The Determinants of Capital Structure: A Study of Industrial Firms listed on the JSE

Presented to the
Commerce Faculty,
University of Cape Town

In Partial Fulfilment of the
Requirements for the Degree of Master
of Commerce in Financial Management

By:
Leshane Luscombe
2009

Declaration

There is no plagiarism in this paper and it is my own work. This work has not been previously submitted in whole, or in part, for the award of any degree. Each significant contribution by, and quotation from the work, or works of other people have been cited and referenced.

Leshane Luscombe

Signature Signed by candidate

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Acknowledgement

I would like to express my thanks and gratitude to the following people who have assisted and encouraged me in the completion of this study.

Sincere thanks must go to:

Prof Mike Wormald, my supervisor, for his continuous assistance and insightfulness through each of the respective stages of this study.

Carlos Correia and Carol Cairney, for their advice and recommendations with particular aspects of this topic. Furthermore, for the valuable knowledge I have learnt from Carlos and Carol over the past two years.

Brian Dunn for his assistance in performing the statistical calculations and the giving of advice with respect to other complexities.

My grandmother, Mrs. Cirkine Russouw, for her constant enthusiasm and interest in the progress of my research.

And finally, to my family, for their continued support and for all the opportunities I have been blessed with.

Abstract

This study intends to offer further insight into the determinants of capital structure of industrial firms listed on the Johannesburg Stock Exchange. The amount of debt in a firm is an indication of leverage and this study uses various different ratios as a proxy for capital structure. .Using multiple regressions, the study sets out to establish whether a relationship exists between a selection of determinants and the capital structure of a firm. The study considers previous research and seminal theories such as the Modigliani-Miller theorem, the trade-off theory, the agency theory and the pecking order theory.

The determinants used in this study (and their respective measures) are; the firm's business risk (standard deviation of sales), size (natural log of sales), asset composition (fixed assets/total assets), profitability (earning before interest and tax/total assets), growth opportunities (market value of equity/book value of equity) and age of the firm (years since incorporation). The study also considers the differentiation between long and short-term debt in identifying the determinants of capital structure.

The sample constitutes seventy-one listed industrial firms, for each year, during the period from 2001 to 2005. Using cross-sectional multiple regression, the study attempts to establish whether relationships change over time. Comparing the coefficient of determination of the models over the five years, no significant trend was noted. Overall however, there did appear to be a general decline in the coefficient of determination from 2001 to 2002, and increases in 2003 and 2005. The decline in 2002 could potentially be related to the global market downturn and devaluation of the Rand during this period. In the multiple regression tests done on the pooled sample, there was found to be a positive correlation between both business risk and tangibility, with total and long-term debt, and a negative correlation with short-term debt. It is suggested that riskier firms are dissuaded from issuing shares at their low market prices, therefore prefer debt, and firms with more tangible assets have more to offer as means of collateral. The size and age of the firm were found to have a negative correlation with total and long-term debt, and firm size a positive correlation

with short-term debt. Across all leverage ratios, there was evidence of a significant negative correlation with profitability.

The findings of the latter three determinants; firm size, age and profitability, are consistent with the pecking order theory. This theory suggests that firms prefer to use their accumulated income before taking on more debt or issuing equity. The findings of this study were found to be consistent with past empirical research.

Chapter 1: Introduction

1. Introduction

An important financing decision in a firm is the choice of an appropriate capital structure. The firm's capital structure is the balance between debt and equity that is used for the purpose of financing operations and new projects. This decision is of particular importance as it determines the financing costs, the firm's competitive strength and the return to shareholders. There are numerous considerations when determining the appropriate balance between debt and equity. These various explanations, along with their relevant justifications, are widely evident in past literature.

Being a topical issue in the 20th century, much empirical research on capital structure was done. Modigliani and Miller (M&M), Myers, Jensen and Meckling are but a few of the researchers investigating capital structure over the recent years. M&M initiated the debate on capital structure arguing that based on certain assumptions, capital structure was irrelevant. Other authors viewed these assumptions as unrealistic and set about relaxing them and drawing new conclusions. M&M did, however, further their research by introducing the effect of taxes. Taxation had an associated benefit for debt in the form of interest expense deductions. Other theories such as the Pecking Order theory (Myers and Majluf 1984) attempted to elaborate on M&M's theory by introducing agency costs, asymmetric information, financial distress costs and so forth.

In an attempt to find the optimal capital structure, researchers also began to investigate the association between leverage and firm specific factors. Some examples of these firm specific factors are; firm size, profitability, age of the firm, business risk, research and development, growth opportunities and non-tax shields. When doing the research in various countries and industry sectors, different relationships were found between these factors and the amount of debt. These findings will be considered when analysing and evaluating the results of this study.

1.1 Rationale for the Study

Leverage can be defined as the amount of debt used to finance a firm's assets. A firm with significantly more debt than equity is considered to be highly leveraged. The advantage of higher leverage is that it can potentially increase the returns to equity. With the intention of finding an appropriate leverage level researchers have investigated the associations between leverage and some firm specific factors. As is evident from past empirical research, many different results regarding these factors and capital structure have been found. Often this is as a result of the differences across industries, the differences between developed and developing countries and the specific methodologies used by the author. Justifications of each of the authors need to be carefully analysed to assess their appropriateness for the sample used in this study.

Due to the capital structure differences between different industry sectors, the sample was restricted to firms only in the industrial sector. Although this provides a better perspective on the particular industry's capital structure, the drawback is that this cannot be directly compared to other industries. However, by focusing on one sector, the study hopes to provide clearer results.

By trying to identify any relationships between the characteristics of the firm and its leverage, the study aims to provide both managers and investors with a better perspective on the appropriateness of the firm's capital structure.

This study aims to further research on the study performed by Ghirmatsion (2004), which focused on long term leverage versus equity in firms, during the period 1997-2002. This study however also includes an important element which takes into account the difference between short and long term debt and uses different ratios as a means of measuring leverage.

Value is added by investigating a more recent period during which various market and economic changes occurred which would potentially affect the optimal capital structure of the firms, as well as affect the market-related variables used as determinants. Some of the occurrences that are expected to have had implications on

the capital structure of the firms, and the market-related variables of the particular firms, are the following:

- The corporate tax rate charged to public and private companies was 35% from 1997 to 2000, when it decreased to 30% until 2005. The study aims to shed some light on whether corporate taxes could have an effect on the choice between debt and equity. Taxes could play a part in the decision of financing as interest is a tax deduction, thus with lower tax rates, debt financing could become less attractive. As this study incorporates annual regression tests, it can be noted whether there are any significant changes in the strength of the relationships over the time period.
- The prime interest rate showed a significant decrease over the period 2001 to 2005, and was particularly low in 2004 and 2005. The prime interest rate was as high as 20.25% in the early part of 1997. The average prime interest rate for the period 1997-2002 was 17.3%, compared to the average of 13.28% from 2001 to 2005. The study aims to assess whether the prime interest rate plays a part in the decision about whether to opt for debt or equity.
- The time between 1995 and 2001 is commonly known as the period of the 'dot-com bubble', when Western Nations saw share values increase rapidly in internet and information technology sectors. Investor speculation in shares and widely available venture capital resulted in high investment in the market. This also led to businesses focusing more on market share than the bottom line, thus may have been less cautious with debt: equity ratios and potentially leading to over-gearing businesses.
- A global stock market downturn occurred in 2002. This can be viewed as the correction of the decade-long bull market which had occurred prior to this period. The year 2002 saw a sharp drop in share prices in United States, Canada, Asia and Europe. These decreases in share prices had an effect on stock exchanges all around the world, including South Africa. Equity markets were particularly volatile during this time, as many internet companies went bankrupt and major accounting scandals such as Enron, Arthur Anderson and WorldCom came to light. Furthermore, investor confidence, particularly in America, had been affected by the September 11 attacks. These events may have played a part in dissuading

companies from issuing new equity. They are also expected to have a significant impact on the market-related variables of the firms.

- The year 2002 saw a major decline in the value of the rand which continued to remain at low levels for the predominant portion of the year. The strength of the rand slowly improved but never returned to its high value experienced during 1997-1998. This is expected to have had a significant impact on the market-related variables of each of the firms e.g. business risk, profitability and growth opportunities.

These occurrences are considered throughout the study as potential reasons for the results noted.

1.2 Objectives of the Study

Using a sample of Johannesburg Stock Exchange ('JSE') listed industrial firms this study aims to provide further research on any potential relationships between the certain factors and leverage. Firstly, the study identifies firm specific factors that may have a determining result on leverage. This choice is largely influenced by past empirical literature.

In addition, this study aims to identify whether relationships exist during a particular year of the research period, as well as the nature of these relationships.

This study also aims to offer a degree of insight into whether the nature and strength of these relationships have changed over the time period.

Finally, by comparing the study's results with well documented theories, the study will determine whether the results obtained in the study support the theories addressing capital structure and if the theories explain the appropriate debt: equity ratio of a firm.

1.3 Justification for the Study

The following are reasons for undertaking the study:

- The study focuses on industrial firms and so may provide a more significant and realistic analysis of the determinants of capital structure of these firms.

- There is limited past research that compares the use of short term versus long term debt. By including the various debt types, this study may provide new information as to which type of debt is preferable.

- Using a more recent time period, the study may produce more applicable and updated findings. This may be of more use to industrial firms currently operating.

- The study may also provide financial managers with better insight of the optimal capital structure that the firm should adopt.

- There has been limited research in this area on South African firms. This study may thus find interesting new information and may provide a new foundation for further future research.

1.4 Contents of the study

- Chapter one introduces the objectives of the study along with a brief introduction of past empirical research and the theories of capital structure. It also includes a discussion of the study's significance and the contents that are to be included in the paper.

- Chapter two includes a literature review which presents significant past papers that relate to theories of capital structure and the relationships between leverage and specific determinants.

- Chapter three introduces the research methodology which includes the methodology used, the measurement variables chosen for leverage and the determinants, details of the data sample and the hypothesis development. Careful note is made of the validity of the tests, and any problems are appropriately

addressed. Assumptions and delimitations of the study are presented as well as factors that are unique to the sample of South African industrial firms chosen. The chapter concludes with a brief discussion of the predictions of the study.

- Chapter four focuses on the data presentation and analysis. Included in this chapter is the analysis of the model's strength, cross-sectional and pooled cross-sectional regression results.

- Chapter five sets about comparing the findings of the study with the past research and theories of capital structure.

- Chapter six presents a summary and conclusion of the study, as well as areas of study that are open to further research.

Chapter 2: Literature Review

2. Introduction

Various theories and principles regarding capital structure have been developed. These theories suggest reasons why a certain capital structure is adopted. Contributing to the differences between the theories are the assumptions on which the theory is based. These should be carefully considered for reliability and accuracy. What follows is a selection of the most common theories and empirical research that addresses the appropriate balance between debt and equity in a firm.

2.1 Theories of Capital Structure

The Modigliani-Miller theorem (1958 and 1963)

The M&M Irrelevance theory has been described as being the theory that initiated the capital structure debate. This theory was developed in 1958 by the two economists, Modigliani and Miller, who argued that capital structure had no affect on the value of the firm. Firm value was created by the investments it took on, and not how these investments were financed. Although this theory rested on unrealistic assumptions, it formed the foundation on which other researchers based their studies. The basis of their 1963 revised model included taxation effects and drew attention to the benefits of the interest deductions for debt.

The Trade-off Theory

This theory, initiated by Kraus and Litzenberger (1973) and developed by Myers in 1977, explains that firms will take into consideration the costs and benefits of debt when deciding on the appropriate mix of debt and equity. In justifying this theory, Myers argues that if it were not for the high costs of adjusting leverage, all firms would be at their optimal capital structures.

The *benefits* of debt are manifested in the deductions allowed for the interest expense for tax purposes. This concept is from Modigliani and Miller's (1963) revised model in which the benefit of tax deductions was recognised. This decrease in tax outflows leads to higher cash flows to the equity shareholders. However, to ascertain the true value of this tax deduction, a firm's marginal tax rate is taken into consideration. In essence, accumulated tax losses are carried forward and other tax deductions such as

depreciation and amortisation will have the effect of lowering the value of this interest-tax shield (DeAngelo and Masulis 1980 and Myers 1984). Thus, the benefit of debt is reduced as the amount of non-interest tax shields increase or the taxable income of the firm decreases.

The associated *costs* of debt act as a deterring factor in taking up too much debt. These costs are those of financial distress. An increase in financial leverage increases the probability of debt default and potential bankruptcy (Kraus and Litzenberger 1973). Financial distress costs include the legal and administrative costs of bankruptcy etc. These costs are argued to be relatively small compared to the market value of the firm (Titman 1984), however, Andrade and Kaplan (1998) argue that these costs are a significant consideration for smaller firms. Agency costs (conflicts between managers and shareholders and between debt- and equityholders) are also to be treated as costs that arise in the event of bankruptcy.

Taking into account the characteristics of the trade-off theory, the model predicts that a firm with more tangible assets will have a lower cost of debt, thus higher financial leverage (Long and Malitz 1983 and Williamson 1981). According to these studies, cheaper debt is due to the fact that the firm can use its assets as collateral. On the other hand, debt and financial distress costs are higher for high-growth firms and those with a significant amount of intangible assets, leading to them having lower financial leverage levels.

In their respective studies, Long and Malitz (1983) and Williamson (1981) found a significant negative relationship between unlevered betas and the leverage of firms. These studies reasoned that firms with high business risk, because of the nature of their business or the industry they were involved in, have a higher chance of debt default and bankruptcy. Thus the high potential cost of financial distress outweighs the benefit of the interest tax shield and so discourages borrowing. As regards profitability, the studies showed that firms that are more profitable, will have a lower probability of financial distress, and will gain more from additional debt.

With respect to the firm's size, larger and generally more diversified firms are better equipped to cope with financial distress. Thus, according to the Trade-off theory,

larger firms have a higher financial leverage compared to those that are smaller and less diversified.

The Agency Theory

The agency theory considers the conflicts of interest between the various groups of people that have claims over the firm's resources, that is, managers, shareholders and debt holders. Building on the foundation set by Fama and Miller (1972), further research in this area was initiated by Jensen and Meckling in 1976. They identified two different types of conflicts; that between shareholders and managers, and that between debt holders and equity holders.

The *conflict between shareholders and managers* was as a result of the managers owning less than 100% of the residual claim of the firms' assets. This concept is also explained in the free cash flow hypothesis by Easterbrook (1984) and Jensen (1986). Because managers received only a portion of the gains that arose from profit making activities, they instead diverted the firm's resources and free cash flows to personal benefits that they could directly enjoy. They could then enjoy all the benefits of the cash spent, instead of sharing some of the gain with the shareholders. Managers would overindulge in these extravagancies at the expense of enhancing positive firm growth.

The impact this had on the capital structure is that, holding constant the managers investment in the firm, the more debt financing, the higher the proportionate share owned by managers. This will have a mitigating effect on the agency problem as manager would lose less to the shareholders. Another solution to reduce the conflict would be to offer managerial incentives and/or more complicated financial securities such as convertible debt. These recommendations were made by Barnea, A., Haugen, R. and Senbet, L. (1985) and Brander and Poitevin(1989).

Continuing with the theme of conflict between shareholders and managers, but relating to bankruptcy, Grossman and Hart (1982) pointed out that if bankruptcy was costly to managers, either by way of them losing control benefits or ruining their reputations, then higher debt levels would act as an incentive to managers to work harder and prioritise firm value and growth.

With regard to bankruptcy, it is worth mentioning the viewpoints of Harris and Raviv (1990) and Stulz (1990). Harris and Raviv pointed out that managers will want to continue with current operations, even if the liquidation value is more beneficial to investors. Debt holders, however, have the power to force liquidation if cash flows are insufficient. In finding the optimal capital structure, this benefit of increased debt is weighed up against the increase of default probability with more debt. Stulz (1990) argues that the likelihood of a takeover influences the decision of the amount of debt taken on by managers. Firms with a higher probability of a takeover will have more debt compared to a firm with anti-takeover measures. This is because in some cases, higher debt discourages takeover attempts.

According to Jensen and Meckling (1976), the *conflict between debt holders and equity holders* arises because of the debt contracts. If the firm experiences large returns, these are predominantly captured by the equity holders. This is because where the returns on debt stay fairly constant, share returns fluctuate. However, in the event of negative returns, because of the limited liability of shareholders, it is the debt holders who bear the consequences. The result of this is that equity holders may over invest in risky investments, as they stand to lose proportionately less. Debt holders however aim to eliminate this inequality by incorporating the cost of this anticipated effect, into the debt issued to equity holders. This cost of debt financing is generally referred to as the "asset substitution effect."

Another conflict between equity and debt holders arises with respect to the likelihood of bankruptcy (Myers 1977). If bankruptcy is likely, there is no incentive for shareholders to contribute capital as the benefits may only be received by the debt holders. This is because debt holders have a preferential claim to the firm's remaining assets. Thus in the event of potential bankruptcy, larger debt levels will result in fewer projects being accepted as shareholders may be less willing to contribute funds.

The reputation considerations of managers have also been noted to have an impact on the debt taken on and projects accepted. This has been presented in the papers of Diamond (1989) and Hirshleifer and Thakor (1989). These authors identified that managers aimed to protect their reputations of lower default probability by accepting

lower risk projects, where riskier ones would probably have offered higher returns to shareholders. It was also suggested that older firms that had more established reputations of debt repayment, would have lower costs of debt financing, thus higher debt levels. Younger firms on the other hand, have little to lose by way of reputation, and may be borrowing at higher rates, so have less debt than older firms, ceteris paribus.

Asymmetric Information/ Pecking Order Theory

This theory models the concept that the capital structure adopted by a firm acts as a signal to outsiders. This is in accordance with Myers and Majluf (1984), The financing option chosen by management is interpreted as an indication of the firm's future and investment opportunities. The theory assumes that information asymmetry exists between managers and outside shareholders. Taking this into account, certain financing options are preferable to others.

Myers and Majluf (1984) refer to this theory as the "Pecking Order" theory of financing. This assumes that companies have a hierarchical order of financing options when looking at taking on new projects. From most to least desirable would be income accumulated by the business, debt, and finally, as a last resort, external equity.

The reason behind this "pecking order" is the signalling effect that a new equity issue has on the market. This is primarily due to existing shareholders losing part of the value of the new projects to the new shareholders. Furthermore it is also assumed that management only issue shares when they are overpriced in the market. Consequently, when shares are issued, the market interprets this as information that insiders have on the intrinsic value of the firm. The shares are deemed overvalued, and so tend to fall in market value[1]. Myers and Majluf (1984) stated that the capital structure was determined by the extent of information asymmetry in the firm[2]. Myers and Majluf also noted that firms with relatively more intangible assets were found to be more

[1] Korajczyk, et al. (1990) found that the problem of underinvestment and information asymmetry was less severe after times of earnings announcements and annual reports. Consequently, it appeared that equity issues tended to occur around these periods.

[2] Lucas and McDonald (1990) found that firms with low earnings did not delay projects, whereas those with high earnings delayed equity issuance until such time as the high earnings were announced. The share price did however appear to still decline.

susceptible to information asymmetry and were seen to accumulate more debt overtime.

Contrary to the Pecking Order Theory are the opinions of Brennan and Kraus (1987), Noe (1988) and Constantinides and Grundy (1989). These authors emphasize the availability of other, more sophisticated financing options. A revised paper, presenting a new test of the Pecking Order Model was done by Shyam-Sunder and Myers (1999). This however attracted criticism from Chirinko and Singha (2000) for lacking plausible patterns in the data used as a basis for the conclusion.

Continuing with the theme of signalling private information to outsiders, Ross (1977) reports on the use of debt levels as a signalling tool. Ross's model concluded that the debt-equity ratio was positively related to the firm's value or profitability. This reasoning came about when noting that stronger performing firms more readily issued debt as the probability of bankruptcy was low. As a result, investors read into these actions, and interpreted them as signals of the value of the company[3].

Product/Input, Market and Corporate Control Considerations

These models explore the relationship between the capital structure and the firm's strategy, product's characteristics and likelihood of being victim to a takeover threat. Although the research on these theories is not extensive, they do add value in assessing the capital structure of the firms. .

Using price and quantity as strategic variables which would affect rivals, Brander and Lewis (1986) found that oligopolies carried more debt than firms in competitive industries. For firms producing unique, high quality products, Titman (1984) found there to be less debt. Debt was found to be positively related to the elasticity of demand of the product (Maksimovic 1988).

Models considering corporate control, focus on the threats of takeovers. To eliminate other factors affecting the capital structure, these models view only the short term changes before an anticipated takeover threat. The most important of the results

[3] Other models that use debt as a signal are Heinkel (1982), John (1987) and Poitevin (1989). Although each used different considerations, they all found similar results.

found, was that on average takeover targets increased their debt levels (Harris and Raviv (1988).

2.2 Determinants of Capital Structure

The choice of determinants in the present study has been primarily guided by previous empirical studies. These studies give a good indication of potential significant relationships. The six variables that have been identified as important and influential of the capital structure are: business risk, firm size, asset composition, profitability, growth opportunities and age of the firm.

Business Risk:

Business risk is the risk of financial distress and bankruptcy that faces the company. Of the determinants presented in this paper, business risk appears to be the most evident in related literature. Kale et al. (1991) assert that there is general consensus that business risk influences the choice of the target capital structure.

The risk of a firm is incorporated in the volatility of its earnings. Firms with high earnings volatility face a higher probability of not meeting debt commitments and experiencing financial distress and bankruptcy (Marsh 1982 and Castanias 1983). As mentioned before, this idea is supported by the trade-off theory which predicts a negative relationship between leverage and business risk. This relationship depends on the extent of the costs of financial distress (Castanias 1983, Bradley, Janell and Kim 1984). These costs depend on the source of the debt and the relationship with the lender. Antoniou et al. (2002) discussed the noticeable contrast between German and United Kingdom ('UK') firms. Where German firms develop close ties with their lending banks, UK firms raise loan capital in arms-length contracts, and hence experience higher costs when failing to meet debt commitments than German firms. This leads to UK firms being more concerned with earnings volatility when deciding on capital structure, than their German counterparts.

A negative relationship is also reasoned to exist because firms financed by equity do not have fixed interest commitments and have the option not to pay out dividends in times of financial difficulties. Thus firms with volatile earnings prefer equity to debt (Antoniou et al. 2002).

DeAngelo and Masulis (1980) further argued that because of the uncertain future of firms with volatile earnings, lenders to such firms will demand a higher premium on the cost of debt. This leads to a lower level of leverage being desired.

Other empirical findings of a negative relationship are reported by Banerjee et al. (2000), Barbosa and Moraes (2003), Drobetz and Fix (2003) and Jong and Dijk (2002). Researchers that found no significant relationship between leverage and business risk were Hirota (1998) for Japanese firms, Heshmati (2001)[4] for Swedish micro and small firms, Auerbatch (1985) and Ferri and Jones (1979).

Measurement variables:

Past literature shows various different means to measure business risk. Amongst these alternatives is the variability of earnings before interest and tax (Ghirmatsion 2004), the variability of sales (Barbosa and Moraes 2003) and the variance of operating income divided by total assets (Booth et al 2001 and Banerjee et al 2000). The present study uses the variability of sales as an indication of business risk. This is the measure of choice as it places less emphasis on the operating risk of the business, which relates more to the particular strategy and management of the business, than to the sales risk of the business. Variability of sales focuses more on business risk, and represents the risk of the company's product in relation to the market.

Firm Size

This determinant refers to the market capitalisation and trading capacity of the firm. It has generally been accepted that the size of a firm is inversely related to the probability of bankruptcy (Rajan and Zingales 1995). There is evidence of bankruptcy costs being relatively higher for smaller firms (Ang, Chua and McConnell 1982)[5] thus less desirable. It may also be the case that larger firms are more diversified and therefore have higher debt capacity and less prone to bankruptcy (Remmers et al. 1976, Castanias 1983 and Titman and Wessels 1988). Taub (1975) further argues that larger firms have more assets and resources to fall back on in the event of not being

[4]Heshmati (2001) reasoned that lenders were more concerned with collateral than earnings stability.
[5] Rajan and Zingales (1995) argue that if these costs of bankruptcy are low, the relationship will not be as strong. Other studies supporting this argument are Ferri and Jones (1979) and Kim and Sorensen (1986).

able to meet their debt commitments. These arguments suggest a positive relationship between firm size and leverage.

With respect to information asymmetry, Fama (1985) argues that monitoring and information transparency costs are higher for small firms. Thus larger firms will have easier access to lending markets and would be able to borrow at lower costs. Similarly, Devic and Krstic (2002) reasoned that larger firms established strong relationships with lenders and so were able to borrow at more favourable conditions than smaller firms. It is suggested that they have a higher degree of flexibility (Roden and Lewellen 1995). On the topic of issuance costs, Smith (1977) also found that small firms incurred greater floatation costs in issuing equity and borrowing new long-term debt. This suggests that small firms prefer short-term to long-term debt because of the relatively lower fixed costs.[6] A slight negative association may be evident with respect to size and short-term debt.

An interesting observation has recently been reported with regard to larger firms beginning to rely more on other credit sources such as the bond market (Gaud et al 2003). This came about in the findings that the positive relationship between size and leverage weakened when looking at long-term debt only. This study was supported by Bevan and Danbolt (2000) who found a less significant relationship (positive) between size and long-term bank borrowing, when compared to the relationship between size and long-term securitized debt.

Other empirical studies supporting this argument of a positive relationship between size and leverage are Shuetrim et al (1993), Booth et al (2001), Hirota (1998) and Barbosa and Moraes (2003).

Barbosa and Moraes (2003) cited a number of researchers whose empirical results found there to be no significant relationship between leverage and size. These include; Remmers et al. (1974), Aggarwal (1981), Castanias (1983), Collins and Sekely (1983), Kim and Sorensen (1988), Titman and Wessels (1988), Mehran (1992) and Roden and Lewellen (1995)

[6] Other studies arguing that smaller firms have less long-term debt and more short-term debt are; Michaelas et al (1999), Titman and Wessels (1988) and Stohs and Mauer (1996).

Results showing negative relationships were found in United States of America ('USA') (Banerjee et al 2000) and Germany (Rajan and Zingales 1995). These findings are however fairly uncommon, especially in developed countries. As cited in Ghirmatsion (2004), a South African study using retail companies listed on the JSE reported an insignificant relationship between size and leverage (Dukhi 2000). The reason suggested by Dukhi, was that retail firms listed on the JSE were generally all large, so there were no marked size differences in the sample.

Measurement variables:

Past literature presents various options of measuring the size of a firm. Much consideration needs to go into choosing the best method as it has been found that results are sensitive to the chosen method of estimation (van der Wijst and Thurik 1993 and Barclay et al 1995). The predominant measures of size are sales and value of assets.

Amongst the authors cited in Ghirmatsion (2004) who used sales as a basis for size are Titman and Wessels (1988), Hirota (1998), Bevan and Danbolt (2000), Booth et al (2001), Manos et al (2001), Devic and Krstic (2002) and Drobetz and Fix (2003). Studies using assets as a measure of size are Roden and Lewellen (1995), Barclay and Smith (1996) and Kim et al (1998).

In support of Titman and Wessels (1988), Drobetz and Fix (2003) set out to justify the use of the logarithm of sales instead of the logarithm of assets. They argue that sales is a better proxy for size as firms sometimes aim to decrease the assets reported on the balance sheet. There are various ways in which this can be achieved, for example by using lease contracts. Sales is also a more accurate and fair representation of the current status of the firm.

Other less common variables used are employee quit rates (Titman and Wessels 1988) and employment levels (Heshmati 2001 and Barbosa and Moraes 2003). The argument for quit rates is that larger firms have more career opportunities and therefore lower quit rates. The use of employment levels may be appropriate for very

small firms (Barbosa and Moraes 2003) but otherwise is not suggested as a proxy for size.

In view of the above and taking into account the potential misleading effect of using the firm's assets; this study will use the natural logarithm of sales as a proxy for size.

Asset composition

Asset composition refers to the degree of tangibility of the assets in a firm. There is strong empirical evidence that the tangibility of the assets affect the collateral value which is of importance in the financial structure. Although there are many dissenting views arguing a negative or no relationship between asset composition and leverage, overriding evidence leans towards a positive relationship existing. There are various reasons for this. As opposed to intangible assets, tangible assets are less complicated to value, and easier to sell in the event of bankruptcy (Heshmati 2001). Firms that invest heavily in fixed tangible assets can borrow at lower rates as they have more assets to offer as security (Bradley et al 1988). These tangible assets which can be used for collateral, largely affect the debt capacity of the firm (Friend and Lang 1978). Similarly, Wedig et al. (1988) affirm that debt will be more readily used if there are tangible assets for collateral. On liquidation, it is also been found that tangible assets retain more value then their intangible counterparts (Rajan and Zingales 1995).

Other studies evidencing a positive relationship between the variables are Gaul et al. (2003), Drobetz and Fix (2003), Shuetrim et al. (1993), Jong and Dijk (2002), Hirota (1998) and Banerjee et al. (2000).

As mentioned, there have also been findings of a negative relationship between leverage and tangibility. Ferri and Jones (1979) argue that because additional fixed assets increase operating leverage and variability of income, having proportionately more fixed assets in the firm will discourage debt financing. Kim and Sorensen (1986) suggest that the desirability for the interest tax shield is reduced at higher levels of depreciation of fixed tangible assets. This is because the depreciation deduction decreases taxable income, reducing the value of the interest tax shield.

With respect to tangibility and short-term debt, negative relationships were found by van der Wijst and Thurik (1993), Chittenden et al. (1996) and Stohs and Mauer (1996).

In some cases, the specific choice of variables and methodology used by the researcher was found to have a noticeable effect on the empirical findings. Devic and Krstic (2001) reported a positive relationship in Hungarian firms only when the market value, instead of book value of equity, was used.

Measurement variables:

Due to the lack of accurate published data, the more direct measure of intangible assets as a proportion of total assets is not commonly used (Drobetz and Fix 2003). Instead the ratio of fixed assets to total assets is more frequently used in the literature[7]. Booth et al. (2001) used total assets less current assets, divided by total assets. Manos et al. (2001) looked at the intangibility of the composition of assets and considered the ratio of R&D and advertising spending to sales.

Comparing the alternative measures, and having considered its past accuracy as a proxy for asset composition, this study will be using the ratio of fixed assets to total assets.

Profitability

The relevance of profitability is evident in most of the popular capital structure theories. According to one of the earlier theories published, that of Modigliani and Miller (1963), to benefit from the interest tax shield, firms with high profits should employ high debt. This may play less of a role in firms that have other tax deductions available, such as depreciation (DeAngelo and Masulis 1980).

The pecking order theory disputes the positive relationship suggested by Modigliani and Miller (1963), reasoning that because of the hierarchical order of financing

[7] Authors using fixed assets divided by total assets are; Rajan and Zingales (1995), Hirota (1998), Bevan and Danbolt (2000), Heshmati (2001), Banerjee et al. (2001), Devic and Krstic (2001) Barbosa and Moraes (2003) and Drobetz and Fix (2003).

preference, firms that have retained income available, will prefer to use this rather than debt (Myers 1984, Myers and Majluf 1984).

According to the trade-off theory, a positive relationship is expected between profitability and leverage. Firstly, bankruptcy costs decline as profitability increases, secondly, interest tax shields are more desirable to profitable firms, and thirdly, as suggested by Jensen and Meckling (1976), Easterbrook (1984) and Jensen (1986), increases in debt reduce agency costs. Instead of pursuing personal objectives, managers will now be disciplined to making efficient investment decisions in order to avoid the non-payment of debt. Related to this theory is the signalling hypothesis that states that higher debt levels suggest quality management and an optimistic future (Ross 1977).

Progressing on from the established theories to more recent studies, empirical evidence finds conflicting results. The most common finding is that a negative relationship exists between the variables. There are many varying arguments suggesting the reason for this. Titman and Wessels (1988) reasoned that because of the high costs of asymmetric information and of the transaction, firms avoided issuing new debt or equity, and preferred to use internal financing. Marsh (1982) suggested that firms issued equity immediately after good performance periods, to benefit from the high share value. Hall and Weiss (1967) asserted that profitable firms aimed to benefit from their strong returns in the form of lower risk levels, thus used retained income instead of debt. As cited in Ghirmatsion (2004) other empirical findings showing a negative relationship are Rajan and Zingales (1995), Hirota (1998), Bevan and Danbolt (2000), Banerjee et al. (2000), Barbosa and Moraes (2003), Guad et al (2003) and Strebulaev (2003).

Despite the convincing evidence of a negative relationship, other studies have produced contradictory findings worthy of discussion. Gale (1972) applies the conventional theory of financial leverage and mentions that by keeping business risk constant, it is found that increases in leverage will increase the returns to shareholders in profitable firms. Arditti (1967) agrees, stating that higher leverage increases variability in earnings, allowing for added distributions to shareholders. However, Arditti does add that this increased risk, must be matched with higher return on

investment for shareholders. From the viewpoint of the lender, Stigler (1963) puts forward the argument that lenders will be more willing to finance profitable firms and so will offer cheaper interest rates, thus encouraging more debt.

Measurement variables:

There is a large combination of indicators of profitability used in past literature. These include the ratios of operating income over sales, operating income over total assets (Titman and Wessels 1988 and Drobetz and Fix 1993), EBIT to total assets (Booth et al. 2001, Guad et al. 2003, Ghirmatsion 2004), net income to total assets (Heshmati 2001 and Banerjee et al. 2001) and EBIT (before depreciation) to net assets (Devic and Krstic 2001).

For purposes of this study, the ratio used to represent profitability is EBIT to total assets. This measure is of the most common used in past studies.

Growth opportunities:

This determinant is symbolic of the future growth prospects of the company. It incorporates the potential future market share and sales growth. Past empirical evidence has shown positive (Baskin 1989, Michaelas et al. 1999), negative (Kim and Sorensen 1986, Titman and Wessels 1988, Stulz 1990, Roden and Lewellen 1995, Lasfer 1995 and Barclay et al 1995) and no relationship (Kale et al. 1991) between growth opportunities and financial leverage.

Toy et al. (1974) suggest that because fast growing firms are unable to meet their market opportunities with retained income, they are forced to borrow more. A similar view was taken by Shuetrim et al (1993) and Barbosa and Moraes (2003) who reasoned that the positive relationship was due to fast growing firms quickly exhausting their internal finances. As debt is the next least expensive source of finance, debt dependency increases. This is supported by the simpler version of the pecking order theory where if firms require external finance, debt is preferable to equity.

A negative relationship is evident from the viewpoint of the more complex pecking order theory. The agency problem is usually higher in growing industries which have

more flexibility with investment choices. Managers may over-invest in risky projects, resulting in the bondholders then bearing the burden of the failure costs. As growing firms attempt to reduce the agency problem, less financing is obtained from debt (Myers 1977). However, it has been found that the agency problem is mitigated if the firm issues short-term instead of long-term debt (Myers 1977, Barclay and Smith 1996 & 1999, Michaelas et al. 1999). This suggests a possible positive relationship between growth opportunities and short-term debt.[8]

The free cash flow model of Jensen (1986) further strengthens the idea of a negative relationship existing. He reasoned that firms with more investment opportunities have less need for the restricting debt payment commitments which affect the firm's cash flows.

Similarly Rajan and Zingales (1995) argue a negative relationship. This is reasoned because it is expected that the higher the market to book value (proxy for growth) the higher the costs of financial distress. Also, firms prefer to issue equity when the shares are overvalued. It should also be noted that growth opportunities are assets that add value to the firm, but cannot be used as collateral for debt, again implying a negative relationship. However, on the contrary, lenders can be attracted by the potential growth as it may lead to higher future cash flows.

An interesting result was found by Gaud et al (2003). The authors presented evidence of a positive relationship when the book value of debt was used, and a negative relationship when market value of debt was used. This suggests that the results are sensitive to the measurement criteria used.

It is also of interest to investigate the results of specific countries. As cited in Ghirmatsion (2004), in the case of South Africa, it was found that there are both positive and negative relationships across sectors (Jordaan et al 1993). Another study by Uliana (1993), showed a negative relationship in South African firms. Performing

[8] Related, but beyond the scope of this thesis, it has also been shown that there is a positive relationship between growth opportunities and convertible debt (Jensen and Meckling 1976, Smith and Warner 1979, Green 1984).

regression tests on ten developing countries[9], Booth et al (2001) found a positive relationship in all, except South Korea and Pakistan. Looking at firms in the UK, no relationship was found (Banerjee et al 2000), but a positive relationship was found in USA firms. This suggests that debt is more accessible to growing venture capitalists in USA.

Measurement variables:

Whilst reviewing literature many different proxies for growth opportunities were found. Amongst these were PE ratios, R&D expenditures, share price to book ratio (Manos et al. 2001), book to market value equity (Drobetz and Fix 2003), past growth rate in assets (Titman and Wessels 1988) and employment levels[10] (Barbosa and Moraes 2003).

The variable decided to be most appropriate as a proxy for growth is the market to book ratio. Reasons for this are that the balance sheet may not capture the future investment potential as well as the share price. The other optional measures are found to be more reflective of historical growth than future growth[11].

Age of firm

The age of the firm is the number of years that have passed since the year the company was founded, to the year under analysis. With regard to the relationship between this determinant and leverage, limited past empirical evidence is found. Some authors focused more on age being a factor in determining the business risk of a company (Archer and Faerber 1966, Leeth and Scott 1989 and Johnson 1997).

In the past statistical evidence, both positive (Heshmati 2001 and Barbosa and Moraes 2003[12]) and negative associations (Wedig et al. 1988, Petersen and Rajan 1994) were found to exist. The argument that supports a positive relationship is that older firms have stable earnings so can afford higher debt ratios (Barton et al. 1989). The

[9] The ten countries include India, Pakistan, Thailand, Malaysia, Turkey, Zimbabwe, Mexico, Brazil, Jordan and Korea (1980- 1990)

[10] This was used with particular reference to small firms.

[11] This comment was stated by Chan, Karkeski and Lakonishok (2003) with reference to the method used by Titman and Wessels (1988).

[12] Barbosa and Moraes (2002) found the relationship to be positive only when using the industry's leverage, and not the firm's leverage.

reasoning for the negative relationship was that the more established firms preferred to use accumulated income as oppose to debt (Diamond 1989). This matches the notion put forward by the pecking order theory.

Measurement variables:

Barbosa and Moraes (2003) and Ghirmatsion (2004) defined age as the number of years since incorporation of the company. This varies from the approach of Taub (1975) who considered the period of solvency of the company. The present study uses years since incorporation of the company as it is the more objective of the two measures.

Measuring Leverage

Many alternative measurement variables for leverage have been used in past literature. This is because there has never been any clear cut definition of leverage [13]. The choice is dependant on the objective of the study (Rajan and Zingales 1995). For purposes of accuracy, more than one measure of leverage will be used. Due to varying relationships between the independent variables and short versus long term debt, both of these have been used as a proportion of total assets. This approach is supported by Schwartz and Aronson (1967) who argue that short term debt should be included in the analysis due to the high degree of substitutability with long term debt. Another argument by Hall and Weiss (1967) is that short term debt is important because accounts receivable and other current liabilities are a substantial portion of total assets less equity. For purposes of this study, it is considered appropriate to include testing of short term debt as this, although indirectly, plays a role in determining the level of financial leverage.

The ratios used in this research paper are similar to those presented by Titman and Wessels 1988 and Pandey 2000. To expand the study, additional leverage ratios that are expected to be significant, have been included. The ratios used in the study are listed in Table 3(a) of Chapter 3 which deals with Research methodology. A description of each these variables will also be addressed in that chapter.

13 Amongst the less conventional measures of financial leverage are; the ratio of interest payments to EBIT (Flath and Knoeber 1980), cash flows (Kale et al 1991), the range of the debt ratios (Fischer et al 1989) etc.

2.3 Summary

The chapter presents an encompassing account of past empirical literature relating to capital structure. It sets out to explain the theories of capital structure. M&M's Irrelevance theory of 1958 provides the foundation upon which other theories such as the trade off, agency and pecking order theories are based. M&M initially argued that in the presence of certain assumptions, the capital structure chosen was irrelevant. The assumptions were adjusted to include the effect of taxes, which via the benefit of interest tax shields, encouraged debt. The trade off theory determined that leverage was as a result of the associated benefits and costs of debt and equity. The agency theory focused on the conflicts of interest between the various stakeholders in the firm and how capital structure was affected by these interests. The pecking order theory emphasized the existence of a hierarchical order of preference with respect to financing. The order of desirability descended from retained income, to debt and lastly to equity. Each theory, as discussed in the chapter 2, predicts a particular relationship between leverage and the determinants.

For each determinant, past empirical research has shown various relationships from a positive, negative or not significant relationship. The alternative findings stem from methodological differences. These methodological differences include the specific proxies used for the determinants, as well as the various ways of measuring financial leverage. Because no obvious definition of leverage exists, past studies have used an array of different measures as an indication of leverage. For improved accuracy, the use of multiple ratios has been suggested. In selecting the measures of leverage, this study has considered ratios recommended in past studies, as well as others appropriate to achieve its objective.

Chapter 3: Research methodology

3. Introduction

This chapter describes the methodology used to test the hypothesis in this study. It will outline the types of tests that are run, the sample that is selected and the means of data collection. A discussion follows addressing the validity of the model and its assumptions. Furthermore, the study addresses any limitations that could affect the results, as well as specific issues that need to be considered when dealing with South African firms. A hypothesis is developed and lastly, by taking into consideration the past empirical findings discussed in the literature review in Chapter 2, the study sets out what it expects from the results of the tests.

3.1 Methods of analysis

To investigate various types of relationship, this study focuses on using cross-sectional regressions over the five-year time period, as well as pooled cross-sectional multiple regressions.. Pooled cross-sectional single regression tests will also be done but only for explanatory purposes. Pooled data allows for a larger set of data as it treats each company in each year as an independent variable. The regression analysis proposes to explore the existence and significance of any relationship between a firm's financial leverage and the independent variables. The independent variables are the determinants of capital structure, namely business risk, size, asset composition, profitability, growth opportunities and age. Furthermore, it will be investigated whether there has been any change in these relationships over time.

3.2 Sample and data collection

The sample was chosen from industrial firms listed on the Johannesburg Stock Exchange. In total there are eighty-seven firms in the industrial sector.

Certain companies were excluded on the following grounds:

- Firstly, to avoid misleading results, companies that had a change of financial year end during the time period under study were eliminated.
- Some firms were incorporated or listed only after the beginning of the data period whilst others delisted during the period. Due to the lack of a complete data set

these companies were also excluded for purposes of improved accuracy and consistency.

Outliers for the independent variables were identified using residual scattergraphs. This approach was consistent across all measurement variables except for firm size (natural log of sales). Because of the wide range of firm sizes it was difficult to ascertain which the outlying variables were. Thus a different variable was used on the particular scattergraph, namely sales/fixed assets. As there is a degree of correlation between sales and fixed assets, it was thought to be a better indication of whether the data was in fact realistic.

A two step process called Winsorisation was considered to eliminate outliers, however it was not deemed appropriate as it would potentially remove influential data. As a result, the use of scatter plots was endorsed and only the outlying variables with no reasonable explanation for their data outcomes were excluded.

The selected time period is the five years from 2001 to 2005. This choice of time period is intended to offer a new and revised understanding of the determinants of capital structure in South African industrial firms. After eliminating the outliers and the companies excluded, as described above, the sample included five years of financial data for seventy-one industrial firms. Thus, the pooled sample consists of a potential 355 observations. The names of these firms can been found in Appendix 1.

The main data source was DataStream and Profile's JSE Handbooks. DataStream was used particularly for the income statement and balance sheet items, whereas Profile's JSE Handbooks were used to ascertain when the companies were founded, that is, the ages of the firms.

3.3 Methodology

This study uses an Ordinary least squares regression model to do a cross-sectional and pooled cross-sectional analysis. It proposes to explore the existence and significance of any relationship between a firm's financial leverage and the independent variables. The cross-sectional regression analysis investigates the relationship of the variables in

each particular year, whereas the pooled cross-sectional analysis looks at the average effect over the period.

There are certain advantages in using pooled data in the regression tests. It increases the degrees of freedom, increases the number of observations, reduces collinearity amongst independent variables and consequently leads to more accurate results.

The null hypothesis, H_0, is that no relationship exists between financial leverage and the independent variables (business risk, size, asset composition, profitability, growth opportunities and age.) H_1 is that a relationship does exist at the confidence level chosen. To achieve a certain degree of assurance in the conclusion of this study, a confidence level of 95% was considered appropriate.

Because all the variables are of a quantitative nature, there is no need for the inclusion of dummy variables. Dummy variables are needed when qualitative measures are being considered. A detailed analysis of each of the independent variables and the respective measurement variables was given in chapter 2. Table 3 (b) is a summary of the measurement variables used for each of the determinants.

Measuring leverage

Considering past empirical research and taking all the relevant issues into account, the study uses a selection of different measures of leverage. Each of these ratios has differences which will play an important part in the explanation of the results. The most significant of these differences is the distinction between long and short-term debt. As they are highly substitutable (Schwartz and Aronson 1967), varying relationships with the determinants can be expected. Another noteworthy difference is the use of book versus market value of equity. As is evident from past literature, the interchangeable use of these could lead to varying outcomes. Although market value has been argued to be more accurate, both book and market values warrant discussion. Due to data limitations on DataStream, it was not possible to distinguish between interest bearing and non-interest bearing debt. This has been considered as a limitation in producing completely accurate results. All the ratios included are expected to contribute to the evaluation of relationships between firms' leverage and

the determinants. The ratios used in the study are listed in Table 3a, followed by their respective definitions.

Table 3a: The various leverage ratios that are used in the study

	LEVERAGE RATIOS:
1	**Total debt** **Total Capital employed**
2	**Total debt** **Total Assets**
3	**Total debt** **BVdebt + MV equity**
4	**Total LT Loan Capital** **Total Assets**
5	**Total LT Loan Capital** **BVdebt + MV equity**
6	**Total ST Loan Capital** **Total Assets**
7	**Total ST Loan Capital** **BVdebt + MV equity**
8	**Borrowing ratio**

'Total debt' is the accumulation of all the long and short term borrowings, including any subordinate debt and hybrid finance instruments that are similar to debt.

'Long-term debt' is the total loan capital that is repayable in more than one year. It includes: term loans, long term bank loans, bonds/notes/debentures and obligations under capital leases.

'Short-term borrowings' is the debt that is repayable within the financial year. The value includes the current portion payable of long-term debt and debentures.

With respect to the denominators in the leverage ratios, authors differ in what they use in their empirical research. For purposes of this study, the measures used are Total Capital Employed, Total Assets and (BVdebt + MVequity).

'Total Capital employed' is defined as the total share capital and reserves (including minority interests) plus the sum of the non-current liabilities. Alternatively, it equals total assets less total current liabilities.

'Total assets' is reported on the company's balance sheet. It includes fixed, current and deferred assets. Fixed assets include tangible fixed assets, intangible fixed assets, long term investments and other assets. Current assets are generally operating assets that are used within the financial year.

The third choice of denominator, 'BVdebt + MVequity', is based on the accounting equation (assets = debt + equity), where the market value of equity replaces the book value of equity. As cited in Ghirmatsion (2004), the reason for this is that market values are argued to be a better representation of capital structure. Although the market value of equity is readily available using the number of shares in issue and their respective prices, data limitations and pragmatic issues prevent the allocation of an accurate market value to debt. Although this is sometimes mentioned as producing misleading results, the difference between book and market value of debt can be argued as not being significant. Bowman (1980) found there to be a high correlation between the market and book value of debt, thus the impact of using book value instead is probably fairly small.[14]

The market value of equity can be found by multiplying the year end number of shares in issue by the year end closing share price. Total debt, as discussed above, has been used as the book value of debt and is added to MV equity to represent Total Assets.

'Borrowing ratio' is the final measurement used to represent the firm's leverage. This is measure that is used by DataStream and has been included for further explanatory and comparison purposes. The Borrowing ratio is the calculation of total loans divided by the book value of share capital and reserves.

[14] A survey presented in Stonehill et al (1973) showed evidence of managers in fact thinking in terms of book value instead of market value of debt.

In line with Ghirmatsion (2004), it has been assumed that *preference shares* are irrelevant. Most literature is silent on the treatment of this type of financing. Possible reasons could be for simplicity purposes or its relative insignificance in the capital structure of the firm. Essentially it bears few of the characteristics of either debt or equity. This considered, it has been disregarded for purposes of our analysis.[15]

It was considered whether to separately assess the effect of the determinants on the *debentures* issued; however, this form of financing was not found to be significant in the sample during this period as only nine firms showed debentures on their balance sheets, and each was of an insignificant proportion.

Measuring the determinants

Included in Chapter 2 was a discussion of the appropriate measurement variables to use as a proxy for the specific determinants. Based on past literature and the specific sample selected, the measurement variables were finalised. These are summarised in table 3b followed by a brief definition analysis.

Table 3b: The measurement variables used for the respective determinants

Determinant	***Measurement variable***
Business Risk	**Standard deviation of Sales**
Size of the firm	**Natural log of Sales**
Asset composition	**Fixed Assets/ Total Assets**
Profitability	**EBIT/ Total Assets**
Growth opportunities	**MV equity/ BV equity**
Age of the firm	**Years since foundation**

'Sales' includes the income from goods and services to third parties relating to the industrial activities of the company. Revenues relating to insurance, property, investment and loan financing are not included.

[15] Titman and Wessels (1988) found very similar results when dividing debt by total assets and when dividing debt by market value of equity plus book value of debt and preferred stock.

'Fixed assets' includes all tangible fixed assets, intangible fixed assets, long term investments and other assets.

'EBIT' is the earnings before interest expense and income tax. It is calculated by taking the pre-tax income and adding back the net interest charges (total interest expense on debt, minus interest income).

'MV equity' is the share price at the end of the financial year.

'BV equity' is the total share capital and reserves, excluding preference share capital, divided by the number of shares at year end. It has been adjusted for subsequent rights and scrip issues.

In analysing the findings, the study takes into consideration the specific measurement of the variables used in the regression. This allows for discussion of any potential distortions that may be due to the choice of measurement variable.

Other optional measurement variables

The study explored other measurement variables evaluating whether they would be suitable proxies for the determinants. Firstly, PE ratios were considered as a representative measure for growth opportunities. Various problematic issues were highlighted. The primary issue being that DataStream presented a number of negative PE ratios. This is because a negative PE will result if the company has made a loss in a particular year. Furthermore, the smaller the loss, the higher the negative value will be. This is by no means representative of the company's prospective growth. There also appeared to be a great variability of PE ratios. PE ratios use amounts only valid at a certain point in time, and rarely constant in the long term. These ratios are also historic and are not accurate measures of future growth. For these reasons, this study does not consider PE ratios as a representative of growth.

3.4 Testing the validity of model

Certain aspects of the model need to be investigated to test its validity. To use the regression model in identifying relationships between variables, and the significance thereof, there are three important criteria to be satisfied. In order for regression tests to

be performed, there has to be a normally distributed dataset, and there can be no significant autocorrelation, heteroscedasticity or multicollinearity. Various tests are available on Eviews and Excel to test whether these qualities exist. In the case that they do not exist, it means that either the data is unsuitable and needs to be cleaned, or a further test will have to be run to remove the problem.

Normality

There are various ways to calculate whether normality exists in a dataset. Histogram graphs are commonly used as they graphically show whether a bell-shaped curve results.

Another test for normality, provided by Eviews, is the Jarque-Bera statistic. To indicate that normality exists in the sample data, it should indicate that the Jarque-Bera statistic is not significant. The Jarque-Bera statistic was used in the study and compared to histograms. The findings were that all the data was normally distributed.

Autocorrelation

To run a regression analysis, it needs to be assessed whether there is any relationship between the error variables. The error variables should be independently distributed and not correlated with each other. A violation of this principle is referred to as autocorrelation.

Autocorrelation can be detected by graphing the residuals against the time periods and noting whether a pattern occurs. On inspection of the Durbin Watson statistics produced by Eviews, it appeared that they all equalled approximately 2 which indicate that there is no significant amount of autocorrelation existed.

Heteroscedasticity

One of the assumptions of multiple regression models is that their variance is constant across observations. A violation of this assumption is heteroscedasticity which occurs when there is more variance in one part of the sample than another. This is a problem as the calculated slope coefficient of the regression line will not necessarily be the one with the smallest variance.

Heteroscedasticity can be tested using a scatter plot of the residuals and the regression line or Eviews' Whites test for Heteroscedasticity. Looking at Whites test which does a regression on the squared residuals, we determine whether the null hypothesis that states that no heteroscedasticity exists, is significantly true.

It is worth noting that remedies do exist in the situation that heteroscedasticity is present in the model. In brief, these include Whites-corrected standard errors (calculating robust standard errors) and generalized least squares (altering of the original model).

Looking at the pooled cross-sectional multiple regression, the results from Whites Heteroscedasticity test showed that the assumption of constant variances is generally valid. Slight heteroscedasticity is sometimes apparent when the dependant leverage ratio includes short-term debt as a variable. In addition to Whites test, the residual plots were also inspected. From these graphs, only minor heteroscedasticity could be observed. Although heteroscedasticity appeared only to be a small hindrance to the model, in order to improve its accuracy, the suggested correctional tests were run.

Remedies for any autocorrelation and heteroscedasticity

Due to these two phenomena potentially having an influential effect on the validity of the model, further investigation was made into whether there was any room for improvement. As these issues are fairly common occurrences in regression analysis, there are programmed tests available that account for them. Using Eviews and the pooled cross-sectional multiple regression, the study attempted to detect any potential for data refinement.

To cater for heteroscedasticity, Whites-corrected standard errors test that was previously discussed was run. This is a robust option which corrects the standard errors of the regression.

What was noted when comparing the normal regression to the one adjusting for heteroscedasticity was that there was very little change in the coefficient of determination (R^2). R^2 is representative of the strength of the model. This small

difference suggests that heteroscedasticity is generally not significant and does not notably affect the model.

To add further value to the analysis, another test called the Newey-West HAC Standard Errors & Covariance, was run. Where Whites test assumes the residuals are uncorrelated, Newey and West (1987) use a more general covariance estimator that is consistent in the presence of both heteroscedasticity and autocorrelation. Results for this test can be seen in tables 2.1 to 2.8 of the Appendix.

Similar outcomes were found when comparing this revised regression to the normal regression used initially. There appeared only to be a marginal improvement in the R^2 and Adjusted R^2, again suggesting that autocorrelation and heteroscedasticity is inconsequential.

It is worth noting that there is almost no difference between the results when comparing the regression using Whites-corrected standard errors test and the regression using Newey-West HAC Standard Errors & Covariance test. There does, however, often appear to be a minor increase in the t-statistics when using Whites test.

Due to the findings that only slight improvement is provided by these tests, the study will continue to base its conclusions on the normal multiple regression. It will, however, make mention where any noteworthy differences exist.

Multicollinearity

To test the robustness of the data results, the correlation between variables is examined. This can be done using the correlation matrix presented in the table 3 of the Appendix. Multicollinearity exists when independent variables are correlated with each other which could result in large sampling errors in the regression analysis. A further problem arising from multicollinearity is that the regression output will show no significant relationship where one does in fact exists.

In examining the correlation matrix, no major correlation exists that would render the model useless. Due to the nature and inter-relationship between some of the variables (size and business risk), a degree of correlation is to be expected. Positive correlation

exists between the following independent variables; standard deviation of sales (business risk) and natural log of sales (size of firm), MV of equity: BV of equity (growth) and EBIT/Total Assets (profitability), MV of equity: BV of equity and natural log of sales, and year founded (age of firm) and natural log of sales. There are reasonable explanations for most of these results however. The measurement variables used for business risk and size (which together have the highest correlation result of 0.6439) both consider the company's annual sales. It can thus be expected that they will be correlated to some extent. The correlation between MV of equity: BV of equity and EBIT/Total Assets (0.4379) is also understandable as usually the company's earnings have a large effect on the value of shares traded in the market. As can be expected, high correlation exists between some of the leverage ratios. Overall, the correlation between the variables is not high and does not compromise the validity of the model.

Other relationships that exist, but to a smaller degree than those mentioned above are; business risk being positively related to growth and age of the firm, firm size to growth and age of the firm (positive correlation), asset composition to total and long-term debt ratios (positive correlation) and lastly, growth is positively correlated to the age of the firm.

3.5 Different regression analysis methods

The various regression techniques performed are multiple and single pooled cross-sectional regression analysis as well as cross-sectional multiple regression for each individual year. The reason for using these different techniques is to address different issues. Firstly, the cross-sectional multiple regression analysis evaluates how each determinant plays a part in the financing decision. The tests performed by Eviews use stepwise regression. This means that all independent variables that do not contribute to the strength of the model are automatically eliminated. Stepwise regression is the recommended approach as the study measures the reliability of the model using the coefficient of determination (R^2). R^2 however increases as variables are added to the multiple regression models, even if the variables are not statistically significant. As mentioned, stepwise regression does not include the variables that do not to some extent improve the model, thus allowing a better interpretation of R^2.

A cross-sectional multiple regression evaluates the relationship on a yearly basis. By doing yearly comparisons, the study can to some extent investigate whether the significance and strengths of the relationships vary over time.

The pooled cross-sectional multiple regression similarly aims to decipher whether any relationships exist, but it uses a larger sample and does not differentiate between the years. On average, it will produce a more accurate result as it is based on a larger sample of data. The main discussions surrounding the reasons for the relationships between variables will be addressed under this section.

3.6 Assumptions and limitations of the study

3.6.1 Assumptions

Because of data limitations and the complexity of the required calculations, debt has been consistently assumed to be valued at the book value found on the balance sheet.

Other, more unique sources of finance, such as debentures, preference shares etc. have not been accounted for.

It has been assumed that negative growth is not possible. This is due to the nature of the measurement variables used for growth (MV equity/ BV equity). A negative will arise if the book value of equity is negative. This is not enough to suggest the company's decline into the future, so these values are excluded from the sample. Six such amounts were found in the sample and excluded from the analysis.

A brief discussion on the adequacy of the PE ratio as a proxy of growth was addressed earlier in the paper. It has been assumed that negative growth suggested by a negative PE ratio is not possible. Especially if the loss is an occurrence unique to that particularly year, the PE ratio should by no means suggest that growth will be negative into the future. Thus PE ratios have not been considered in the study.

3.6.2 Limitations

This study focuses only on the firms in the industrial sector of the JSE. It offers little insight into the financing decisions of firms in other sectors.

The exclusion of firms that listed, delisted or changed their year ends during 2001-2005 may result in sampling bias.

There can be a large degree of estimation in using the measurement variables chosen as proxies for the determinants.

The material on DataStream was limited with regard to the line items that were most appropriate for the test. Two important examples are that short-term debt included the current portion of long-term debt, and that long-term debt included non-interest bearing debt. Pragmatic considerations made it difficult to adjust for these amounts that could be potentially misleading. However, on inspection, these amounts appeared insignificant and it was viewed as having little effect on the findings.

3.7 Hypotheses development

Using the empirical research and theories of capital structure, this study attempts to predict the effect of the determinants on the financial leverage decisions of the firm. Particularly in relation to past studies done in other countries, it is useful to first address issues that are unique to South Africa which may have an impact on the results. This is important for a better understanding of the findings of the test.

3.7.1 Factors unique to South Africa and its industrial sector

Stage of economic development:

The past empirical research differs between developed and developing countries. A study done by Demirguc-Kunt and Maksimovic (1996) argued that due to its stock market's liquidity and size, South Africa can be classified as a developed country. South Africa, although classified as a developed country, meets some of the criteria describing developing countries. An illustration of this is the country's relatively volatile market returns and currency value. This could potentially have an effect in the weightings of debt and equity in the firm. The country's unique stage of development may lead to results that do not exactly match up to those in past literature.

Corporate tax rates:

Because the interest tax shield is one of the primary benefits of debt financing, a country's corporate tax rate is largely influential of its firms' optimal capital

structures. Before and during the period, 2001 to 2005, the corporate tax rate in South Africa differed to other countries. The corporate tax rate changed from 48% in 1993, to 35% in 1997, and then decreased to 30% in 2000. These tax rate variations may impact the benefits of debt to the company.

STC on dividends:

Impacting on the attractiveness of equity is Secondary Tax on Companies which was introduced at 15% in 1993. STC increased to 25% in 1994 and then dropped to 12,5% in 1996. In essence, this is the tax levied on companies when they declare dividends or in some cases when they buy back their own shares. STC is uncommon internationally and its tax implications in South Africa certainly play a part in the country's general financing decisions.

Exchange rate volatility:

Because of the country's relatively unstable economy, South Africa's currency experiences higher volatility when compared to other developed countries where similar research has been done (e.g. USA and UK). This currency volatility is factored into financing costs, especially that of foreign debt.

Efficiency of South Africa's capital market:

Only recently has South Africa's stock exchange been described as efficient. Although fairly liquid and efficient, it does not match up with the capital markets in USA or UK, where shares are much more thinly traded.

Size of firms:

Due the fact that generally larger companies list on the JSE, there may be fewer firms in the lower data range of the size determinant variable. Having a limited data range to compute regressions may result in a slightly lower degree of accuracy.

Cultural influences:

Research done by Sekely and Collins (1988) found there to be significant differences in international capital structure spurred predominantly by the cultural influences of the country. The culture adopted in South Africa may well have an impact on the business environment and the capital structure chosen.

3.7.2 Predictions

The following relationship predictions are based on capital structure theories and past empirical research. Consideration is taken of the aspects unique to South Africa.

Business Risk

From a South African perspective, a major consideration is whether the volatility in the economy or companies profits will potentially result in bankruptcy. An increase in business risk (represented by the volatility in sales) will increase the probability of financial distress. Because dividend payouts are more flexible than the interest commitments of debt, companies prefer equity financing to debt financing.

In support of the trade-off theory, we expect a negative relationship to occur between the determinant and both long-term debt and short term debt. However, the extent of the negative relationship with short term debt can be expected to be less extreme as companies may rely of short term debt for immediate financing requirements. Short term debt is usually in smaller amounts but has a marginally higher cost than debt repayable after a year or more.

Size of the firm

Large firms are generally associated with diversification and more consistent sales trends. Both these attributes represent a decreased risk of financial distress, which according to the trade-off theory, suggests a positive relationship with debt. Thus, debt is issued cheaply because the risk of default is lower.

All taken into account, a positive relationship with long term debt can be expected. The relationship with short term debt and firm size may be similar, but may not be as significant.

Asset composition

The overriding result found in past studies has been that firms with more assets to use as collateral have a higher degree of leverage. Because intangible assets are difficult to value, tangible assets give a better idea of whether there is sufficient security for the debt or not. This will have an effect on the cost of the debt. On the other hand, fixed assets increase operating leverage so that a higher proportion of tangible assets

increase business risk. The latter issue has not been as significant in empirical literature so the study predicts that leverage, particularly long-term, will be positively related to the tangibility in the firm. As short-term debt is rarely securitized with assets, no significant relationship is expected.

Profitability

This determinant is addressed in most capital structure theories. Modigliani and Miller (1963) predict that firms with higher profitability will employ more debt as to benefit from the interest tax shields. On the contrary, the pecking order predicts a negative relationship as firms with high profits and retained income will first use that as a source of financing prior to taking on more debt. Weighing up the benefits and costs of debt, the trade-off theory predicts a positive relationship. This is because the probability of financial distress is lower in profitable firms, and in accordance with Modigliani and Miller's theory, the tax shield becomes more desirable.

Taking into account the two opposing theories and past studies done on industrial firms, the study expects the pecking order theory to have an overriding influence. Thus it can be expected that a negative correlation may result. At the outset, there are no expectations of any clear distinction between long and short-term debt.

Growth opportunities

There have been various findings with regard to this variable. This may be partly due to the wide array of measurement variables used to approximate growth. A conclusion that appears to have considerable merit in this study is that firms with high growth opportunities quickly exhaust their internal means of finance and so need to incur debt (Toy et al. 1974). They incur debt instead of issuing equity as debt is generally cheaper. Suggesting a negative relationship, however, is the agency problem described in the pecking order theory. Because debt holders bear the burden of the failure costs, managers tend to invest more than they can afford to. This risk is priced into the debt, leading to debt being less optimal. It has been found that the agency problem is diminished somewhat when long term debt is replaced with short term debt (Myers 1977, Barclay and Smith 1996 & 1999, Michaelas et al. 1999).

Taking the above into account, the study expects a slightly positive relationship with both long and short-term debt as firms borrow more to finance growth opportunities.

Age of the firm

The principles of the pecking order theory suggest a negative relationship. This is because older surviving firms tend to have higher retained earnings. Following the hierarchical ladder of preference, the firms will first use retained income before incurring debt. However, on the other hand, these firms have built established relationships with lenders and so can get their debt at cheaper rates.

Because younger companies are riskier and new to the market, they are expected to rely more on short term debt. Although short-term debt is relatively more expensive, the new companies generally try to avoid any long term commitments. Thus, a negative relationship can be anticipated between age and short-term debt, and according to the pecking order theory, a similar relationship with age and long-term debt.

3.8 Summary

Considering the alternatives, it was decided to use regression tests to find any existing relationships between leverage and the determinants. The various tests that were run included cross sectional multiple regressions (2001-2005) and pooled cross sectional multiple regressions. The regressions done for each individual year aimed to establish whether there was any change over time and the pooled regression allowed for a bigger sample to determine more accurately if any relationships existed. The sample used included JSE listed industrial companies and covered the 5-year period from 2001 to 2005. Attention was given to eliminating outliers and inappropriate companies, leaving a sample size of seventy-one firms. The variables for leverage and the determinants that were used in the regressions were carefully chosen and explained. To assess its validity, the model was tested for autocorrelation, heteroscedasticity and multicollinearity. Although none of these relationships appeared to be problematic, remedial action (for autocorrelation and heteroscedasticity) was taken to improve the models accuracy. Important assumptions and limitations of the study were presented and their likely effects on the model were mentioned. For consideration in the predictions and data analysis to follow, factors

unique to South Africa were addressed. The chapter concluded with a discussion on the expected relationships between the determinants and leverage. The foundation for these predictions was based on past empirical research and factors characterising the sample selected.

Chapter 4: Data presentation and analysis

4. Introduction

This chapter addresses the analysis of the tests performed. The analysis takes into account the literature review of chapter 2 and the research methodology and hypothesis development of chapter 3. The data used and the methodologies followed are explained in this chapter. This aims to provide a better overview and understanding of the models tested. The study then presents the empirical results of an evaluation which tests the strength of the models. This is followed by the results of the cross-sectional regressions. The analysis of the findings is intended to offer a better insight into the relationships between the determinants and leverage.

4.1 Data used

The first step in testing was to arrange a valid data set using DataStream output. Companies that did not meet the appropriate criteria as discussed in chapter 3.2, were excluded from the sample. By excluding these figures, a more reliable and cleaner set of raw data was available for the regression tests.

In testing, there appeared to be no flaw with the assumptions of normality, heteroscedasticity and multicollinearity, and only marginal violation in the assumption of autocorrelation in some of the sample years. To account for this and any heteroscedasticity, the Whites-corrected standard errors test and Newey-West HAC Standard Errors & Covariance test were run on the data. Due to autocorrelation being only a minor problem and there being only limited improvement after doing the above mentioned tests, the normal stepwise regression was used for the analysis.

In total, the data included eight dependent leverage variables and six independent determinant variables. Thus eight different regressions were done and analysed. The most significant factors differing between the leverage ratios were; long-versus short-term debt and book versus market value of equity.

For purposes of the cross-sectional pooled multiple regression, data was arranged to allow for pooling. Eviews then used the pooled data sample to compute 8 different stepwise regressions. Multiple stepwise regressions were also done for each

individual year so as to ascertain whether the strength of the model has changed over time. Because this regression provides forty different equations, only the significant changes that warrant a mention will be addressed. Finally, bivariate regressions were done for each determinant. The purpose of these regressions was to provide further substantiating evidence for the tests where necessary.

4.2 Empirical Results

4.2.1 Determining the strength of the model

In producing the regression models, it is useful to determine the relative strengths of the models, noting whether there are any changes over the period. Taking into account the strength of the model, this offers insight into the extent of reliance that can be placed on the model. The measurement variable, the coefficient of determination (R^2), is defined as the percentage of the total variation in the dependent variable (financial leverage) that is explained by the independent variables (the determinants). The adjusted R^2 (Adj R^2) takes into account the sample size and the number of independent variables.

These two variables, R^2 and Adj R^2 are presented in table 4b. They show the explanatory power of the determinants in determining the adopted capital structure. It can be expected that the degree of strength of the model is fairly low due to the practical limitations of only being able to include a few independent variables. There will undoubtedly be other variables that play a part in determining the capital structure. It may also be the case that in some particular years, an external factor had a significant impact on firms' optimal capital structure, again decreasing the strength of the model.

From the results, it was shown that the financial leverage models in which the determinants had the highest explanatory power, were the Borrowing and LT loan capital/Total assets ratios. As noted from table 4b, the respective average R^2 over the period of these two ratios are 38.91% and 32.32%.

The first measure of financial leverage, Total debt/ Total Capital employed, shows no particular pattern. Although there is an impressive 63.52% in 2001, this drastically drops to 9.07% in 2002.

The second measure, Total debt/ Total assets, shows an improvement on average over time. Although there is a drop from 2001 (17.85%) to 2002 (13.05%), the model shows strong explanatory power in 2003 to 2005. The result in 2005 shows that almost 29% of the variation in financial leverage (Total debt/ Total assets), is explained by the determinants included in the model. The third measure of financial leverage, Total debt/ (BVdebt+ MVequity), shows similar movements although in 2005 only 20.55% of the variation is explained by the model.

The fourth and fifth measures of financial leverage deal with long-term loan capital, and as mentioned, are amongst the regression models with the strongest explanatory power. With respect to LT loan capital/ Total Assets, 2001 shows the lowest R^2 of 18.91%. The other years in the period, however, show strong results, ranging between 33.63% in 2002 to 39.25% in 2003. When using LT loan capital/ (BVdebt+ MVequity), R^2 shows similar strong outcomes, ranging from 23.38% in 2001 to 36.95% in 2003.

The six and seventh measures consider ST debt as a source of financing the total assets. From the results of R^2, it is noted that these measures include some of the weakest explanatory models. The respective results for 2002 show small R^2s of 6.93% and 4% when BV of equity and MV of equity is used. The R^2 in 2005 for ST loan capital/ Total Assets also showed a low 2.10%, which is in fact the weakest result in the table.

The eighth financial leverage measure, the Borrowing ratio, shows consistent moderate to high R^2s. The highest R^2 of 59.65% and 60.67% appeared in 2002 and 2004 respectively. These percentages were, however, not sustained and both deteriorated drastically in the following years.

These results are useful in deciphering the strength, and the appropriateness of the determinants, in the regression models devised. The various coefficients of determination are shown in Graph 4c where the different trends can be noted. It is surprising to note a common drop in R^2 from 2001 to 2002 in most forms of leverage measures. This is followed by a predominant increase to 2003. The level of strength in most of the models peaks in either 2003 or 2005. This suggests that external factors

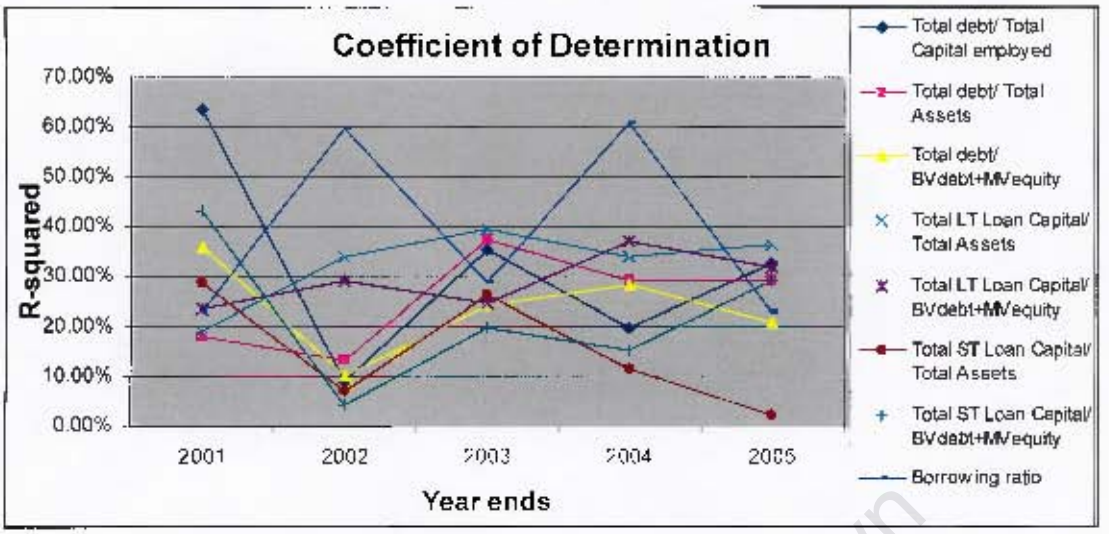
may have had varying effects on the firms' capital structures over these years. Suggestions for what these external factors could have been are the global stock market downturn and devaluation of the Rand during 2002 (refer to point 1.1 in chapter 1). It is likely that market sentiment and credit facilities would have been affected by these occurrences. From the results, it is further evident that the independent variables have a more significant impact on long term-, as opposed to short term debt.

Table 4b: Coefficients of Determination (*and Adjusted R^2*) showing the explanatory power of the determinants to the different measures of financial leverage.

		2001	2002	2003	2004	2005	AVE
Total debt/ Total Capital employed	R^2	**63.52%**	**9.07%**	**35.18%**	**19.55%**	**32.29%**	**31.92%**
	Adj R^2	*60.71%*	*6.40%*	*32.28%*	*17.18%*	*29.11%*	*29.14%*
Total debt/ Total Assets	R^2	**17.85%**	**13.05%**	**37.07%**	**28.89%**	**28.97%**	**25.17%**
	Adj R^2	*16.66%*	*10.49%*	*35.22%*	*26.80%*	*24.66%*	*22.77%*
Total debt/ BVdebt+ MVequity	R^2	**35.99%**	**9.90%**	**24.13%**	**28.39%**	**20.55%**	**23.79%**
	Adj R^2	*33.13%*	*7.24%*	*21.90%*	*25.19%*	*18.21%*	*21.13%*
Total LT Debt/ Total Assets	R^2	**18.91%**	**33.63%**	**39.25%**	**33.73%**	**36.08%**	**32.32%**
	Adj R^2	*16.53%*	*29.61%*	*34.58%*	*29.71%*	*33.22%*	*28.73%*
Total LT Debt/ BVdebt+MVequity	R^2	**23.38%**	**29.03%**	**24.58%**	**36.95%**	**31.66%**	**29.12%**
	Adj R^2	*21.12%*	*24.73%*	*20.01%*	*33.13%*	*26.40%*	*25.08%*
Total ST Debt/ Total Assets	R^2	**28.66%**	**6.93%**	**26.17%**	**11.50%**	**2.10%**	**15.07%**
	Adj R^2	*25.41%*	*4.20%*	*22.86%*	*7.54%*	*0.66%*	*12.13%*
Total ST Debt/ BVdebt+MVequity	R^2	**42.96%**	**4.00%**	**19.72%**	**15.22%**	**28.84%**	**22.15%**
	Adj R^2	*40.37%*	*1.18%*	*17.36%*	*10.00%*	*24.25%*	*18.63%*
Borrowing ratio	R^2	**22.79%**	**59.65%**	**28.69%**	**60.67%**	**22.73%**	**38.91%**
	Adj R^2	*19.33%*	*57.84%*	*25.40%*	*58.88%*	*19.10%*	*36.11%*

Note: Values in italics are Adjusted R^2

Graph 4c: Showing the relative movements in R^2 from 2001 and 2005.



4.2.2 Cross-sectional evidence on the Determinants of Capital Structure

By doing multiple regression tests for each individual year, the study intends to identify any changes over time in the relationships between leverage and the determinants. These regression tests were done at a significance level of 5%. Specific mention will be made if relationships exist at the 10% significance level. The t-stats of the cross-sectional results can be viewed in table 4d below. Each of these results will be discussed, with respect to each related determinant. A brief explanation of the relationships will be given; however, a more thorough discussion will follow in the section investigating the pooled multiple regression results (section 4.3.3) as these reasons are based on the same principles.

Table 4d: T-statistics for the cross-sectional regressions for each year

		2001	2002	2003	2004	2005
TD/TCE	**T stat: EBIT/TA**	**-10.3463**	-1.0963	**6.0182**	**-2.4230**	**-4.4683**
	T stat: Fixed assets/Total Assets	-1.0658		1.1453	**2.9360**	1.9340
	T stat: MV equity/ BV equity	**2.2723**	**2.3743**			**4.8760**
	T stat: Year founded	-1.6743				
	T stat: Natural log of Sales			**-2.1074**		
TD/TA	**T stat: EBIT/TA**	**-3.8723**	**-1.8727**	**-5.5309**	**-3.3183**	0.4772
	T stat: MV equity/ BV equity		**2.6081**			
	T stat: Fixed assets/Total Assets			1.6159	**3.6316**	**3.6551**
	T stat: Natural log of Sales					**-2.9482**
	T stat: Standard deviation of Sales					1.7515

		2001	2002	2003	2004	2005
[illegible]	T stat: EBIT/TA	-5.2233	-1.7215	-3.7777	-3.6166	-2.0391
	T stat: Fixed assets/Total Assets	1.5192	1.9157	1.6947	3.2996	3.0456
	T stat: MV equity/ BV equity	-1.5988				
	T stat: Natural log of Sales				1.3084	
LT/TA	T stat: Fixed assets/Total Assets	3.6617	3.2972	2.5181	3.9598	4.3071
	T stat: MV equity/ BV equity	1.9275	3.8484			
	T stat: EBIT/TA		-1.4143	-3.0864	-1.8776	
	T stat: Natural log of Sales		-1.9149	-2.9958	-1.5482	-3.5184
	T stat: Year founded			1.0501		
	T stat: Standard deviation of Sales			1.5713	1.1598	1.8913
LT/MV	T stat: Fixed assets/Total Assets	4.2590	4.2955	2.8534	4.4940	4.1146
	T stat: EBIT/TA	-1.6020	-1.2177	-1.8308	-2.9389	-0.5384
	T stat: Natural log of Sales		-1.6022	-1.4510		-1.8111
	T stat: MV equity/ BV equity		1.5328			
	T stat: Standard deviation of Sales			1.0084	1.2111	1.6025
	T stat: Year founded				-1.7112	-0.8254
ST/TA	T stat: EBIT/TA	-4.2635		-4.4373	-2.3134	
	T stat: Fixed assets/Total Assets	-2.3073	-1.8573			
	T stat: MV equity/ BV equity	-1.0320				
	T stat: Natural log of Sales		1.3377	3.4792	2.0116	
	T stat: Standard deviation of Sales			-1.7214		
	T stat: Year founded				1.0887	1.2067
ST/MV	T stat: EBIT/TA	-5.4293		-3.7407	-2.6183	-3.9511
	T stat: MV equity/ BV equity	-3.0138	-1.4075		-1.4884	0.5832
	T stat: Fixed assets/Total Assets	-2.0009	-1.0001			
	T stat: Natural log of Sales		2.7483		1.6144	1.4850
	T stat: Standard deviation of Sales				0.0762	
	T stat: Year founded					0.7118
BR	T stat: MV equity/ BV equity	2.7719	9.1013	4.5450	7.9566	3.1945
	T stat: EBIT/TA	-3.5947	-2.5139	-1.8605	-6.9510	-3.1968
	T stat: Year founded	1.1095				
	T stat: Natural log of Sales		-2.1820	-2.7893		
	T stat: Fixed assets/Total Assets				2.6390	2.4977

A significance level of 5% was used and these significant t-stats are in bold print.
TD/TCE is the ratio total debt divided by total capital employed, TD/TA is total debt divided by total assets, TD/MV is total debt divided by the sum of the book value of debt and the market value of equity, LT/TA is total long-term debt divided by total assets, LT/MV is total long-term debt divided by the sum of the book value of debt and the market value of equity, ST/TA is total short-term debt divided by total assets, ST/MV is total short-term debt divided by the sum of the book value of debt and the market value of equity and BR is the Borrowing ratio.

Business risk

When addressing the relationships separately for each individual year, there were found to be no significant relationships between leverage and business risk. Between 2003 and 2005, a few insignificant relationships became apparent.

Using LT debt/Total Assets, the results portrayed a slight positive relationship for the period between 2003 and 2005. During these three years, none were considered to be materially significant at the 5% significance level. In 2003 and 2005, it considered to be significant at the 10% significance level. The positive relationship is 2005 is in accordance with the findings of Total debt/Total assets which also showed a positive relationship at the 90% confidence level. The 2003 results for LT debt/ (BVdebt+ MVequity) showed a positive (insignificant) relationship. This positive association remained constant in 2004 and 2005.

A negative relationship, significant only at the 90% confidence level, was shown in 2003 for the ST debt/ Total assets leverage ratio. When using ST debt/ (BVdebt+ MVequity), an insignificant relationship occurred in 2004, but in contrast to ST debt/ Total assets, showed a positive association.

From the cross-sectional results, it appears that the relationship between leverage and business risk is low, but strengthening marginally over the period. The relationship between risk and long term leverage is generally positive but is rarely significant, even at the 10% significance level. The fact that the relationships slightly strengthened after 2002 could potentially be related to the global stock market downturn in 2002, when equity markets became more volatile (refer to point 1.1 in chapter 1). Due to the volatility in the equity markets, managers of risky firms may have preferred debt financing.

In contrast, a negative relationship (at 90% confidence level) was noted with short term debt when the book value of equity was considered.

Size of the firm

The study found there to be many varied relationships between the leverage ratios and the determinants. Many of these relationships are significant at the 5% and 10% level of significance.

There are no significant relationships in 2001. In 2002, it is only the Borrowing ratio that is negatively related at the 95% confidence level. This ratio remains significantly negatively related in 2003, but no evidence of any relationship is shown in later years.

LT debt/ Total assets also shows a negative relationship in 2002, but only at a confidence level of 90% confidence. The relationship remains negative from 2003 till 2005. This relationship is shown to be significant at the 95% confidence level in each of these years except 2004.

When replacing the denominator of Total assets with (BVdebt + MVequity), a negative relationship is again revealed. This relationship is insignificant in years 2002 and 2003, and becomes significant at the 10% significance level in 2005.

With respect to Short-term debt, there appears to be a distinct change to positive relationships with firm size. The ratio ST debt/Total assets shows an insignificant positive relationship in 2002 and significant positive relationships in both 2003 and 2004. When using ST debt/ (BVdebt+ MVequity), a significant positive relationship existed in 2003, and insignificant relationships in years 2004 and 2005.

In summary, the study reveals a negative association with both total and long-term debt and the size of the firm. These findings are similar to those found in other South African studies done by Jordaan (1993) and Dukhi (2000). The degree of significance differs between each individual leverage ratio and within the different years. It is in 2003 and 2005 that these negative relationships are shown to be the strongest.

Short-term debt ratios show a consistent positive relationship with firm size suggesting that the larger the firm, the more short term debt the firms opts for. This could be because larger firms are better able to afford the interest rates charged on short term debt. These relationships appear to be the most significant in 2002 to 2004.

Asset composition

With regard to long-term debt, there exists a positive association in most of the years across the leverage ratios. In contrast, the short term debt ratios show negative relationships in the earlier years.

Particularly worth noting is the constant relationship between LT debt/Total Assets and the firm's asset composition. The results show a significant positive relationship for all of the 5 years in the period.

This relationship is similar when the LT debt/ (BVdebt+ MVequity) ratio is used. This association is also significant for the duration of the period.

The ratios Total debt/ Total assets and Total debt/ (BVdebt+ MVequity) also showed positive slopes, which were significant only in 2004 and 2005. The latter ratio was also significant, but at the 10% significance level, in 2002 and 2003. The Borrowing ratio showed a significant positive relationship but again, only in the later years, 2004 and 2005.

As expected, short-term debt showed negative associations with tangibility. The ST debt/Total assets relationship was significant in 2001 and significant at the 10% level in 2002. When using the ST debt/ (BVdebt+ MVequity), a significant negative relationship exists in 2001 and an insignificant one in 2002.

From the results, there is convincing evidence that a positive relationship existed between tangibility and long-term leverage in all the years from 2001 and 2005. A negative relationship between short-term leverage and tangibility is apparent in the earlier years of the period under study. These results are consistent with numerous other studies (Friend and Lang 1978 and Wedig et al. 1988) which argue that because fixed assets are used as collateral for issuing debt, more debt will be taken on.

Profitability

Viewing the results of the sample of JSE listed industrial firms, there appears to exist a negative relationship between leverage and profitability. This applies to both long-term and short-term debt.

The only leverage ratio that produces mixed results is Total Debt/ Total capital employed. Significant negative relationships exist in 2001, 2004 and 2005. Interestingly a significant positive relationship is found in 2003. A possible reason for this could be related to the global stock market downturn and the devaluation of the Rand in 2002. Due to the increased cost of imports, firms may have had to rely more on debt to finance their purchases and operations, in order to make their profits.

With respect to the Total debt/ Total Assets and Total debt/ (BVdebt+ MVequity) ratios, there exist significant negative relationships in 2001, 2003 and 2004. Relationships that are only significant at the 90% confidence level exist in 2002. The latter ratio differs in that it shows a significant relationship in 2005 as well.

For LT debt/Total assets there is a significant negative association in 2003, and one that is significant at the 90% confidence level in 2004. When the market value of equity is used in the denominator instead of book value, a significant negative relationship exists in 2004, with a negative relationship at the 90% confidence level in 2003.

Both short-term debt ratios show negative associations in 2001, 2003 and 2004. When the market value of equity is used, a significant negative relationship also appears in 2005.

The Borrowing ratio shows significant negative relationships in all the years except 2003 where it is only significant at the 10% significance level.

From the analysis, there is overwhelming evidence that negative relationships existed between both long-term and short-term debt and the profitability of the industrial firms. This is in support of the pecking order theory that suggests that firms will first use their retained earnings to fund projects, before issuing more debt. This will be discussed in detail with the pooled results.

Growth opportunities

Mixed results were shown in the assessment of the relationship between growth opportunities and leverage over the five-year period.

The ratio that shows the most consistent results is that of the Borrowing ratio that has a significant positive relationship with growth opportunities for all the years from 2001 to 2005. Total debt/ Capital employed is significantly positively related in 2001,2002 and 2005, and Total debt/ Total assets in 2002.

Looking at the long-term and short-term debt ratios, LT debt/ Total assets shows a positive relationship in 2002 and a positive relationship at the 10% significance level in 2001. ST debt / (BVdebt+ MVequity) is negatively related to growth opportunities in 2001. Insignificant relationships for this leverage ratio exist in 2002, 2004 and 2005.

These results are mixed and somewhat inconclusive. Reasons for the varying results could be owing to the measurement variable used as a proxy for growth (MVequity/ BVequity). A rough analysis suggests a positive association between growth opportunities and long-term debt, and a negative association with short-term debt in the earlier years. This suggests that firms fund expansion with long term debt.

Age of the firm

Of the determinants included in the study, there appears to be the least association between leverage and the age of the firm. This is possibly why so little empirical research on this issue is available.

The two significant relationships that were established was the negative one with LT debt/ (BVdebt+ MVequity) in 2004 and the negative relationship one with Total debt/ Total Capital employed, in 2001. Both were however only significant at the 90% confidence level. Other relationships exist, however they are insignificant for purposes of this study.

It is difficult to draw a conclusion from the limited results but a slight negative relationship is suggested. This is in accordance with the pecking order theory that

argues that a hierarchical preference order of financing exists. Generally older surviving firms have accumulated more profits over the years thus are able to use this instead of debt for asset financing.

4.2.3 Pooled cross-sectional multiple regression

To allow for a larger sample, data was pooled for the purpose of this analysis. Unlike the previous analysis, no distinction is made between the different years. The benefit of pooling data is to allow for a larger number of observations, thus more accurate data. After pooling the data, the study has approximately 355 observations to use for each regression between the particular leverage ratio and a determinant. The regressions are done using the step-wise approach which only includes independent variables (the determinants) which contribute to the strength of the model. It should be taken into consideration that the inability to include all influential variables in the model will have the effect of reducing the model's strength.

As mentioned earlier in the previous chapter, slight heteroscedasticity was apparent in some of the regressions. To compensate for this, two correctional tests were run, namely Whites-corrected standard errors test and Newey-West HAC Standard Errors & Covariance test (which in addition also removes some autocorrelation). On investigation of the regression results, there was found to be little difference, bar a marginal improvement in the correlation of determination (R^2). To get the most reliable results and for improved accuracy in analysis, the focus will be on the regressions after applying the tests. Although the two are almost identical, the Newey-West regression has been chosen as the primary regression due to it also dealing with autocorrelation. The detailed results can be seen in Tables 2.1 to 2.8 of the Appendix. Mention will be made of any noteworthy differences between the models.

Below is table 4e which is a summarized table of the findings for each leverage ratio, as derived from table 2.1-2.8. Each determinant will be individually addressed, along with a discussion of the potential reasons for the relationship.

Table 4e: Summarised details of the regression tests.

A significance level of 5% was used and the t-stats of these significant determinants are highlighted.
Note: The Newey-West HAC Standard Errors & Covariance test was used to perform this regression.

Total debt/ Total Capital employed	
Alpha	0.133601
Beta: EBIT/TA	-1.657747
Beta: Fixed assets/Total Assets	0.225071
Beta: MV equity/ BV equity	0.049432
Beta: Year founded	-0.000684
Beta: Standard deviation of sales	-6.21E-09
T stat: EBIT/TA	-4.152671
T stat: Fixed assets/Total Assets	1.436546
T stat: MV equity/ BV equity	3.772902
T stat: Year founded	-1.182855
T stat: Standard deviation of sales	-0.77445
T stat: Natural log of Sales	1.524283
R square	0.180972
Adj R square	0.166603

Total debt/ Total Assets	
Alpha	0.472899
Beta: EBIT/TA	-0.446994
Beta: Fixed assets/Total Assets	0.332575
Beta: Natural log of Sales	-2.27E-02
Beta: Year founded	-9.41E-05
Beta: Standard deviation of sales	1.45E-08
T stat: EBIT/TA	-3.176199
T stat: Fixed assets/Total Assets	3.75295
T stat: Natural log of Sales	-2.090755
T stat: Year founded	-0.267494
T stat: Standard deviation of sales	-2.324747
R square	0.20036
Adj R square	0.188904

Total debt/ BVdebt+MVequity	
Alpha	0.232106
Beta: EBIT/TA	-0.774668
Beta: Fixed assets/Total Assets	0.300462
Beta: Year founded	-7.40E-04
Beta: Natural log of Sales	0.006402
Beta: Standard deviation of sales	-3.13E-10
T stat: EBIT/TA	-7.064328
T stat: Fixed assets/Total Assets	4.583597
T stat: Year founded	-1.847111
T stat: Natural log of Sales	0.630873
T stat: Standard deviation of sales	-0.051581
R square	0.221231
Adj R square	0.210074

Total LT Loan Capital/ Total Assets	
Alpha	0.493723
Beta: Fixed assets/Total Assets	4.11E-01
Beta: EBIT/TA	-1.79E-01
Beta: Natural log of Sales	-0.03504
Beta: Year founded	-5.37E-05
Beta: Standard deviation of sales	1.83E-08
T stat: Fixed assets/Total Assets	4.915561
T stat: EBIT/TA	-1.310707
T stat: Natural log of Sales	-3.618059
T stat: Year founded	-0.186546
T stat: Standard deviation of sales	3.188302
R square	0.258804
Adj R square	0.248185

Total LT Loan Capital/ BVdebt+MVequity	
Alpha	0.258012
Beta: Fixed assets/Total Assets	4.13E-01
Beta: EBIT/TA	-0.249491
Beta: Year founded	-0.000359
Beta: Natural log of Sales	-0.013989
Beta: Standard deviation of sales	9.35E-09
T stat: Fixed assets/Total Assets	[illegible]
T stat: EBIT/TA	[illegible]
T stat: Year founded	-1.287899
T stat: Natural log of Sales	-1.851253
T stat: Standard deviation of sales	1.93953
R square	0.266751
Adj R square	0.256246

Total ST Loan Capital/ Total Assets	
Alpha	-2.00E-02
Beta: EBIT/TA	-0.267067
Beta: Fixed assets/Total Assets	-0.078702
Beta: Natural log of Sales	0.012293
Beta: Standard deviation of sales	-3.91E-09
Beta: Year founded	-2.13E-05
T stat: EBIT/TA	[illegible]
T stat: Fixed assets/Total Assets	[illegible]
T stat: Natural log of Sales	[illegible]
T stat: Standard deviation of sales	-1.890991
T stat: Year founded	-0.145564
R square	0.124671
Adj R square	0.112058

Total ST Loan Capital/ BVdebt+MVequity	
Alpha	
Beta: EBIT/TA	5.79E-02
Beta: MV equity/ BV equity	-0.523747
Beta: Year founded	-0.022266
Beta: Fixed assets/Total Assets	-0.000237
Beta: Standard deviation of sales	-0.091546

Beta: Natural log of Sales	-5.81E-09
T stat: EBIT/TA	1.63E-02
T stat: MV equity/ BV equity	-3.99530
T stat: Year founded	-4.61487
T stat: Fixed assets/Total Assets	-0.947574
T stat: Standard deviation of sales	-1.904656
T stat: Natural log of Sales	-2.01919
R square	2.67787
Adj R square	0.192112
	0.177855

Borrowing ratio	
Alpha	
Beta: MV equity/ BV equity	3.204746
Beta: EBIT/TA	0.593054
Beta: Natural log of Sales	-6.412148
Beta: Year founded	-0.239062
Beta: Fixed assets/Total Assets	0.006914
Beta: Standard deviation of sales	8.68E-01
T stat: MV equity/ BV equity	2.09E-08
T stat: EBIT/TA	3.797764
T stat: Natural log of Sales	
T stat: Year founded	
T stat: Fixed assets/Total Assets	1.442875
T stat: Standard deviation of sales	3.077133
R square	0.504782
Adj R square	0.274696
	2.62E-01

A summary of the results can be seen in tabular format in table 4 (e).

Table 4e: Summary of the significant relationships between the leverage ratios and the determinants.

Significant relationships						
	Risk	Size	Tangibility	Profitability	Growth	Age
Total debt/ Total Capital employed				Negative	Positive	
Total debt/ Total Assets	Positive	Negative	Positive	Negative		
Total debt/ BVdebt+MVequity			Positive	Negative		*Negative**
Total LT Debt/ Total Assets	Positive	Negative	Positive	Negative		
Total LT Debt/ BVdebt+MVequity	*Positive**	*Negative**	Positive	Negative		
Total ST Debt/ Total Assets	*Negative**	Positive	Negative	Negative		
Total ST Debt/ BVdebt+MVequity	Negative	Positive	*Negative**	Negative	Negative	
Borrowing ratio		Negative	Positive	Negative	Positive	

Note: * and italic print show relationships that are significant at the 10% significance level.

Business risk

The results for business risk were slightly different to what had been predicted. It was expected that firms with higher risk of default would avoid issuing debt in fear of the

high costs associated with bankruptcy (Marsh 1892 and Castanias 1983). Although not all the relationships with total and long-term debt ratios were significant, those that were showed a positive relationship. The relationships with Total debt/ Total assets and LT loans/ Total assets were both significantly positive. LT debt/ (BVdebt +MVequity) was also significantly positive but only at the 10% significance level.

With regard to the short-term debt, the opposite association was found to exist. Both leverage ratios showed a negative relationship with business risk. ST debt/ (BVdebt +MVequity) was significantly related and ST debt/ Total Assets was significant only at a 10% significance level.

Past literature presents a predominant argument for negative a relationship. Generally, firms with high earnings volatility are more likely to not meet debt commitments, resulting in bankruptcy (Marsh 1982 and Castanias 1983). Furthermore, these firms prefer equity to debt as interest payments are fixed whereas dividends can be avoided in precarious financial times (Antoniou et al. 2002). The Trade off theory concurs with these principles, emphasising the associated costs of debt that risky firms are more susceptible to. These studies offer some support to the study's findings relating to short-term debt. Short-term loans are usually associated with higher interest payments. To avoid this, risky firms may instead use equity or cheaper long-term debt as an alternative.

The positive relationship between business risk and long-term leverage is consistent with some of the results found by Ghirmatsion (2004). The reason suggested for this connection is the sentiment of investors. Marketable shares of firms with volatile earnings are generally cheaper due to the risk associated with them. Thus, firms seeking finance are dissuaded from issuing shares if they are under priced in the market, and prefer to issue debt instead.

Size of the firm

Using the pooled data, the size of the firm shows a varying relationship with long-term versus short-term debt. Past empirical research shows both negative and positive results. The results in this study varied to a degree depending on which variables were used in leverage ratios.

The relationship between size and ratios: Total debt/ Total assets, LT debt/ Total assets and the Borrowing ratio, were all negative. LT debt/ (BVdebt +MVequity) was also negative but only at the 90% confidence level. The results for the two short-term leverage ratios were both significant, but instead showed a positive relationship with firm size.

The results dealing with Total debt leverage ratios differ to an extent from those of Dukhi (2000) who found no significant relationship, and Ghirmatsion (2004) who found a positive relationship. Dukhi's (2000) study differed in that he investigated retail sector companies and Ghirmatsion (2004) differed in his methodologies and basis for exclusion of outliers.

The argument for the negative relationship with total and long-term debt could be due to the principles of the pecking order theory. Large firms could potentially have built up a significant amount of accumulated income. According to the pecking order theory, using the income retained in the firm is preferable to issuing debt and equity which both have potential financial distress and agency costs. The use of the measurement variable, natural log of sales, is also representative of how much income is earned and that could subsequently be retained in the firm[16]. To support this argument, the correlation coefficient between the Distributable Reserves of a firm and the Natural log of sales was calculated. This was found to be moderately high at 0.626 which suggests they are interrelated.

The positive relationship between size and short-term debt contrasts with the findings of Smith (1997) who argued that smaller firms favour short-term debt because of the higher issuance costs of equity and long-term debt. A possible counterargument is that larger firms prefer to use short-term debt to temporarily finance their needs which are in excess of the distributable reserves. This leads to a positive relationship between size and short-term leverage.

[16] This measurement variable was used by Ghirmatsion (2004).

Asset composition

The regression tests showed convincing evidence of a positive relationship between tangibility and both total and long-term leverage. This result has been common in past literature by authors such as Hirota (1998), Banerjee et al. (2000), Jong and Dijk (2002) and Drobetz and Fix (2003).

In the Total debt and Long Term debt ratios, irrespective of whether the market value of equity was used or not, a significant correlation was indicated. This is indicative of the strength of this determinant. The weakest relationship of the four leverage ratios was Total debt/Total assets which had a very low p-value of 0.0002. Furthermore, looking at each of these four leverage models, it appears that asset composition, together with profitability, is one of the determinants with the highest association with leverage.

Similar to above, the Borrowing ratio also shows a positive relationship with the proportion of fixed assets in the firm. Although also significant at the 5% significance level, asset composition is not the strongest determinant in this model.

There is evidence of a negative association with short-term debt. This relationship is significant with ST debt/Total assets and significant at the 10% level when the market value of equity is used. These findings of inverse relationships agree with those of van der Wijst and Thurik (1993), Chittenden et al. (1996) and Stohs and Mauer (1996).

Empirical research provides many reasons for the relationships found above. Tangible assets encourage debt as they are easier to sell in the event of bankruptcy (Heshmati 2001) and because they can be used as collateral, allow for cheaper debt. Furthermore, on liquidation tangible assets tend to be more valuable than intangible assets (Rajan and Zingales 1995). With respect to the short-term debt, the weaker relationships could be expected as it is seldom that short-term lenders require assets as security. Thus, firms with proportionately more intangible assets may have to revert to short-term debt financing.

Profitability

Similar to asset composition, profitability shows significant relationships with many of the leverage ratios. In contrast however, this relationship is constant across all leverage ratios; total, long- and short-term debt.

In all the ratios, there is significant evidence of a negative relationship between leverage and the profitability of the firm. This is in agreement with many past studies (Myers and Majluf 1984 and Titman and Wessels 1988) which supported the foundations set by the pecking order theory. This theory argues that because of asymmetry information and agency costs, internally generated income is preferred to debt and equity. In profitable firms, large distributable reserves allow for sufficient financing in the future. Furthermore, Hall and Weiss (1967) added that profitable firms gained returns in the form of lower risk levels, thus preferred retained income to debt.

Because of the firm's strong profits, there will generally be no temporary need for short-term financing. This results in the corresponding negative relationship with short-term debt.

A question that arises from these results is whether the negative relationship suggests a positive one between profitability and the issuance of equity. This would be in contrary to the pecking order theory where debt is deemed preferable to equity. Marsh (1982) contends that to benefit from the high share value arising from investor confidence, firms issued equity in profitable times. Share issues are used as signalling tools to portray confidence in the firm's future prospects. Unfortunately, because distributable reserves and share capital are both classified as equity on the balance sheet, the present results do not show which of the two the alternative to debt is.

Growth opportunities

The results for growth opportunities show that both Total debt/ Total capital employed and the Borrowing ratio are significantly positively related. In contrast, a negative association was apparent between growth opportunities and ST debt/ (BVdebt +MVequity). All the other leverage ratios had no relationship of any degree with this determinant causing it to be eliminated from the multiple regressions. Past

literature has shown both negative (Kim and Sorensen 1986, Titman and Wessels 1988, Stulz 1990, Roden and Lewellen 1995 and Barclay et al 1995) and positive (Michaelas et al. 1999) relationships.

Arguments for a positive relationship with long-term debt are that growing firms quickly exhaust their internal finances and are forced to borrow (Toy et al. 1974, Shuetrim et al 1993 and Barbosa and Moraes 2003). Again according to the pecking order theory, debt is cheaper and the preferable source of finance when compared to equity. Another explanation is that mature firms are slow growing firms which have sufficient distributable reserves available which they use instead of debt to finance projects (Ghirmatsion 2004).

The negative relationship with short-term debt can be reasoned to be because of the high cost of this type of debt. Firms that have low growth potential (low MV: BV ratio) may not be able to negotiate superior terms with respect to long-term debt and may have to resort to the more expensive short-term debt. Bankers will be more willing to lend long-term debt to firms that have potential to grow and be profitable in the future.

Age of the firm

These results showed negative correlations for most of the ratios but none were found to be significant. It was only with the Total debt/ (BVdebt+ MVequity) ratio that a negative relationship, at the 90% confidence level, existed. This finding is consistent with a selection of other studies (Wedig et al. 1988, Petersen and Rajan 1994).

A suggested reason for this is that older firms that have survived generally have higher retained finances at their disposal (Diamond 1989). This finding again supports the pecking order theory which states that firms will first use their retained income before applying for more debt.

4.3 Summary

In evaluating the strength of the models, the coefficient of determination was calculated and investigated. It was noted that with the majority of the variables, R^2

deteriorated in strength from 2001 to 2002, but peaked again in 2003 or in some cases, 2005.

The study then used stepwise regression tests to establish any relationships. Firstly, annual cross-sectional regressions were done which allowed for some insight into whether relationships changed over time. In general, no clear change in the significance of the relationships could be noted; however, they did tend to move in a constant direction. Following this, pooled cross-sectional multiple regressions were done. Using the larger sample size, results were based on data that represented the average over the period. In most cases, as anticipated, the relationships differed between short-term debt and both total and long-term debt. Asset composition and profitability were of the determinants showing the most significant relationships. Indicating that tangible assets are preferred to intangible assets with respect to collateral, total and long-term debt was found to be positively related to tangibility. On the contrary, short-term debt was negatively related. Profitability was negatively related across all leverage ratios suggesting the validity of the pecking order theory.

Chapter 5: Comparison of findings with Theories of Capital Structure and Past literature

5. Introduction

One of the objectives of this study was to ascertain whether the theories of capital structure were appropriate in determining the optimal debt: equity weighting in a firm. The results of the study are compared to theory to establish whether the theory is applied in the context of the JSE and whether or not the financing decisions of JSE listed industrial firms are in fact consistent with the findings of past literature.

5.1 Comparison with Theories of Capital Structure

Modigliani and Miller

M&M's revised model highlighted the benefit of debt through having higher interest tax shields. This tax shield would only have value if the company was profitable, and so would suggest a positive relationship between leverage and profitability. In the findings of this study however, it appeared that a negative relationship existed between leverage and profitability for the firms included in the sample.

The Trade off Theory

This theory, developed by Myers (1977), considers the relative benefits and costs of an increased level of debt. The primary benefit of more debt is the interest-tax shield. This benefit decreases with an increase in other tax deductions such as depreciation and amortisation (DeAngelo and Masulis 1980 and Myers 1984).

The cost of increased debt is the result of higher probability of financial distress and bankruptcy (Marsh 1982 and Castanias 1983). Along with financial distress and bankruptcy, come many associated expenses which can be costly for the firm e.g. legal fees, administrative fees and agency costs.

Taking into account the principles set out in this model, certain relationships between leverage and the determinants can be established. The trade off theory encompasses three of the determinants included in the study, namely asset composition, business risk and size of the firm.

Firms with more tangible assets can borrow more cheaply as tangible assets are used as collateral for the debt. This suggests that a positive relationship will exist between tangibility and the leverage of the firm. This matched the results of the study when investigating the relationships between long term debt and the firm's tangibility. A negative relationship was found to exist between tangibility and short term debt but this may be due to the fact that the cost of short term debt is less reliant on collateral being provided. A separate discussion on short term debt is not presented in the Trade off theory, thus this theory cannot be applied to this duration of debt.

With respect to business risk, the trade off theory suggests a negative relationship with leverage. Firms with a higher volatility in sales have a higher probability of bankruptcy and incurring the associated costs. Thus firms that are riskier will be found to adopt less debt due to the risk of financial distress. In this study, this negative relationship only applied when short term debt was used as the measure of leverage. A positive relationship was found to exist when using Total debt and Total LT debt as a proportion of Total assets. This is thus contrast to what would be expected when using the trade off theory.

The trade off theory also considers size. The theory argues a positive relationship as larger firms are generally more diversified and better equipped to cope with financial distress. Similar to business risk, this positive relationship was found to apply only to short term debt. In contrast to the principles of the trade off theory, a significant negative relationship was found between firm size and Total debt/Total Assets, Total LT debt/ Total Assets and the Borrowing ratio. The results of the study could be influenced by the pecking order theory which will be addressed later.

The Agency Theory

The agency theory, developed by Jensen and Meckling in 1976, considers the conflicts of interest amongst the various groups of people that have claims to the firm's resources. Two different types of conflicts were identified; that between shareholders and managers, and that between debt holders and equity holders. It is worth noting that again little is mentioned with regard to short term debt as a separate financing source.

This theory addresses three of the determinants, profitability, business risk and age of the firm. With regard to profitability and business risk, the theory states that firms with a higher probability of bankruptcy will have higher proportionate debt levels. This is because shareholders will be hesitant to contribute additional capital. Shareholders' hesitancy is due to debt holders having a preferential claim on the firm's assets. This theory thus suggests a negative association with profitability and a positive association with business risk. The findings of the study agree in part with the agency theory, showing significant negative relationships with profitability and all the leverage ratios and profitability and significant positive relationships with business risk and both Total debt/ Total assets and Total LT debt/ Total assets ratios.

With regard to the age of the firm, it is suggested that older firms that had more established reputations of debt repayment and lower costs of debt financing (Ghirmatsion 2004). This will lead to higher levels of leverage in comparison to younger, less established firms. From the results of the study, there appeared to be no significant relationships between age and the leverage of the firm. A negative relationship, at the 90% confidence level, was however found to exist between age and Total LT debt / (BVdebt + MV equity). This is in contrast to what was predicted by the agency theory, but could in part be explained by the pecking order theory.

The Pecking Order Theory

The basis of the pecking order theory assumes that companies have a hierarchical order of financing options. Making use of the firm's accumulated income is the most desirable option, with the issuance of equity being the least preferable option. The unattractiveness of a new issue of shares is sparked by the negative signals given to the market as well as existing shareholders potentially losing value to new shareholders.

In essence, this theory suggests that if there are funds available in the firm, these will be used prior to debt or equity issuance. Although there is no determinant directly representing accumulated income, there was found to be positive correlation between accumulated income and each of profitability, firm size and age. According to the pecking order theory, it is expected that leverage is negatively related to the three

determinants; profitability, size and age. This is largely due to the fact that the firm will ideally first use its retained income before taking on more debt.

With respect to profitability, a clear negative relationship was established when compared with all the types of leverage measures. This suggests that the pecking order is in fact adopted by listed South African industrial firms. To further substantiate the argument proposed by this theory, negative relationships were also found with some leverage ratios and size, as well as age of the firm (at 90% confidence level). These findings suggest that firms prefer to use their operational profits and retained income to funds new ventures.

5.2 Comparison with past literature

Business risk

Significant positive relationships were found between risk and the leverage ratios, Total debt/ Total assets and Total LT debt/ Total assets. This finding was common in the results of past literature that generally showed a positive relationship between leverage and business risk. Reasoning the positive correlation, Marsh (1982) and Castanias (1983) suggested that riskier firms had a higher chance of financial distress and not meeting debt payments, thus would take on less debt. Baxter (1976) and Antoniou et al. (2002) further substantiated the argument by noting that equity was more desirable for riskier firms because of the dividend payment flexibility.

The findings of the negative relationship between business risk and short term debt correlated more closely with those found in past literature. In addition to the reasons mentioned above, DeAngelo and Masulis (1980) added that lenders of riskier firms will demand a higher premium on the cost of debt, thus discouraging long and short term debt.

Firm Size

This study showed a general negative association with long term debt and a positive association with short term debt. Other authors finding a negative relationship were Banerjee et al (2000) in USA, and Rajan and Zingales (1995) in Germany. Dukhi (2000), doing a study on South African firms, found no significant relationships which was the case in the present study when the market value of equity was used.

Many authors[17] found positive relationships and reasoned this to be because smaller firms had higher bankruptcy costs and larger, more diversified firms had a better ability to sustain debt. Reasons for these opposing findings could be due to other sources of financing, such as debentures and company bonds, becoming more popular for larger firms.

With respect to short term debt, Smith (1977) found a negative relationship with firm size. He argued that short term debt was preferable for smaller firms because of its lower issuance and fixed costs. This argument is in contrary to what was found in this study of South African industrial firms.

Asset composition

The study found significant evidence of a positive relationship between total and long term debt and tangibility. With respect to short term debt, a negative relationship was established when using the book value of equity.

Past literature shows overriding evidence of a positive relationship between leverage and tangibility. This result was found by many authors; Friend and Lang (1978), Bradley et al (1988), Wedig et al. (1988), Rajan and Zingales (1995) and Heshmati (2001). This mirrors the findings of the study and is reasoned to be primarily because tangible assets are preferable for collateral, as compared to intangible assets.

With respect to short-term debt, negative relationships with tangibility were found by van der Wijst and Thurik (1993), Chittenden et al. (1996) and Stohs and Mauer (1996). Again, this mirrors the results found in this study.

Profitability

With regard to profitability, overriding evidence of a negative relationship exists with all the leverage ratios. This matches the predominant findings in past literature. Studies supporting these findings are Titman and Wessels (1988), Marsh (1982) and

[17] Warner (1977), Remmers et al. (1974), Ang, Chua and McConnell (1982), Castanias (1983), Fama (1985) and Titman and Wessels (1988).

Hall and Weiss (1967), amongst others. The basis for most of these are similar to those set out by the pecking order theory, that is, that firms prefer using their own retained income before incurring debt or issuing equity. In their respective samples of South African firms, both Duhki (2000) and Ghirmatsion (2004) also established negative relationships between leverage and profitability.

There is limited past literature that deals specifically with short term debt, however, this can be assumed to follow the same principles as those which relate to long term debt.

Growth opportunities

The study showed mixed results with regard to leverage and growth opportunities. This corresponds with other studies focusing on South African firms (Jordaan et al 1993 and Ghirmatsion 2004). The only significant relationships found in this study were a positive one with both Total debt/ Total Capital employed and the Borrowing ratio, and a negative one with Total ST debt/ (BVdebt+ MVequity). The positive association with long term debt agrees with the findings of Toy et al. (1974), Shuetrim et al (1993) and Barbosa and Moraes (2003). These researchers argue that faster growing firms quickly used up their retained finances and required additional debt to finance their new opportunities. It was added that debt was preferable to equity as it is considered to be relatively cheaper.

The only past studies done on short term debt were done by Myers (1977), Barclay and Smith (1996& 1999) and Michaelas et al. (1999). These authors found that a positive relationship existed between short term debt and growth, reasoning that this occurred because short term debt had lower agency costs than long term debt. This did not coincide with the results of this study.

Age of the firm

No significant relationships between leverage and age were found to exist when doing the regression tests. However, at the 90% confidence level, a negative relationship existed with Total debt/ (BVdebt+ MV equity). Of the limited past literature, both positive and negative correlations were found. The negative association found in this study agrees with the findings of Wedig et al. (1988), Diamond (1989) and Petersen

and Rajan (1994). The predominant reason given supports the notion of the pecking order theory. The notion is that older firms generally have more retained income and prefer using this before using debt or equity[18].

5.3 Summary

When comparing the results of this study with that of the theories of capital structure and past literature, it appears that most match the results that were expected. The determinants that did not wholly match past empirical research are business risk and age of the firm. This could be partially explained by features that are unique to the South African economy. With respect to the popular theories of capital structure, it was found that the pecking order theory most suitably explained the financing decision made by managers. This was shown in the negative associations with leverage and firm size, profitability and age. The positive relationship between leverage and tangibility is predicted by the trade off theory, and the agency theory supports the relationships found between leverage and both profitability and business risk. In conclusion, it appears that the financing decision is to some extent explained by the theories of capital structure and past literature.

[18] This argument was proposed by Diamond (1989).

Chapter 6: Summary and conclusions

6.1 Summary

This study set out to establish the relationships between leverage and certain determinants empirically, as well as the nature of these relationships. It aimed to contribute additional findings to recent studies done in South Africa[19]. The determinants were chosen using the guidance of past empirical research. These determinants included business risk, size, asset composition, profitability, growth opportunities and age. The sample included JSE-listed industrial firms and covered the period between 2001 and 2005. Both pooled and annual cross-sectional multiple regression tests were done to establish the existence of any relationships during this period. The annual regressions were done to investigate whether there were any changes in the relationships over time. However, the focus of this study was on the pooled cross-sectional regression, which investigated the average trend over the whole period. In the analysis of the results, the findings were explained and compared with past literature and popular theories of capital structure.

The results of the study are consistent with past studies, particularly those researching South African companies. Investigating the multiple regressions for each particular year gave insight into whether there were any changes in the strengths of the relationships over time. The strength of the models is limited due to the pragmatic problem of not being able to include all the influential factors. Of the models, the measurement of leverage that was the strongest was the Borrowing ratio with an average R^2 of 38.91%, followed by the LT debt/ Total assets ratio with R^2 of 32.32%. When looking at debt in its entirety, the ratio, Total debt/ Total assets showed an improvement in model strength over time. This suggested that over time, total leverage in firms was being more affected by the firm-specific factors. The weakest models were found to be those dealing with short-term debt. This suggested that it was other external factors that largely influenced that proportion of short-term debt taken on. Overall, the respective strengths of the models appeared to show a decline from 2001 to 2002. However, this was shortly followed by a peak in either 2003 or 2005. Not all the relationships remained significant over the entire period, but the directions of these relationships generally tended to be consistent. Of the

[19] This includes the study done by Ghirmatsion (2004) on the capital structure of industrial firms.

determinants, asset composition and profitability showed the most consistently significant relationships with leverage over the period.

The pooled cross-sectional regressions allowed for a larger sample by pooling the determinants of each year into one group. The results can be summarized as follows:

Business risk was found to be positively related to total and long-term leverage, but only when the book value of equity was used. With respect to short-term debt, this determinant was found to be negatively related but only when the market value of equity was used.

The *size of the firm* was found to be negatively related to total and long-term debt but again, only when the book value of equity was used. These negative associations existed between the leverage ratios; Total debt/Total assets, LT debt/Total assets and the Borrowing ratio. Both short-term debt ratios were significantly positively related to the size of the firm.

Suggesting the importance of having collateral for security when borrowing, and in agreement with earlier research, all total and long-term leverage ratios were found to be positively related (at 5% significance level) to the amount of tangible assets in the firm[20]. When using the book value of equity, short-term debt showed a negative association (at 5% significance level) with the *tangibility of the firm.*

Convincing results were also produced when testing the relationship between leverage and the firms' *profitability*. Significant negative relationships were evident with every one of the eight leverage ratios. *Growth opportunities* showed less persuasive results with relationships only being significant with Total debt/ Total Capital employed (positive), the Borrowing ratio (positive) and ST debt/ (BVdebt+ MVequity) (negative). At the 95% confidence level, no significant relationships existed with regard to the *age of the firm.*

[20] Friend and Lang (1978), Bradley et al (1988), Wedig et al. (1988), Rajan and Zingales (1995) and Heshmati (2001).

In comparing the results with the hypothesized predictions, they were found to be similar, bar the long-term debt relationships with business risk and size of the firm and the short-term debt relationship with growth opportunities. The analysis suggested strong evidence of the pecking order theory, particularly for determinants: firm size, profitability and age.

6.2 Conclusions

Although the results of this study depend largely on the measurement variables that were used, the findings do allow for a conclusion to be drawn with respect to the determinants of capital structure in JSE-listed industrial firms.

In the analysis, there was convincing evidence of the pecking order theory in the financing decisions of firms. Because of the associated costs and benefits of the different financing sources, a hierarchical order of preference exists. Firms prefer to use accumulated profits prior to borrowing debt or issuing shares. Thus, it was found that larger and older firms, which generally had more retained income, used this instead of adopting more debt or issuing equity. Similarly, profitable firms prefer to use their earnings for financing purposes.

The significance of collateral in long-term debt issuance is evident from the results reviewing asset composition. JSE firms with more tangible assets appear to be able to borrow at rates that are lower than firms with more intangible assets. This concept supports the trade-off theory which considers the respective benefits and costs of debt and equity. Tangibility has a negative relationship with short term debt. A possible reason for this is that companies strive to match the maturities of their assets and liabilities, that is, firms use long-term loans to finance these fixed assets.

With respect to business risk, the results found in South Africa are that riskier firms prefer to use debt as opposed to equity. This could be because the shares of risky firms are generally underpriced in the market so managers are dissuaded from issuing additional shares at these low values. The negative relationship between risk and short term debt may be because short-term debt is usually associated with higher interest payments, and instead, risky firms use cheaper long-term debt or equity.

Firms with more opportunities for growth tend to quickly use up their retained earnings and need to borrow for future projects. Again according to the pecking order theory, debt is cheaper and the preferable source of finance when compared to equity. Furthermore, because these are growing firms that will need to take risks, their shares may be undervalued in the market.

There is no strong correlation between leverage and the age of firm. At a lower level of confidence, age is negatively related to total debt. This again agrees with the concepts proposed by the pecking order theory that using retained income is preferable to using debt.

This study aimed to contribute to the limited research already done in South Africa and provide a more recent analysis of capital structure determinants in industrial firms. Past literature was used in order to design a valid model that could be used for purposes of the research. The findings were compared to past literature and were largely consistent with previous findings. The results were found to predominantly support the principles set out in the popular theories, particularly the pecking order and trade-off theories.

Further research

This study addressed the effects that six different determinants had on the capital structure of JSE-listed industrial firms. The study covered the period from 2001 to 2005. Further areas of research should be addressed in the future to better understand the decisions involving the important topic of capital structure. Proposed future research could investigate the following areas:

- A similar analysis could be done which includes comparisons between the capital structure determinants of different sectors of the JSE.
- Research could be done using other measurement variables that are prevalent specifically in South Africa, such as secondary tax on companies, high corporate taxes and volatile lending rates.
- Regression testing can be done on a pooled sample extending over a period longer than five years. This may allow for results that are more representative of the industry.

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Appendix

Table 1:
Names of companies included in sample

	DataStream name	Company's name
1	ADCORP	ADCORP HOLDINGS LTD
2	AFGRI	AFGRI LTD
3	AG INDUSTRIES	AG INDUSTRIES LTD
4	ALLIED TECHNOLOGIES	ALLIED ELECTRONICS CO LTD
5	AMAL.APPC.	AMALGAMATED APPLIANCES HOLDINGS LTD
6	ARGENT INDUSTRIAL	ARGENT INDUSTRIAL LTD
7	ASTRAL FOODS	ASTRAL FOODS LTD
8	ASTRAPAK	ASTRAPAK LTD
9	AVENG	AVENG LTD
10	AVI	AVI LTD
11	AWETHU BREWERIES	AWETHU BREWERIES LTD
12	BARLOWORLD	BARLOWORLD LTD
13	BASIL READ	BASIL READ HOLDINGS LTD
14	BELL EQUIPMENT	BELL EQUIPMENT LTD
15	BIDVEST GROUP	BIDVEST GROUP LTD (THE)
16	BUILDMAX	BUILDMAX LTD
17	CARGO CARRIERS	CARGO CARRIERS LTD
18	CERAMIC INDUSTRIES	CERAMIC INDUSTRIES LTD
19	CONTROL INSTRUMENTS GP.	CONTROL INSTRUMENTS GRP
20	CROOKES BROTHERS	CROOKES BROS LTD
21	DELTA ELECT.INDS.	DELTA ELECRICAL INDUSTRIES
22	DIGICORE	DIGICORE HOLDINGS LTD
23	DISTELL GROUP	DISTELL GROUP LTD
24	DS.& WHSG.NETWORK	DISTRIBUTION AND WAREHOUSING
25	DORBYL	DORBYL LTD
26	ELB GROUP	ELB GROUP LTD
27	ENVIROSERV	ENVIROSERV HOLDINGS LTD
28	EXCELLERATE HDG.	EXCELLERATE HOLDINGS LTD
29	GRINDROD	GRINDROD LTD
30	GROUP FIVE	GROUP FIVE LTD
31	HOWDEN AFRICA	HOWDEN AFRICA HOLDINGS LTD
32	HUDACO	HUDACO INDUSTRIES LTD
33	ILIAD AFRICA	ILIAD AFRICA LTD
34	ILLOVO SUGAR	ILLOVO SUGAR LTD
35	IMPERIAL	IMPERIAL HOLDINGS LTD
36	INTERTRADING	INTERTRADING LTD
37	INVICTA	INVICTA HOLDINGS LTD
38	JASCO ELTN.	JASCO ELECTRONICS HOLDINGS LTD

39	KAIROS INDL.	KAIROS INDUSTRIAL HOLDINGS LTD
40	KAP INTL.	KAP INTERNATIONAL HOLDINGS LTD
41	MASONITE AFRICA	MASONITE AFRICA LTD
42	METAIR INVESTMENTS	METAIR INVESTMENTS LTD
43	METROFILE	METROFILE HOLDINGS LTD
44	MOBILE INDUSTRIES	MOBILE INDUSTRIES LTD
45	MARSHALL MONTEAGLE (JSE)	MONTEAGLE SOCIETE ANONYME
46	MURRAY & ROBERTS	MURRAY AND ROBERTS HOLDINGS LTD
47	MVELAPHANDA GP.	MVELAPHANDA GROUP LTD
48	NAMPAK	NAMPAK LTD
49	OCEANA GROUP	OCEANA GROUP LTD
50	PALS	PALS HOLDING LTD
51	PASDEC RESOURCES	PASDEC RESOURCES SA LTD
52	PRETORIA POR.CMT.	PRETORIA PORT CEMENT
53	PRIMESERV GROUP	PRIMESERV GROUP LTD
54	RAINBOW CHICKEN	RAINBOW CHICKEN LTD
55	REUNERT	REUNERT LTD
56	SEARDEL INV.	SEARDEL INVESTMENT CORPORATION LTD
57	SEKUNJALO INVS.	SEKUNJALO INVESTMENTS LTD
58	SETPOINT TECH.	SETPOINT TECHNOLOGY HOLDING LTD
59	SOVEREIGN FOOD INVS.	SOVEREIGN FOOD INVESTMENT LTD
60	STEINHOFF INTL.	STEINHOFF INTERNATIONAL HOLDINGS LTD
61	SUPER GROUP	SUPER GROUP LTD
62	THE HOUSE OF BUSBY	HOUSE OF BUSBY LTD (THE)
63	TIGER BRANDS	TIGER BRANDS LTD
64	TIGER WHEELS	TIGER WHEELS LTD
65	TONGAAT HLT.GP.	TONGAAT-HULETT GROUP LTD
66	TRANSPACO	TRANSPACO LTD
67	TRENCOR	TRENCOR LTD
68	VALUE GROUP	VALUE GROUP LTD
69	VENTER LEIS.COML.TLR.	VENTER LEISURE AND COMMERCIAL
70	WILSON BAY HLM OVC	WILSON BAYLY HOLMES-OVCON LTD
71	WINHOLD	WINHOLD LTD

Table 2.1: Pooled cross-sectional regression results of the relationship between the determinants and Total debt/ Total Capital employed

Total debt/ Total Capital employed	
Alpha	0.133601
Beta: EBIT/TA	-1.657747
Beta: Fixed assets/Total Assets	0.225071
Beta: MV equity/ BV equity	0.049432
Beta: Year founded	-0.000684
Beta: Standard deviation of sales	-6.21E-09
Beta: Natural log of Sales	2.28E-02
Std error: EBIT/TA	0.3992
Std error: Fixed assets/Total Assets	0.156675
Std error: MV equity/ BV equity	0.01335
Std error: Year founded	0.000578
Std error: Standard deviation of sales	8.02E-09
Std error: Natural log of Sales	1.50E-02
T stat: EBIT/TA	-4.152671
T stat: Fixed assets/Total Assets	1.436546
T stat: MV equity/ BV equity	3.702902
T stat: Year founded	-1.182855
T stat: Standard deviation of sales	-0.77445
T stat: Natural log of Sales	1.524283
P value: EBIT/TA	0
P value: Fixed assets/Total Assets	0.1518
P value: MV equity/ BV equity	0.0002
P value: Year founded	0.2377
P value: Standard deviation of sales	0.4392
P value: Natural log of Sales	0.1284
R square	0.180972
Adj R square	0.166603
Durbin Watson	2.284437
F-statistic	12.59469
P value of f statistic	0
Breusch-Godfrey value	0.888465
Brensch-Godfrey P value	0.641316
White value	11.35296
White P value	0.498936

A significance level of 5% was used and the t-stats of these significant determinants are highlighted.
Note: The Newey-West HAC Standard Errors & Covariance test was used to perform this regression.

Table 2.2: Pooled cross-sectional regression results of the relationship between the determinants and Total debt/ Total Assets

Total debt/ Total Assets	
Alpha	0.472899
Beta: EBIT/TA	-0.446994
Beta: Fixed assets/Total Assets	0.332575
Beta: Natural log of Sales	-2.27E-02
Beta: Year founded	-9.41E-05
Beta: Standard deviation of sales	1.45E-08
Std error: EBIT/TA	0.140732
Std error: Fixed assets/Total Assets	0.088617
Std error: Natural log of Sales	0.010835
Std error: Year founded	3.52E-04
Std error: Standard deviation of sales	6.25E-09
T stat: EBIT/TA	-3.176199
T stat: Fixed assets/Total Assets	3.75295
T stat: Natural log of Sales	-2.099755
T stat: Year founded	-0.267494
T stat: Standard deviation of sales	2.324747
P value: EBIT/TA	0.0016
P value: Fixed assets/Total Assets	0.0002
P value: Natural log of Sales	0.0373
P value: Year founded	0.7892
P value: Standard deviation of sales	0.0207
R square	0.20036
Adj R square	0.188904
Durbin Watson	2.213546
F-statistic	17.48925
P value of f statistic	0
Breusch-Godfrey value	6.851079
Breusch-Godfrey P value	0.032532
White value	28.60468
White P value	0.001443

A significance level of 5% was used and the t-stats of these significant determinants are highlighted.
Note: The Newey-West HAC Standard Errors & Covariance test was used to perform this regression.

Table 2.3: Pooled cross-sectional regression results of the relationship between the determinants and Total debt/ (BVdebt + MVequity)

Total debt/ BVdebt+MVequity	
Alpha	0.232106
Beta: EBIT/TA	-0.774668
Beta: Fixed assets/Total Assets	0.300462
Beta: Year founded	-7.40E-04
Beta: Natural log of Sales	0.006402
Beta: Standard deviation of sales	-3.13E-10
Std error: EBIT/TA	0.109659
Std error: Fixed assets/Total Assets	0.065552
Std error: Year founded	4.01E-04
Std error: Natural log of Sales	0.010147
Std error: Standard deviation of sales	6.07E-09
T stat: EBIT/TA	-7.063328
T stat: Fixed assets/Total Assets	4.583597
T stat: Year founded	-1.847111
T stat: Natural log of Sales	0.630873
T stat: Standard deviation of sales	-0.051581
P value: EBIT/TA	0
P value: Fixed assets/Total Assets	0
P value: Year founded	0.0656
P value: Natural log of Sales	0.5285
P value: Standard deviation of sales	0.9589
R square	0.221231
Adj R square	0.210074
Durbin Watson	1.526959
F-statistic	19.82865
P value of f statistic	0
Breusch-Godfrey value	1.526385
Breusch-Godfrey P value	0.466176
White value	28.68218
White P value	0.001402

A significance level of 5% was used and the t-stats of these significant determinants are highlighted.
Note: The Newey-West HAC Standard Errors & Covariance test was used to perform this regression.

Table 2.4: Pooled cross-sectional regression results of the relationship between the determinants and Total LT debt/ Total Assets

Total LT Debt/ Total Assets	
Alpha	0.493723
Beta: Fixed assets/Total Assets	4.11E-01
Beta: EBIT/TA	-1.79E-01
Beta: Natural log of Sales	-0.03504
Beta: Year founded	-5.37E-05
Beta: Standard deviation of sales	1.83E-08
Std error: Fixed assets/Total Assets	0.083669
Std error: EBIT/TA	1.36E-01
Std error: Natural log of Sales	0.009685
Std error: Year founded	0.000288
Std error: Standard deviation of sales	5.75E-09
T stat: Fixed assets/Total Assets	4.915561
T stat: EBIT/TA	-1.310707
T stat: Natural log of Sales	-3.618059
T stat: Year founded	-0.186546
T stat: Standard deviation of sales	3.188302
P value: Fixed assets/Total Assets	0
P value: EBIT/TA	0.1908
P value: Natural log of Sales	0.0003
P value: Year founded	0.8521
P value: Standard deviation of sales	0.0016
R square	0.258804
Adj R square	0.248185
Durbin Watson	2.142806
F-statistic	24.37214
P value of f statistic	0
Breusch-Godfrey value	5.57E+00
Breusch-Godfrey P value	0.061778
White value	35.59868
White P value	9.90E-05

A significance level of 5% was used and the t-stats of these significant determinants are highlighted.
Note: The Newey-West HAC Standard Errors & Covariance test was used to perform this regression.

Table 2.5: Pooled cross-sectional regression results of the relationship between the determinants and Total LT debt/ (BVdebt +MVequity)

Total LT Debt/ BVdebt+MVequity	
Alpha	0.258012
Beta: Fixed assets/Total Assets	4.13E-01
Beta: EBIT/TA	-0.249491
Beta: Year founded	-0.000359
Beta: Natural log of Sales	-0.013989
Beta: Standard deviation of sales	9.35E-09
Std error: Fixed assets/Total Assets	4.71E-02
Std error: EBIT/TA	0.079284
Std error: Year founded	0.000279
Std error: Natural log of Sales	0.007556
Std error: Standard deviation of sales	4.82E-09
T stat: Fixed assets/Total Assets	8.778804
T stat: EBIT/TA	-3.14681
T stat: Year founded	-1.287899
T stat: Natural log of Sales	-1.851253
T stat: Standard deviation of sales	1.93953
P value: Fixed assets/Total Assets	0
P value: EBIT/TA	0.0018
P value: Year founded	0.1986
P value: Natural log of Sales	0.065
P value: Standard deviation of sales	0.0532
R square	0.266751
Adj R square	0.256246
Durbin Watson	1.581402
F-statistic	25.39282
P value of f statistic	0.00E+00
Breusch-Godfrey value	5.220404
Breusch-Godfrey P value	0.07352
White value	42.6008
White P value	6.00E-06

A significance level of 5% was used and the t-stats of these significant determinants are highlighted.
Note: The Newey-West HAC Standard Errors & Covariance test was used to perform this regression.

Table 2.6: Pooled cross-sectional regression results of the relationship between the determinants and Total ST debt/ Total Assets

Total ST Debt/ Total Assets	
Alpha	-2.00E-02
Beta: EBIT/TA	-0.267067
Beta: Fixed assets/Total Assets	-0.078702
Beta: Natural log of Sales	0.012293
Beta: Standard deviation of sales	-3.91E-09
Beta: Year founded	-2.13E-05
Std error: EBIT/TA	0.063743
Std error: Fixed assets/Total Assets	0.03068
Std error: Natural log of Sales	0.004008
Std error: Standard deviation of sales	2.07E-09
Std error: Year founded	0.000147
T stat: EBIT/TA	-4.189761
T stat: Fixed assets/Total Assets	-2.56528
T stat: Natural log of Sales	3.067032
T stat: Standard deviation of sales	-1.890991
T stat: Year founded	-0.145564
P value: EBIT/TA	0
P value: Fixed assets/Total Assets	0.0107
P value: Natural log of Sales	0.0023
P value: Standard deviation of sales	0.0595
P value: Year founded	0.8843
R square	0.124671
Adj R square	0.112058
Durbin Watson	2.003599
F-statistic	9.884485
P value of f statistic	0
Breusch-Godfrey value	0.497439
Breusch-Godfrey P value	0.779799
White value	25.6793
White P value	0.004196

A significance level of 5% was used and the t-stats of these significant determinants are highlighted.
Note: The Newey-West HAC Standard Errors & Covariance test was used to perform this regression.

Table 2.7: Pooled cross-sectional regression results of the relationship between the determinants and Total ST debt/ (BVdebt + MVequity)

Total ST Debt/ BVdebt+MVequity	
Alpha	5.79E-02
Beta: EBIT/TA	-0.523747
Beta: MV equity/ BV equity	-0.022266
Beta: Year founded	-0.000237
Beta: Fixed assets/Total Assets	-0.091546
Beta: Standard deviation of sales	-5.81E-09
Beta: Natural log of Sales	1.63E-02
Std error: EBIT/TA	0.130953
Std error: MV equity/ BV equity	0.004825
Std error: Year founded	0.000251
Std error: Fixed assets/Total Assets	0.048064
Std error: Standard deviation of sales	2.88E-09
Std error: Natural log of Sales	0.0061
T stat: EBIT/TA	-3.999504
T stat: MV equity/ BV equity	-4.61487
T stat: Year founded	-0.947574
T stat: Fixed assets/Total Assets	-1.904656
T stat: Standard deviation of sales	-2.01919
T stat: Natural log of Sales	2.67787
P value: EBIT/TA	0.0001
P value: MV equity/ BV equity	0
P value: Year founded	0.344
P value: Fixed assets/Total Assets	0.0577
P value: Standard deviation of sales	0.0443
P value: Natural log of Sales	0.0078
R square	0.192112
Adj R square	0.177855
Durbin Watson	1.70E+00
F-statistic	13.47503
P value of f statistic	0
Breusch-Godfrey value	5.076889
Breusch-Godfrey P value	0.078989
White value	40.97867
White P value	4.90E-05

A significance level of 5% was used and the t-stats of these significant determinants are highlighted.
Note: The Newey-West HAC Standard Errors & Covariance test was used to perform this regression.

Table 2.8: Pooled cross-sectional regression results of the relationship between the determinants and the Borrowing Ratio

Borrowing ratio	
Alpha	3.204746
Beta: MV equity/ BV equity	0.593054
Beta: EBIT/TA	-6.412148
Beta: Natural log of Sales	-0.239062
Beta: Year founded	0.006914
Beta: Fixed assets/Total Assets	8.68E-01
Beta: Standard deviation of sales	2.09E-08
Std error: MV equity/ BV equity	0.156159
Std error: EBIT/TA	1.714087
Std error: Natural log of Sales	0.116704
Std error: Year founded	0.004792
Std error: Fixed assets/Total Assets	0.282016
Std error: Standard deviation of sales	4.14E-08
T stat: MV equity/ BV equity	3.797764
T stat: EBIT/TA	-3.740854
T stat: Natural log of Sales	-2.048439
T stat: Year founded	1.442875
T stat: Fixed assets/Total Assets	3.077133
T stat: Standard deviation of sales	0.504782
P value: MV equity/ BV equity	0.0002
P value: EBIT/TA	0.0002
P value: Natural log of Sales	0.0413
P value: Year founded	0.15
P value: Fixed assets/Total Assets	0.0023
P value: Standard deviation of sales	0.614
R square	0.274696
Adj R square	2.62E-01
Durbin Watson	1.730978
F-statistic	21.5877
P value of f statistic	0
Breusch-Godfrey value	7.22721
Breusch-Godfrey P value	0.026955
White value	43.15608
White P value	2.10E-05

A significance level of 5% was used and the t-stats of these significant determinants are highlighted.
Note: The Newey-West HAC Standard Errors & Covariance test was used to perform this regression.

Table 3 (pg 42): Correlation matrix of the independent and dependant variables

CORRELATION MATRIX		1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Standard deviation	1.0000													
2	Natural log of Sales	0.6439	1.0000												
3	Fixed assets/Total Assets	0.0097	0.0058	1.0000											
4	EBIT/TA	-0.0299	0.0778	-0.1318	1.0000										
5	MV equity/ BV equity	0.1681	0.2530	-0.1139	0.4379	1.0000									
6	Year founded	0.1829	0.3322	-0.0018	0.0846	0.1734	1.0000								
7	Total debt/ Total Capital employed	0.1000	0.1003	0.0560	-0.2396	0.0773	0.0218	1.0000							
8	Total debt/ Total Assets	0.0747	0.0137	0.1562	-0.2364	0.0275	-0.0151	0.8969	1.0000						
9	Total debt/ BVdebt+MVequity	0.0203	-0.0240	0.1983	-0.3681	-0.2932	-0.1075	0.7119	0.7366	1.0000					
10	Total LT Debt/ Total Assets	0.0440	-0.0481	0.3102	-0.1319	0.0978	-0.0492	0.5659	0.7987	0.5542	1.0000				
11	Total LT Debt/ BVdebt+MVequity	0.0334	-0.0143	0.3615	-0.2252	-0.1364	-0.0986	0.4501	0.6316	0.7839	0.8148	1.0000			
12	Total ST Debt/ Total Assets	0.0693	0.0820	-0.1243	-0.2285	-0.0753	0.0358	0.7861	0.6693	0.5351	0.0875	0.0397	1.0000		
13	Total ST Debt/ BVdebt+MVequity	-0.0034	-0.0227	-0.0720	-0.3430	-0.3192	-0.0651	0.6478	0.4929	0.7479	0.0079	0.1741	0.8062	1.0000	
14	Borrowing ratio	-0.0124	-0.1123	0.0540	-0.1263	0.1587	0.0520	0.5822	0.6736	0.4408	0.6732	0.4748	0.2839	0.1916	1.0000

Figure 1: Graph showing the average share value of the companies included in the sample