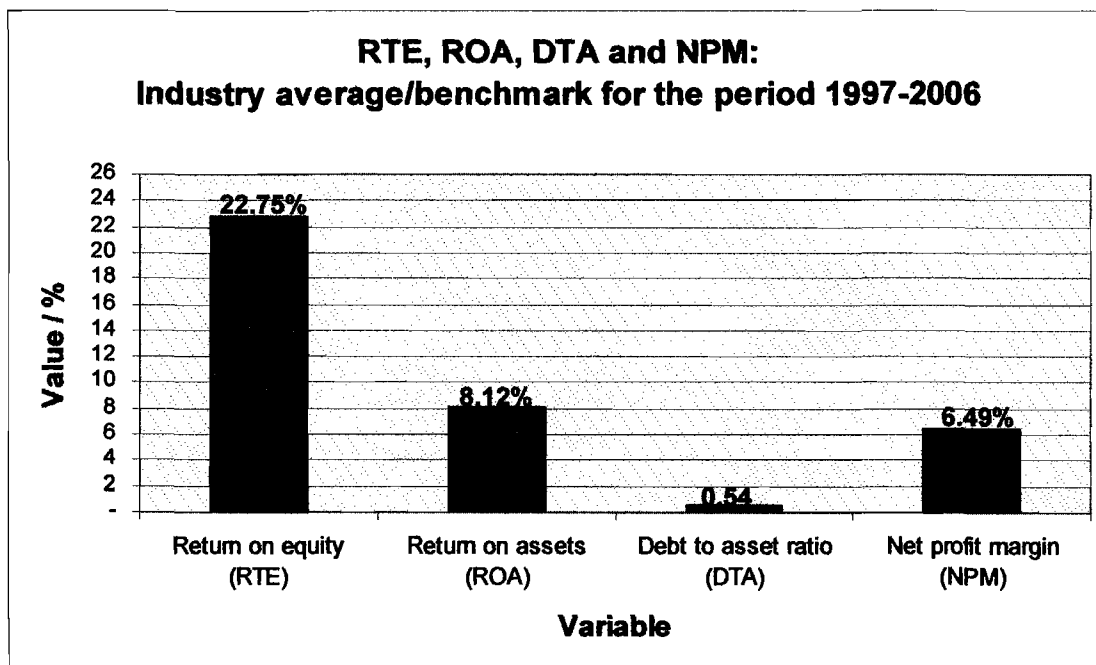
Step 1

Company values based on standardised data have been used to determine the average of each variable within each year for the period 1997-2006. Ten averages for each of these years have been calculated for RTE, ROA, DTA and NPM.

Step 2

The average value for each year, as determined in step 1 above, has been used to calculate the average for RTE, ROA, DTA and NPM over the period 1997-2006. The average of all the averages has also been calculated for the same period to arrive at the industry average of each variable. The industry average of each variable (RTE = 22.75%, ROA = 8.12%, DTA = 0.54 and NPM = 6.49%) is illustrated in graph 3.9 below. The values of all the variables, except for DTA (ratio), are indicated as a percentage in the graph.

Graph 3.9: Industry average for each variable from 1997-2006



Source: Own

Step 3 (a)

The industry average of each variable calculated in step 2 above and illustrated in graph 3.9, has been used as a benchmark to develop the model.

Step 3 (b)

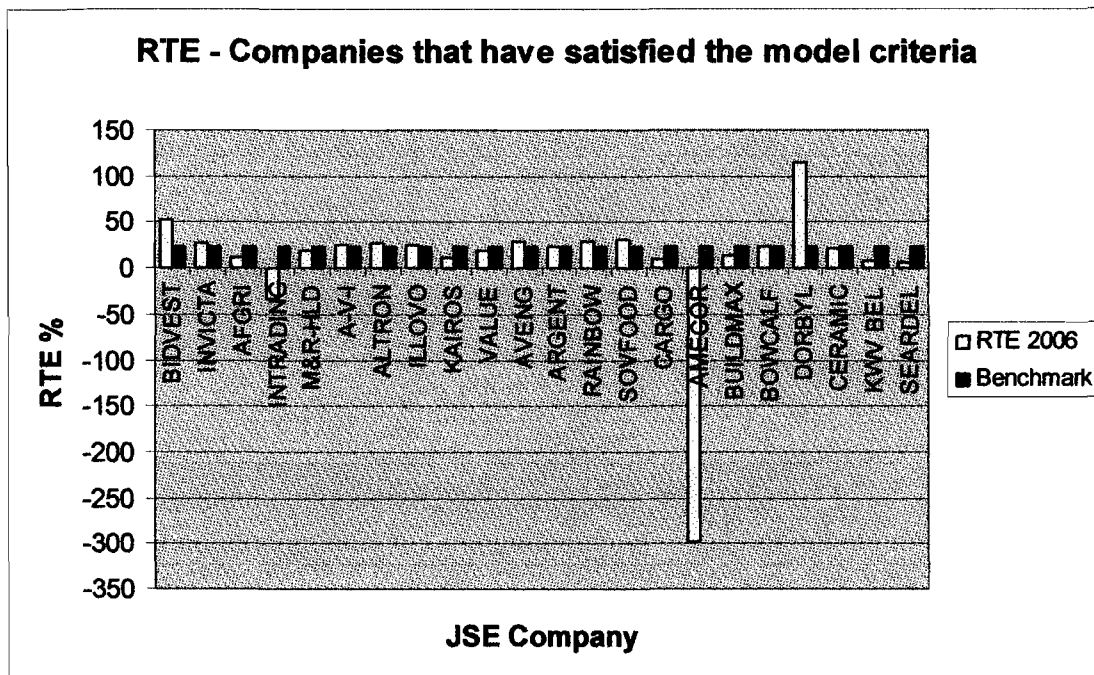
Compare the 2006 values for the explanatory variables RTE, ROA, DTA and NPM against the benchmark. If the variable's 2006 value is lower or higher than the benchmark it is anticipated that the direction of movement will be upwards or downwards respectively. The latter applies because a positive correlation exists between the explanatory variable and the dependent variable, debt to equity. The model criteria include all companies to which independent variables and debt to equity ratios are positively correlated.

Step 3 (c)

Compare 2006 debt to equity values to 2007 values and determine if the predictions derived, as described in step 3 (b), are correct.

Graphs 3.10-3.13 illustrate companies that have satisfied the model criteria for each of the variables RTE, ROA, DTA and NPM. Therefore, the graphs only include companies whose debt to equity ratios for 2007 has been anticipated to move in the right direction. Each graph includes the 2006 values of each variable for companies listed in the industrial sector of the JSE and the benchmark value of that specific variable (as indicated and discussed in graph 3.9 above). The first value (bar) on each graph indicates the variable's value per company and the second value indicates the benchmark (industry average) of that specific variable. One benchmark for each variable has been calculated, as can be seen in graph 3.9. Therefore, the benchmark value of each variable over the period 1997-2006 is the same for all companies, illustrated in graphs 3.10-3.13.

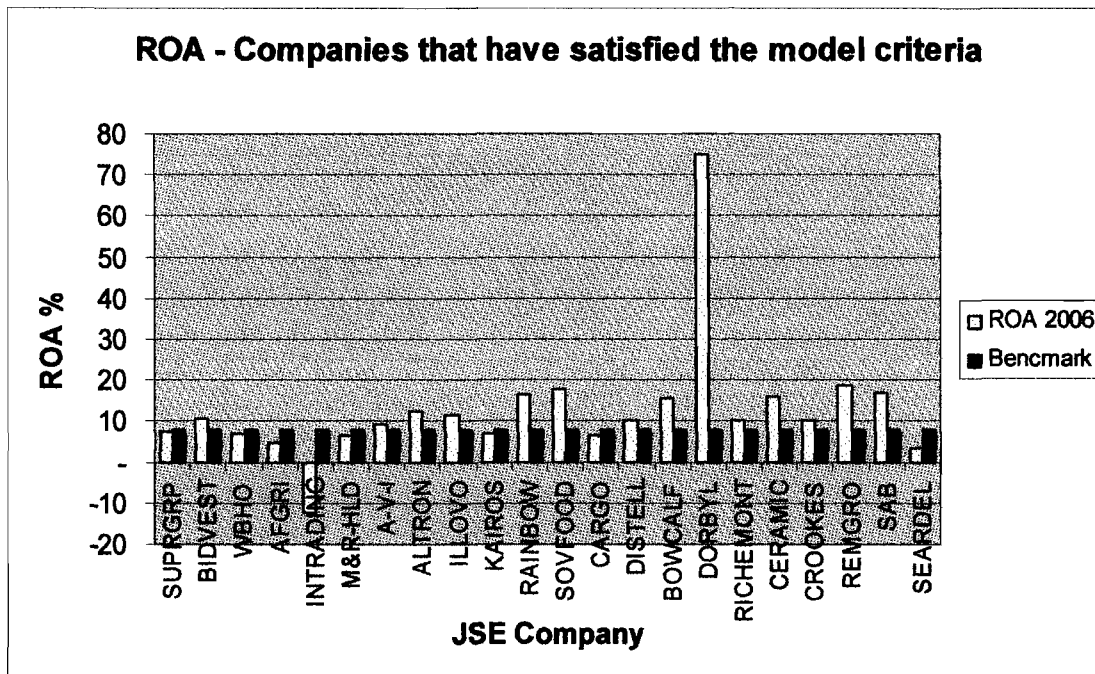
Graph 3.10: RTE: Companies that have satisfied the model criteria



Source: Own

Graph 3.10 illustrates that Bidvest Ltd's 2006 RTE value (53.14%) is higher than the RTE benchmark value (22.75%) for the period 1997-2006. Therefore, the debt to equity ratio for Bidvest is expected to decrease in 2007 due to a positive correlation between RTE and DEQ, as seen in table 3.8. The same situation is valid for all the other companies in graph 3.10. Thus, if the value of the explanatory variable is lower than the benchmark for that specific variable, the debt to equity ratio is expected to increase and vice versa. A positive correlation exists for all companies indicated in graphs 3.10-3.13 below.

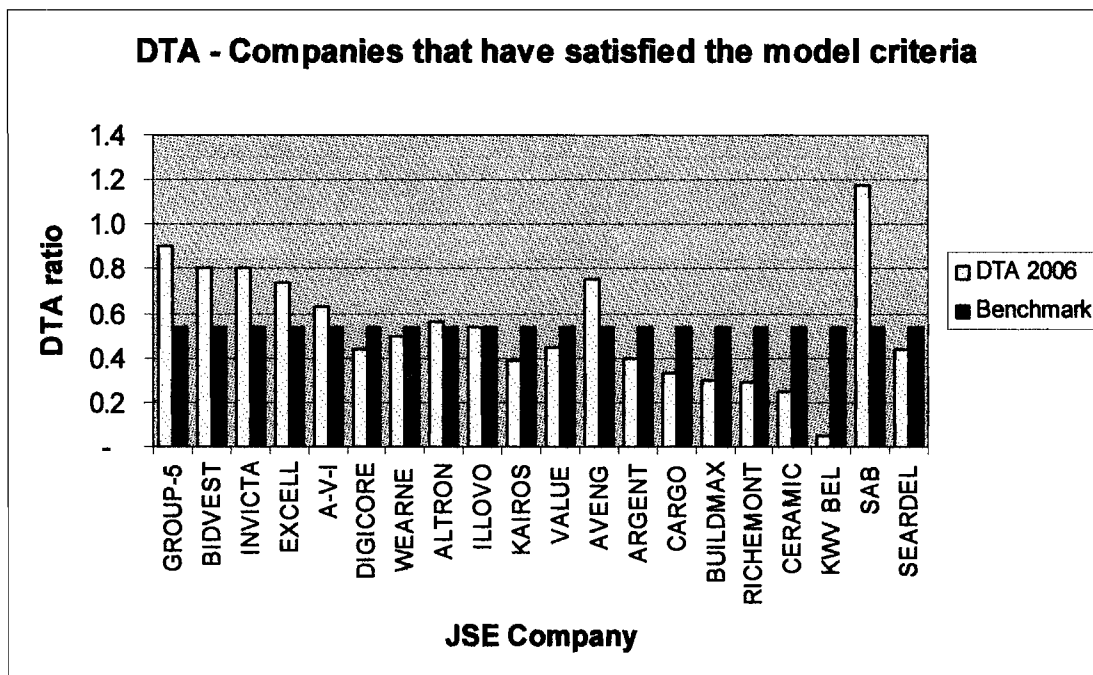
Graph 3.11: ROA: Companies that have satisfied the model criteria



Source: Own

Graph 3.11 includes all companies that have satisfied the model criteria of expected upward or downward DEQ movement for variable ROA. This graph indicates that eight companies have satisfied the model criteria of an upward direction of debt to equity movement in 2007. The eight companies are Super Group Ltd (SUPRGRP), Wilson Bayly HLM-OVC (WBHO), Afgri Ltd (AFGRI), Intertrading Ltd (INTRADING), Murray and Roberts Holdings Ltd (M&R-HLD), Kairos Industrial Holdings (KAIROS), Cargo Carriers Ltd (CARGO) and Seardel Invest Corp Ltd (SEARDEL). The ROA values of the mentioned eight companies have been lower than the ROA benchmark value of 8.12%. Therefore, an upward direction of debt to equity movement is expected due to a positive correlation, as previously discussed. The other fourteen companies' 2007 debt to equity ratios are expected to decrease, as indicated in graph 3.11.

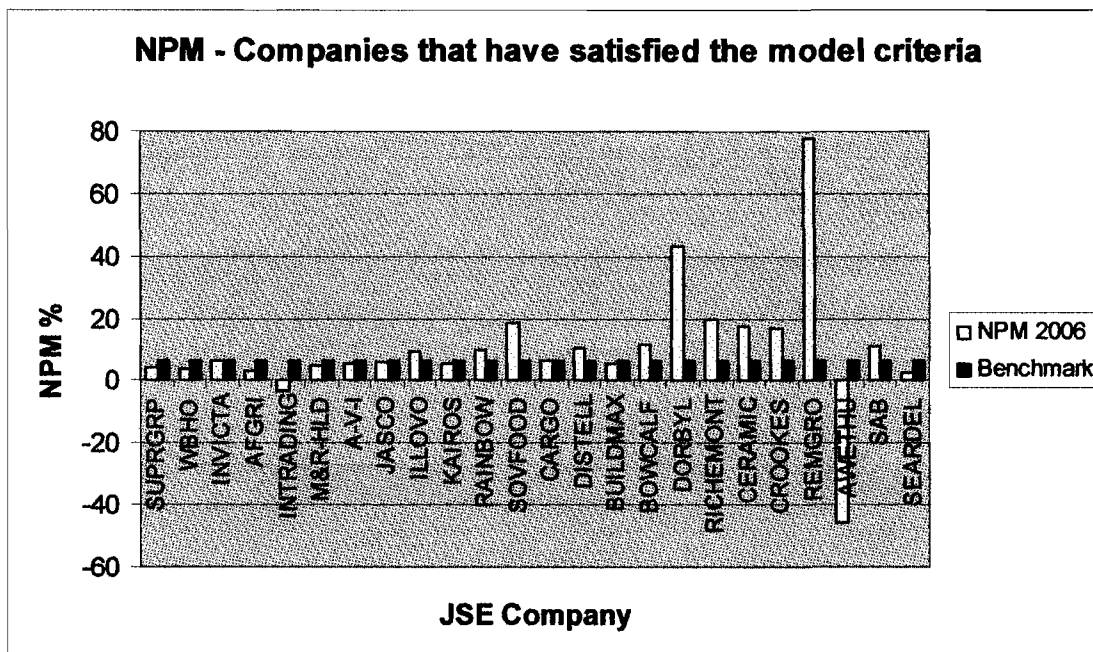
Graph 3.12: DTA: Companies that have satisfied the model criteria



Source: Own

Graph 3.12 illustrates that twenty companies have satisfied the DTA model criteria. Eight companies' DTA ratios have been higher than the benchmark ratio of 0.54. This means that eight out of the twenty companies' debt to equity ratios for 2007 are expected to move in a downward direction. The DTA ratio of Illovo Sugar Limited equals the benchmark, which means this company's debt to equity ratio for 2007 can either move upward or downward. The 2006 DTA ratios of all the other companies have been lower than the benchmark, which means an upward movement of the companies' 2007 debt to equity ratios have been expected.

Graph 3.13: NPM: Companies that have satisfied the model criteria



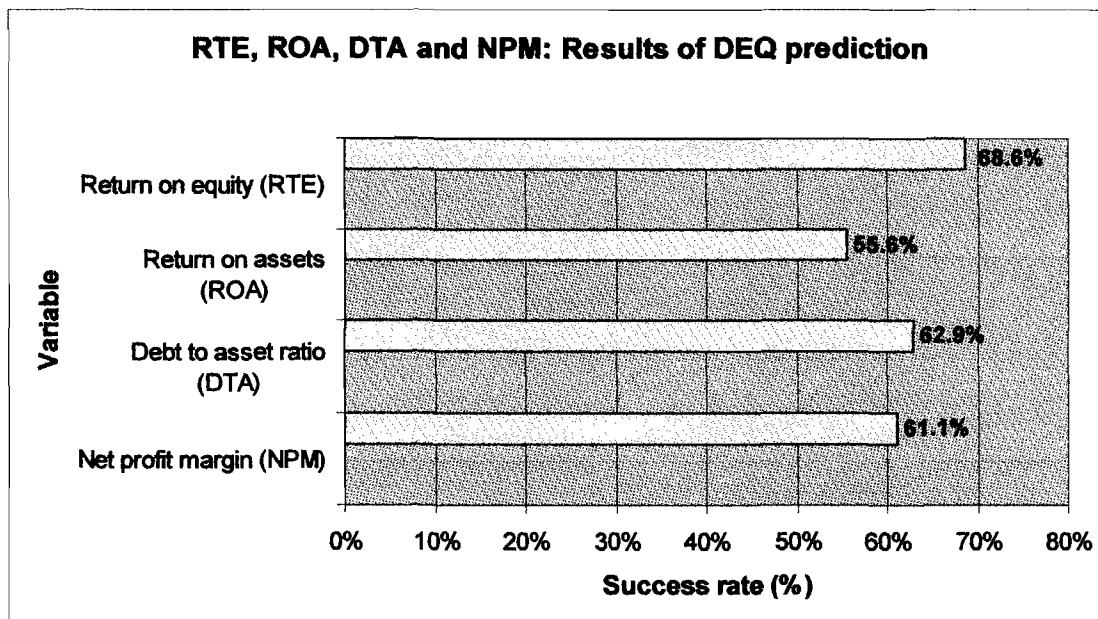
Source: Own

Twelve out of the 24 companies included in graph 3.13 have indicated an upward anticipated movement of debt to equity ratios for 2007. The other 50% of companies' NPM values (%) have been higher than the NPM benchmark of 6.49%, which means a downward movement of the debt to equity ratio is expected.

JSE listed companies in the industrial sector that have not satisfied the model criteria have been excluded from the development and testing of the model research part of the study. That is, all companies of which the explanatory variables and debt to equity ratios have been negatively related. The RTE, ROA and DTA values of Bidvest Ltd are all higher than the variable's benchmark, which leads to an anticipated downward movement of the company's 2007 debt to equity ratio. The only variable for Bidvest Ltd which have not satisfied the model criteria has been NPM. Therefore, Bidvest Ltd is not included in the NPM graph, graph 3.13. All variables for Illovo Sugar Ltd satisfy the model criteria.

RTE, ROA, DTA and NPM's values (DTA ratio equals benchmark) for Illovo Sugar Ltd are slightly higher than the variable's benchmark, which means a downward movement of Illovo's 2007 debt to equity ratio is expected. The results of each variable's DEQ prediction criteria are summarised in graph 3.14 below.

Graph 3.14: RTE, ROA, DTA and NPM – Meeting DEQ prediction criteria



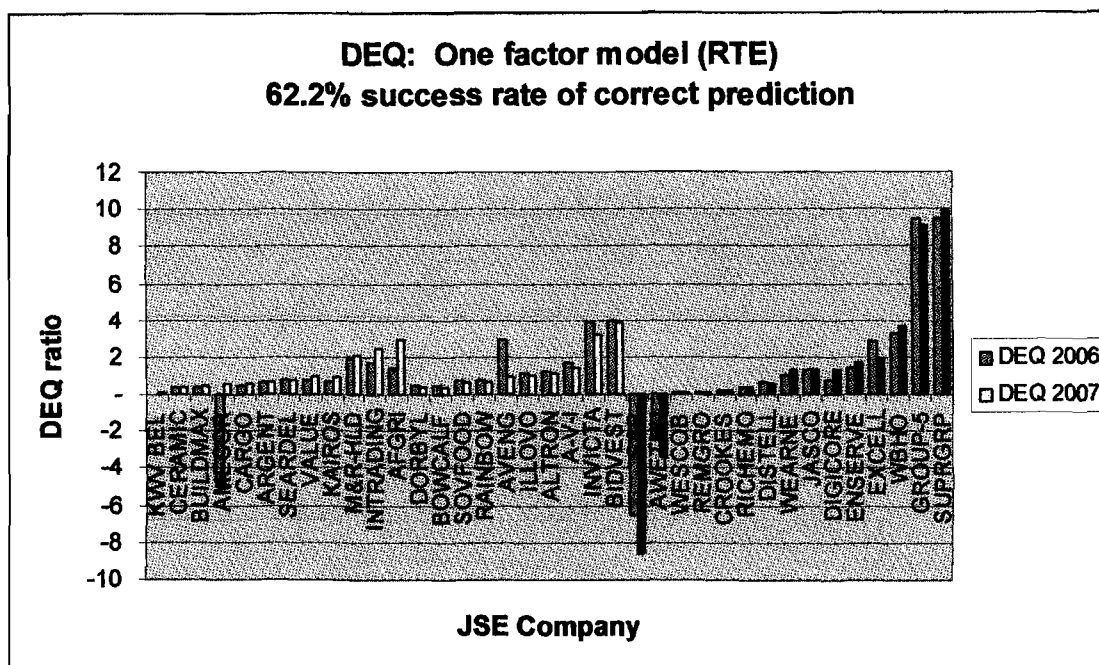
Source: Own

Graph 3.14 indicates the success rate of debt to equity prediction of each variable for all companies. RTE has met 68.6%, ROA 55.6%, DTA 62.9% and NPM 61.1% of the DEQ prediction criteria. RTE, the most significant explanatory variable of debt to equity, as seen in table 3.2, has also achieved the best success rate, as indicated in the above graph.

The next four graphs, 3.15-3.18, illustrate one, two, three and four factor models which represent a combination of debt to equity variables. The idea behind such models is to test the success rate of DEQ predictability as the number of factors/variables in each model increases. The one factor model only includes one variable, while the four factor model includes all four explanatory variables of

debt to equity. The selection criteria of the factor models include all companies which 2007 debt to equity ratios have been predicted to move in the same direction by all the variables in that specific model. Therefore, for a company to satisfy the four factor model criteria – all four variables: RTE, ROA, DTA and NPM – should predict that company's debt to equity ratio to either move upwards or downwards. Companies that have satisfied the model criteria for each of the factor models are indicated in graphs 3.15-3.18.

Graph 3.15: One factor model: RTE – Success rate of 2007 debt to equity prediction

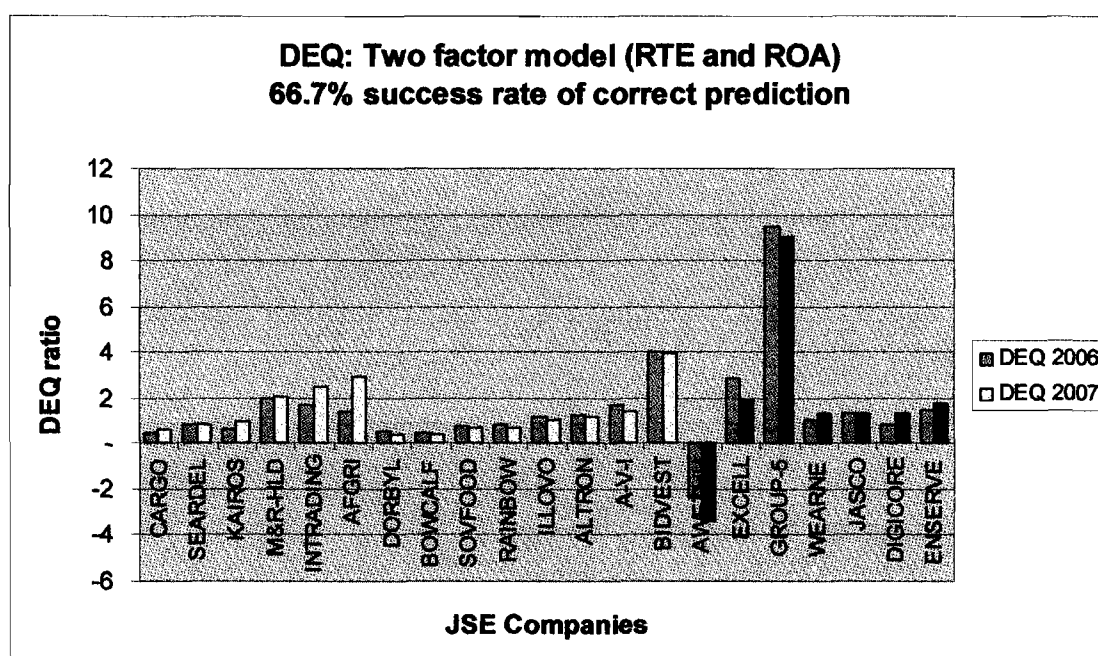


Source: Own

Graph 3.15 indicates a one factor model, which include 37 companies that have satisfied the criteria, as previously discussed. RTE has been selected for this model as it appears eight times (the most) from 1997-2006 as significant explanatory variable of debt to equity (see table 3.8). The first 23 companies from the left, as indicated in yellow on graph 3.15, indicate the companies whose 2007 debt to equity ratios moved in the expected direction. The debt to equity ratios of

the companies indicated in red in the above graph have not moved in the expected direction. Therefore, the one factor model has achieved a 61.1% (20 out of 36) success rate of correctly predicting direction of movement of debt to equity ratios. Companies like SEARDEL and WESCOB with the same debt to equity ratios in 2006 and 2007, have been included in the graph. For purposes of the more factor models all companies with the same 2006 and 2007 debt to equity ratios have been included in the models.

Graph 3.16: Two factor model: RTE and ROA – Success rate of 2007 debt to equity prediction

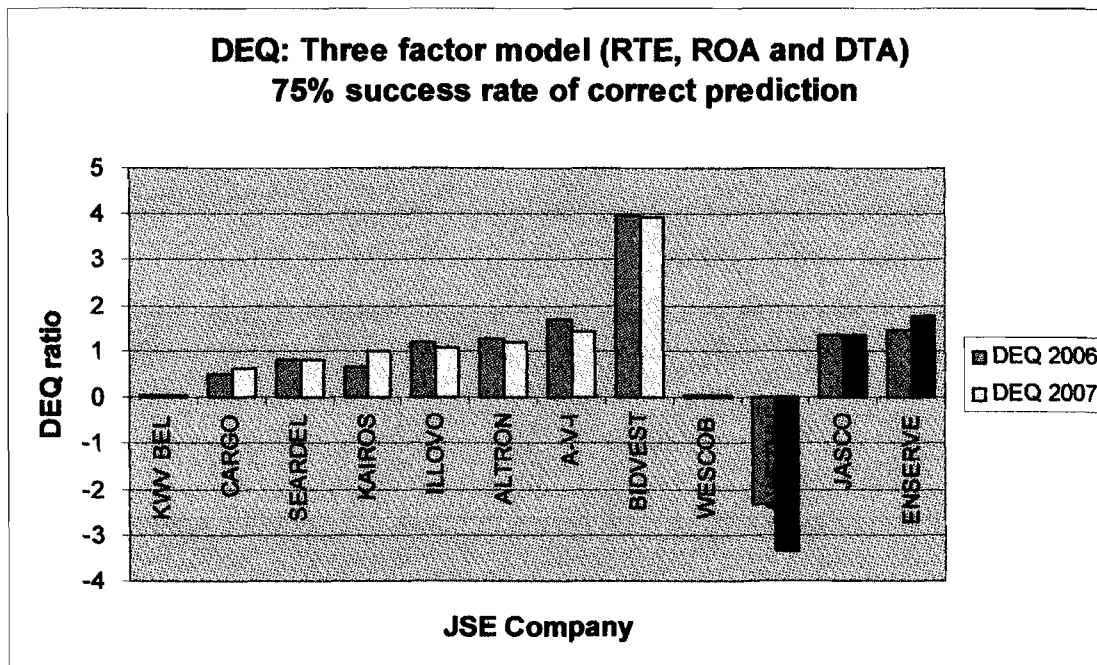


Source: Own

Graph 3.16 indicates the 2006 and 2007 debt to equity ratios for 21 companies that have satisfied the model criteria for RTE and ROA. This graph includes all companies whose debt to equity ratios have been expected to move in the same direction, according to the two factor model variables. Fourteen (first fourteen from left on graph) companies' 2007 debt to equity ratios, indicated in yellow on graph 3.16, have moved in the anticipated direction. Therefore, the two-factor

model has achieved a 66.7% success rate when companies' direction of debt to equity movement has been considered. The RTE and ROA values of the first six companies (CARGO to AFGRI) on graph 3.16 have been below the RTE and ROA benchmarks. Therefore, the abovementioned six companies' debt to equity ratios have moved in an upward direction from 2006-2007, as can be seen in the graph. The next eight companies' (DORBYL to BIDVEST) debt to equity ratios have decreased from 2006-2007. The ratios of the last seven companies (AWETHU to ENSERVE) on graph 3.16 have been expected to move in the same direction, but have not satisfied the criteria. For example in GROUP-5's case, the 2007 debt to equity ratio has been expected to increase from 2006, but its ratio has decreased from 9.48 to 9.03. Companies whose 2007 debt to equity ratios have not moved in the expected direction are indicated in red on graph 3.16.

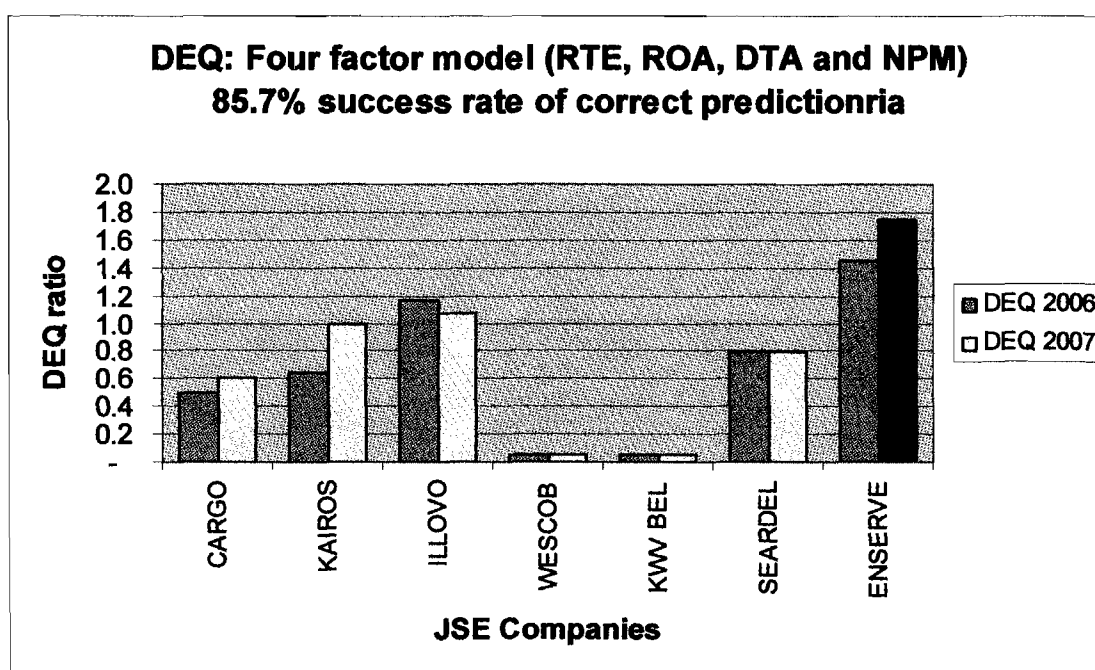
Graph 3.17: Three factor model: RTE, ROA and DTA – Success rate of 2007 debt to equity prediction



Source: Own

The three factor model, which includes the three most significant explanatory variables of debt to equity, achieved a 75.0% success rate of debt to equity prediction, as seen in graph 3.17. Nine out of the twelve companies satisfied the three factor model criteria. This means that all three variables, RTE, ROA and DTA expected the nine companies' debt to equity ratio to either move upwards or downwards. Therefore, nine companies' debt to equity ratios, indicated in yellow on the graph, moved in the correct direction as predicted by all three variables. The direction of debt to equity movement for the last three companies (AWETHU, JASCO and ENSERVE) on graph 3.17 was not predicted correctly. JASCO's and ENSERVE's debt to equity ratios have been expected to decrease from 2006 to 2007, but it increased from 1.32 to 1.34 and 1.45 to 1.74, respectively. AWETHU's debt to equity ratio was expected to increase from 2006 to 2007, but in stead it decreased from -2.34 to -3.37.

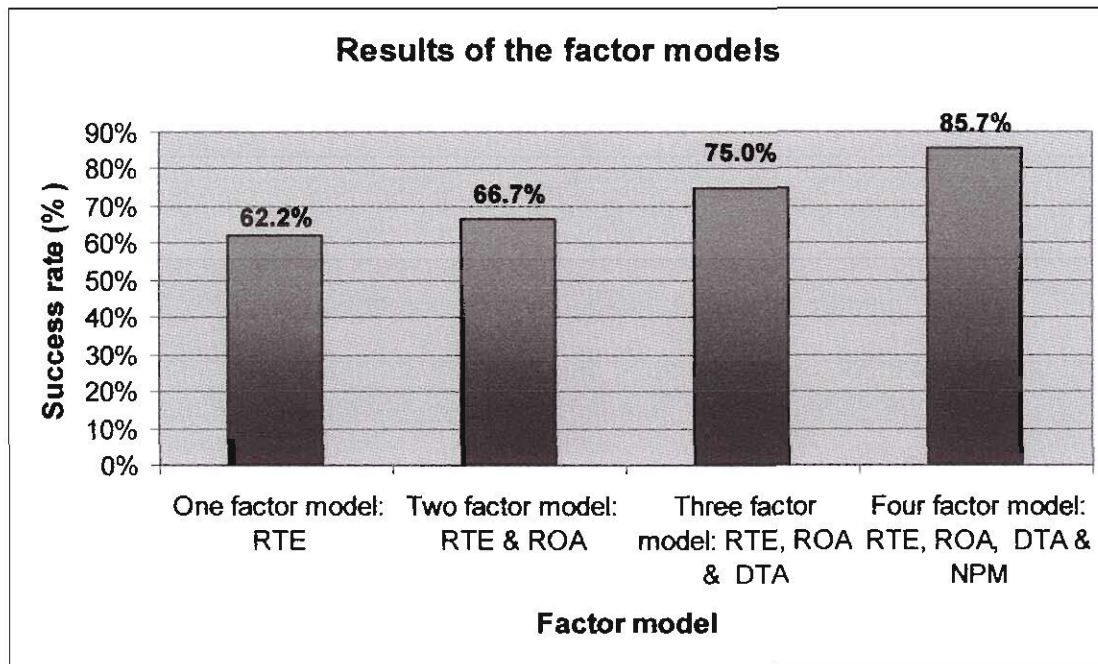
Graph 3.18: Four factor model: RTE, ROA, DTA and NPM – success rate of 2007 debt to equity prediction



Source: Own

The four factor model indicated in graph 3.18, has achieved the best success rate of 85.7%. This means that the factor model becomes a better indicator of debt to equity movement as the number of variables in the model increases. Six of the seven companies' debt to equity ratios have moved in the anticipated direction. Seven companies have satisfied the model criteria for the four factor model. The 2007 debt to equity ratios of the seven companies meeting the criteria have been predicted to move in the same direction by all four variables. CARGO, KAIROS, ILLOVO, WESCOB, KVV BEL and SEARDEL are the six companies whose the debt to equity ratios have moved in the anticipated direction. WESCO, KVV BEL and SEARDEL's 2006 debt to equity ratios equal their 2007 debt to equity ratios. Therefore, CARGO, KAIROS and ILLOVO are the three companies in the four factor model whose debt to equity movement has been predicted correctly and can be used as benchmarks. The debt to equity ratios for CARGO and KAIROS have moved in an upward direction from 2006 and 2007, while ILLOVO's 2007 debt to equity ratio has moved downwards from 1.17 to 1.07. The summarised results of all factor models, as indicated in graphs 3.15 to 3.18, are illustrated in graph 3.19.

Graph 3.19: Success rates – summarised results of all factor models



Source: Own

Graph 3.19 indicates the success rate of prediction of companies' debt to equity movement for all four factor models. The one factor model illustrates the weakest success rate and the four factor model, which includes all variables, has achieved the best success rate. The success rate of prediction increases as the number of variables increases. Therefore, the four factor model is the best indication of what a company's debt to equity movement is expected to do in the future for certain companies in the industrial sector.

3.10 SUMMARY

In this chapter the results of the empirical study have been discussed and the most important criteria for change in share price and debt to equity identified. A three-step debt to equity model has been designed at a 5% level of significance for the evaluation of the most important variables. The model has been tested on

the study sample. The results of the model testing indicate that the success rate of the factor models increases as the number of variables included in the factor models increases.

CHAPTER 4

CONCLUSION AND RECOMMENDATIONS

4.1 GENERAL CONCLUSIONS

It is known that although each firm has a theoretically optimal capital structure, in practice it cannot be estimated with precision. Determining the exact optimal capital structure is not a science. So, after analysing a number of factors, a firm establishes a target capital structure it believes is optimal, which is then used as a guide for raising funds in the future.

Capital structure dynamics have been thoroughly researched in a theoretical context and discussed in chapter 2 to understand which factors determine a firm's capital structure and why capital structure matters to the firm. The literature study/theoretical chapter starts off by discussing the Modigliani-Miller theorem which forms the basis for modern thinking on capital structure. The M&M propositions have created a starting point for capital structure theory. Capital structure dynamics are modelled by means of the three models, as discussed in the empirical study. The relationship between capital structure determinants and sustainable value creation, as reflected in a company's share prices, is theoretically discussed in the literature study by means of factors that determine an appropriate capital structure. These factors largely determine the target capital structure, but it is also known that operating conditions can cause the actual capital structure to vary from the target at any given time.

The empirical relationship between capital structure determinants and sustainable value creation has been investigated based on statistical data -and multiple regression analyses. The main objective of this study, as discussed in the problem statement, has been to research capital structure dynamics with the

intention of developing a model for improved and dynamic capital structure management for sustained value creation. This has been done firstly by determining the relationship between the dependent research variables, **change in share price** and the **debt to equity ratio** and the independent capital structure variables, and secondly to develop and test the model, based on the most significant variables. The results from the regression models at a 5% level of significance have indicated that the most important or most represented criteria with regard to change in share price have been free cash flow (FCF), net operating profit after taxes (NOPAT) and net profit after taxes (NPAT), as indicated in graph 3.5. FCF, NOPAT and NPAT have appeared three times as significant explanatory variables for the period 1997-2006. The multiple regression models for change in share price have also indicated low overall adjusted R^2 s for most of the years which lead to a situation of low predictability. It has been decided that only significant variables that appear four times and more will be included in the development of an analysis model. The most represented variables for change in share price did not satisfy the model criteria. Therefore, a change in share price model did not make sense and has not been developed.

The regression model for debt to equity has indicated the following variables as most represented criteria: return on equity (RTE) occurring eight times, return on assets (ROA) occurring seven times, debt to assets (DTA) occurring six times and the net profit margin (NPM) occurring four times for the period 1997-2006. Empirical research and findings have confirmed a 5% significance model, developed based on debt to equity, makes sense for assessment of company capital structures. The analysis model for debt to equity has been developed by using the significant variables appearing four times and more as explanatory variables.

The debt to equity analysis model developed has also been tested, as indicated and discussed in chapter 3. The first step has been to determine which companies have satisfied the model criteria of each individual variable. NPM is

the variable with the most represented (twenty four) companies. RTE and ROA follow with twenty two companies and DTA with twenty that have satisfied the model criteria. The next step has been to develop a one, two, three and four factor model at a 5% level of significance. The factor models consist of variables in order of significance. The first factor model represents all the companies that have satisfied the model criteria for RTE. The one factor model consists of the most represented variable (appearing eight times) of debt to equity, RTE. The two factor model consists of RTE and ROA. The three factor model includes all companies whose 2007 debt to equity ratios movement have been predicted to move in the expected direction, as indicated by RTE, ROA and DTA. The four factor model consists of all the variables that have appeared four times and more as significant explanatory variables of debt to equity at a 5% level of significance. If the company's variable value is below the benchmark, the company's debt to equity ratio has moved in an upward direction and vice versa. The idea behind the multi factor models is to determine which variables have been the best predictors (individually and combined) of the expected direction of movement of companies' debt to equity ratios. The results from testing the model confirm that the four variables are significant indicators of the direction of movement of a company's debt to equity ratio.

The results of the factor models indicate that the four factor model has achieved the best success rate of 85.7%. The one, two and three factor models have achieved a success rate of 62.2%, 66.7% and 75.0% respectively. Therefore, it is concluded that the models become stronger predictors of the expected direction of movement of debt to equity ratios as the number of variables included in the model increases.

Recall that the goal of management is to maximise the value of the firm. Since the value of the firm is basically a cash flow stream divided by a discount rate (cost of capital), it can be maximised by either maximising the numerator (CF) or

minimising the denominator (cost of capital). A key aspect of value based management (VBM) is managers' focus on the goal of stockholder wealth maximisation.

It has been expected that the value of a firm and certain capital structures are strongly correlated, but this study on industrial companies has indicated that the debt to equity variables and change in share price are weakly correlated. Three of the most significant explanatory variables (RTE, ROA and NPM) of debt to equity are profitability ratios, which mean that industrial companies are managed using financial ratios instead of value based management variables, as expected. The most significant explanatory variables of change in share price at a 5% level of significance are FCF, NOPAT and NPAT, as indicated in table 3.7. The regression model for change in share price, indicated in table 3.5, confirms the conclusion of the mentioned weak correlation.

It is clear from the research of this study that industrial companies are far from practising value based management. The model indicates which variables play a significant role in the expected movement of companies' debt to equity ratios. Therefore, the model can be used as a tool for dynamic capital structure management and sustainable value creation.

4.2 RECOMMENDATIONS FOR FURTHER RESEARCH

A recommendation for further research is to investigate why there is such a weak correlation between capital structure variables and the change in share price of companies in the industrial sector of the JSE.

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**Note: References in text with no page numbers are internet resource, indicated above.*

APPENDIX 1: LIST OF JSE LISTED COMPANIES IN THE INDUSTRIAL SECTOR

Company name	Abbreviation
ADCORP HLDGS LTD	ADCORP
AFGRI LTD	AFGRI
AG INDUSTRIES LTD	AGI
ALLIED ELECTRONICS CO LTD	ALTRON
AMALGAMATED APPL HLD LTD	AMAPS
AMALGAMATED ELEC CORP LTD	AMECOR
ARGENT INDUSTRIAL LTD	ARGENT
ASTRAL FOODS LTD	ASTRAL
ASTRAPAK LTD	ASTRAPAK
AVENG LTD	AVENG
AVI LTD	A-V-I
AWETHU BREWERIES LTD	AWETHU
BARLOWORLD LTD	BARWORLD
BASIL READ HLDGS LTD	BASREAD
BELL EQUIPT LTD	BELL
BICC CAFCA LTD	BICAF
BIDVEST LTD	BIDVEST
BOWLER METCALF LTD	BOWCALF
BUILDMAX LTD	BUILDMAX
CARGO CARRIERS LTD	CARGO

Company name	Abbreviation
CERAMIC INDUSTRIES LTD	CERAMIC
COMMAND HOLDINGS LTD	COMMAND
CONAFEX HLDGS SOCIE ANON	CONAFEX
CONTROL INSTRUMENTS GRP	CONTROL
CROOKES BROS LTD	CROOKES
DELTA ELECRICAL IN	DELTA
DIGICORE HOLDINGS LTD	DIGICORE
DISTELL GROUP LTD	DISTELL
DISTRIBUTION AND WAREHOUSING	DAWN
DORBYL LTD	DORBYL
ELB GROUP LTD	ELBGROUP
ENVIROSERV HOLDINGS LTD	ENSERVE
EXCELLERATE HLDGS LTD	EXCELL
GRINDROD LTD	GRINDROD
GROUP FIVE LTD	GROUP-5
HOUSE OF BUSBY LTD (THE)	BUSBY
HOWDEN AFRICA HLDGS LTD	HOWDEN
HUDACO INDUSTRIES LTD	HUDACO
ILIAD AFRICA LTD	ILIAD
ILLOVO SUGAR LTD	ILLOVO
IMPERIAL HOLDINGS LTD	IMPERIAL
INTERTRADING LTD	INTRADING

Company name	Abbreviation
INVICTA HOLDINGS LTD	INVICTA
JASCO ELECTRONICS HLDGS	JASCO
KAIROS INDUSTRIAL HLDGS	KAIROS
KAP INTERNATIONAL HLDGS	KAP
KWV BELEGGINGS BPK	KWV BEL
MARSHALL MONTEAGLE HD SA	MONTE
MASONITE AFRICA LTD	MASNITE
METAIR INV LTD	METAIR
METROFILE HOLDINGS LTD	METROFILE
MOBILE INDUSTRIES LTD	MOBILE
MURRAY AND ROBERTS HOLDINGS LTD	M&R-HLD
MVELAPHANDA GROUP LTD	MVELA GRP
NAMPAK LTD	NAMPAK
NORTHERN ENG IND AFR LTD	NEI AFR
NU-WORLD HOLDINGS LTD	NUWORLD
OCEANA GROUP LTD	OCEANA
PALS HOLDING LTD	PALS
PRETORIA PORT CEMNT	PPC
PRIMESERV GROUP LTD	PRIMESERV
QUYN HOLDINGS LTD	QUYN
RAINBOW CHICKEN LTD	RAINBOW
REMGRO LTD	REMGRO

Company name	Abbreviation
REUNERT LTD	REUNERT
RICHEMONT SECURITIES DR	RICHEMONT
SABMILLER PLC	SAB
SEARDEL INVEST CORP LTD	SEARDEL
SEKUNJALO INV LTD	SEKUNJALO
SETPOINT TECHNOLOGY HLDG	SETHOLD
SOVEREIGN FOOD INVEST LTD	SOVFOOD
STEINHOFF INTERNTL HLDGS	STEINHOFF
SUPER GROUP LTD	SUPRGRP
TIGER BRANDS LTD	TIGBRANDS
TIGER WHEELS LTD	TIWHEEL
TRANSPACO LTD	TRNPACO
TRENCOR LTD	TRENCOR
VALUE GROUP LTD	VALUE
VENTER LEISURE AND COMM	VENTEL
W G WEARNE LTD	WEARNE
WESCO INV LTD	WESCOB
WILSON BAYLY HLM-OVC	WBHO
WINHOLD LTD	WINHOLD