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The capital structure variations across industries of listed South African firms during boom and bust cycles

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Thesis submitted for the
Master of Management in Finance and Investments

Topic: The capital structure variations across industries of listed South African firms during boom and bust cycles

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at the

UNIVERSITY OF THE WITWATERSRAND

DECLARATION

I, Matthew James Nel, the undersigned declare that the research work reported in this dissertation is my own, except where otherwise indicated and acknowledged. It is submitted to fulfil the requirements for the Masters of Management in Finance and Investment degree at the University of the Witwatersrand, Johannesburg. This thesis has not, either in whole or in part, been submitted for a degree or diploma to any other institution or university for a similar qualification.

31/03/2014
Date signed

M.NEL
Matthew James Nel

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To God be the glory, everything in his plans and timing shall be fulfilled!

Abstract:

Capital structure is the varying levels of use of debt and equity to finance a firms operations. Firms have an overall leverage level, consisting of a long term and short term level. The economy has different phases over the business cycle ranging from boom cycles where businesses prosper to recessions when they may have difficulties. This cycle can be identified utilising economic indicators, the South African Reserve Bank has classified time periods into growth and recessionary periods, this business cycle phase allocation was utilised for this study to mark recessions.

Specific industries from the JSE were selected in an attempt to answer the study's hypotheses of industry capital structure heterogeneity and that recessions affect capital structure. A sample period from 1995 until 2012 was utilised, containing 5 recessionary years. A stable industry, farming and fisheries, a highly variable industry, the heavy construction industry and a new age industry, the computer services industry, were selected. The results of the study suggested that capital structure varies across industries as evidenced by the mean differences of leverage for total debt, long term debt and short term debt being statistically significant. The computer services industry utilised the least debt over all. The industries all showed a preference for the use of short term debt.

Panel data analysis following both Fixed Effect Methodology and Random Effect Methodology was conducted to analyse the firm-specific factors which affect capital structure as well as the use of a dummy variable to capture the effects of recessions.

The firm-specific effects under study included asset tangibility, tax, profitability, age and size. South African firms follow a pecking order as shown by the negative relationship observed between profitability and long and short term debt ratios. Existence of weak evidence in this study shows that recessions affect the capital structure of some of the industries studied. The computer services industry is clearly affected, while farming and fisheries industry has very weak evidence that long term debt may be affected, while there is no evidence to show that the heavy construction industry is affected at all. The study concluded with accepting the hypothesis that there are capital structure variations across industries, which are listed on the JSE in boom and bust periods.

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1 Chapter 1: Introduction

No work regarding the capital structure of corporate firms can begin without the recognition of the contribution made by Modigliani and Miller (1958) in providing a framework from which to consider capital structuring issues. They provided two propositions which hold true under the assumption of a perfect market. The propositions are (1) the market value of a firm is independent of its capital structure and (2) the expected return on equity relates in a linear manner to the debt to equity ratio of the firm. This is to say that the capital structure or mix of debt and equity used to finance the firm has no effect on the market value of the firm and that as you have more debt in the structure your equity becomes more expensive. The assumption of perfect markets is utopian, most especially in an emerging market context such as South Africa. Modigliani and Miller (1958) set the framework, which has now been expanded to incorporate market dynamics, and this has spawned many competing theories on how firms structure their capital to find the optimal capital structure of the firm.

The trade-off theory Myers (1984) claims that an optimal capital structure does exist. This implies that management can choose an optimal combination of debt and equity that will ultimately maximise the value of the firm. In an attempt to make this financing decision, management will trade off the benefits of using debt with the associated costs thereof (Myers, 1984).

The pecking order theory states that management will consider all the financing sources available to them and then use the least expensive source first, implying that an optimal capital structure does not exist (Myers, 1984). Firms prefer to utilise a specific order in the financing decision. Initially they will utilise retained earnings. If that is not sufficient, they will make use of debt instruments because debt is a cheaper form of financing than equity. Therefore, firms leave the issuing of new equity as a last resort (Myers, 1984).

De Vries (2010) states the ongoing debate in financial literature on which of the two dominant theories of capital structure best explains the financial behaviour of firms, has resulted in various international studies to determine which theory holds in a specific country. Gwatidzo and Ojah (2009), de Vries (2010) and de Wet (2006) studies, all revealed that the South African capital structure tends to follow the pecking order model. Kasozi (2009) revealed in his study that he could not find an absolute and resolved it to be highly firm specific.

The goal of firms is to maximise shareholder wealth, one of the means to achieve this is to lower the weighted cost of capital (WACC) for the company, this will allow for cheaper access to capital to take on positive net present value projects. Each company has its own unique capital structure; the quest for the optimal capital structure has become a major consideration for firms. There are currently no theories which encapsulate all the current viable and empirically tested theories, some are seen to be contradictory. To find the model which provides the optimal capital structure decision framework, is to find the proverbial golden goose.

Research has suggested that the macroeconomic environment in which firms operate does affect their capital structure decision (Baum, Caglayan & Rashid, 2013). Much effort has gone into finding which indicators have the greatest effect (de Vries 2010 and Mans 2012). The results however are highly variable, finding high levels of multicollinearity in the indicators. Yeh & Roca (2010) found that utilising one indicator which encompassed all the other indicators would produce the most significant results, as the indicators after all are proxies for the state of the general economy.

1.1 Purpose of the study

The purpose of the study is to determine, the capital structure norms in the various industries of companies as listed on the Johannesburg Securities exchange (JSE). The study will investigate these capital structure determinants during economic growth and recessionary periods, to determine if there are any differences during the periods. Listed firms are utilised as they have access to the widest array of capital sources.

There have been numerous studies internationally and locally (Gwatidzo and Ojah, 2009; de Vries, 2010; de Wet, 2006; Kasozi, 2009; Porwal and Kaur, 2012; Talburg et.al, 2008; Ojah and Pillay, 2009) on the capital structure determinants of various firms, industries & markets. To date there is no known industry and inter-industry study performed for JSE listed firms which analyses if firm's capital structures differ during recessionary and growth periods. This research intends to fill this gap.

This research will provide insights into the nature of the listed industries capital structures and if a dynamic nature is present, how and when the changes occur. Determining the direction of changes, i.e. from debt to equity during recessionary periods will empower managers and investors, to position themselves appropriately.

The cyclicality of debt meant credit booms over the 1990's and early 2000's lead to firms taking on massive levels of leverage. This credit boom ended in 2007 with the popping of the American Housing boom, and over time various other issues surfaced. This has thrown capital structure issues back into the forefront of discourse as firms are re-evaluating their positions. This study will provide insights for some industries listed on the JSE, in terms of the levels and nature of their leverage.

1.2 Problem statement

Corporate managers require benchmarks to ensure they are able to set targets relevant to their firm within their relevant industry (Auret, Chipeta and Krishna, 2013). Knowing whether there are significant differences in capital structure across firms in one's industry will enable the manager to identify if they are over or under leveraged, and what options they have available to finance their firms. Knowing how the industry reacts to boom or bust cycles, will provide insight for managers to position their firms correctly and have well informed capital structure decisions.

The differences across industries in terms of capital structure will provide insights into the operations of the industries and their need for the different sources of capital. This will enable the industries as well as capital providers to determine which industries could be targeted for increased usage of their capital offerings. Understanding of the nature of capital structure changes during economic cycles as well as which cycle the sector is currently in, will provide valuable insight into the nature of the decisions firms are likely to take. Will they be seeking equity, debt and/or a combination in the near future and how will the firm be structured after this decision. Firms are also analysing their capital structure to ensure they manage the risks around credit cycles.

1.3 Research hypothesis

The following two hypotheses will be tested statistically:

H_0: There is no significant difference in capital structure between industries

H_A : The is a significant difference in the capital structure between industries

H_0: There is no significant relationship between the boom/bust macroeconomic cycle and capital structure of industries

H_A : There is a significant relationship between the boom/bust cycle and capital structure of industries

1.4 Research questions

The following research questions are needed to be answered before the main research hypothesis can be answered. They exist as stepping stones in the research process. Following the list of questions, is a discussion on each question and its relevance to the study.

1. Is the proposed model the best model to provide the required insight?
2. Which industries should be studied?
3. How should the boom/bust macroeconomic cycle be classified?

In relation to question 1, further literature review will be required to ensure that the major independent variables are accounted for and are applicable to the South African context.

Question 2 relates to which industries on the Johannesburg Securities Exchange (JSE) should be studied. The JSE has many firms, they are categorised into industries which are homogenous in terms of products and or services offered. Each individual industry will behave in a unique manner, it will be advantageous to carefully select which industries to study.

Questions 3, relates to the boom/bust of the macroeconomic cycle. This cycle needs to be defined for the study and then the periods in the study can be allocated to be either boom or bust.

1.5 Brief description of methodology

Regression analysis utilising panel data structure, under both a Fixed Effects Methodology and Random Effects Methodology will be conducted. The results will then be used to test if there is significant difference between all the industries capital structure and if there is a relationship to the boom/bust macroeconomic cycle.

As per the norm in various studies on capital structure, a 5% level of significance will be used. Results in the 5% and 10% levels of significance will be identified, as they can show relative strength/importance of the result.

1.6 The model

There are many studies on capital structure topics, each has a unique flavour however most of the research has identified specific independent variables to use as a base. Various dependant variables have also been utilised, usually switching between debt to assets ratios and/or debt to equity ratios. Porwal and Kaur (2012) utilised only debt equity ratios for their study on Indian industries, the results were bland and uninformative. For this reason, a study methodology following after them is not a good idea, their model is too simple and missed most of the complexity in the decision framework utilised by firms which constitute the industries under study. Gwatidzo and Ojah (2009) utilised the following model to determine the capital structure determinants in 5 African countries including South Africa. Their data fit the model well and produced significant results:

$$D_{it} = \beta_0 + \beta_1 AT_{it} + \beta_2 Tax_{it} + \beta_3 Pro_{it} + \beta_4 Size_{it} + \beta_5 Age_{it} + \varepsilon_{it}$$

- D_{it} = leverage of firm i in time t, computed as total debt divided by total assets or as long-term debt divided by total assets or as short-term debt divided by total assets.
- AT_{it} = asset tangibility of firm i in time t, calculated as non-current assets divided by total assets.
- Tax_{it} = average corporate tax rate of firm i in time t.
- Pro_{it} = the profitability, a ratio of operating income to total assets for firm i in time t.
- $Size_{it}$ = size of firm i in time t, calculated as the log of total assets.
- Age_{it} = number of years since the incorporation of firm i in time t.

This model will form the basis on which investigation will occur to construct the model to be utilised in this study. De Vries (2010) found it necessary to add in more independent variables covering business risk as well as a variable that captures growth. She also utilised macro-economic variables to ensure that the macro-environment in which the firms operate was considered. This will be investigated for its usefulness by literature review and compared to the results of Mans (2010) who also utilised individual indicators. Talburg et.al (2008) also utilised a growth capturing variable. For the purposes of this study no additional growth capturing variable is necessary as profitability will proxy for growth. As the research is a single country study, by adding a dummy variable to capture a boom/bust periods of the

entire economy, the researcher can capture the effects of the cycle. This is to say that the time periods will be separate discrete points, they will be classified as either boom or bust periods, based on the macro-economic indicators selected and these will be grouped to identify if there is a relationshipbetween the business cycle and capital structure.

1.7 Data sources

The data will be sourced from the various applicable databases such as I-Net Bridge and/or McGregor BFA as well as from the relevant companies' financial statements. Year end values as reported in the financial statements will be utilised as these are audited and have the highest probability to reflect a true image of the operations of the firms.

The study will be for the period 1995 until 2012. Firms which delist and/or listed during this period will not be ignored as this will add survivorship bias; however at least 5 years of consecutive data is required to be included in the sample.

1.8 Significance of the study

The significance of this study lies within both academia and practice. The results could be used to justify the adoption of a capital structure model utilised in South Africa, which best fits the empirical results. It will also aid corporate managers to enhance their decisions on capital structure as they can see what is happening elsewhere in their industry as well as what is going on in the market as a whole and finally in terms of the historic reaction of their industry to changing boom/bust macroeconomic cycles. Investors will also find this insight useful as they can use the past reaction to predict the future and potentially time their market interactions more effectively.

1.9 Limitations

The main limitation of this study will be the small sample size. The number of firms in each industry is low as the JSE has a set size, after splitting up the JSE into each industry, the grouping of the firms will be small. In an attempt to counter this, the time frame of the study is 18 years, this will ensure that there are sufficient data points.

The financial services sector will not be investigated, as they are both providers and users of credit, which can blur the distinctions needed. Ojah and Pillay (2009) chose to include financial firms as it provides insights into market behaviour, they did however identify the challenges associated with differentiating, traditional covenant based debt, product-based liability and deposit type debts. For this reason this study will exclude the financial industry.

Additionally they are constrained under international regulations, which affect their capital structures such as the BASEL accords which is beyond the scope and purpose of this research. Excluding the financial sector is a norm in capital structure studies.

A limitation as identified by Talburg, et. al (2008) will be that the universal model utilised, might not accurately capture the different specific micro and macro environmental aspects of each individual industry and the competitive structure effects are also difficult to capture. To be able to resolve this, each industry will require an in depth study, which is beyond the scope of this research.

1.10 Outline of the study

The outline of the study will be as follows:

Chapter 1: Introduction to the Study

This chapter will provide a background to the study, sets the research problems and objectives, and discusses the research method of the study.

Chapter 2: Literature review

This chapter will provide the literature review on capital structure, the impacts of business cycles on firm's capital structure and how the business cycle should be classified.

Chapter 3: Research questionsand hypothesis

Chapter 3 will provide the main hypothesis of the research, and the stepping stone research questions which need to be answered in order to confirm/test the research hypothesis.

Chapter 4: Research Methodology

This chapter has a focus on the research methodology of the study and the allocation of years to the relevant business cycle phase.

Chapter 5: Research Results

The empirical results obtained from the statistical tests conducted will be presented.

Chapter 6: Summary, and Conclusions

A brief summary will be provided, the findings will be discussed and the implications of these findings will be presented. The conclusions of the research will be presented. Ending with a presentation of areas of limitation of the study and potential further research topics.

2 Chapter 2: Capital structure and the economic cycle as discussed in current literature

This chapter has the intention of reviewing the current applicable available body of knowledge in the fields of capital structure and the business/economic cycle. It will conclude by theoretically linking the business cycle to the capital structure of firms, to form the basis of the research hypothesis. Due to the wide expanse of the fields of research in capital structure and the business cycle, not all previous research will be covered, only the core tenant/principle works and those perceived to be relevant to this specific study will be covered.

2.1 Capital structure

Firms require funds to ensure they are able to operate. How they acquire these funds is a major concern of all going concerns. Firms have a choice of funds being sourced via liabilities (debt) or via equity. A balance should be struck between the two, the search for this balance, its' meaning and what it represents will be the focus of this section. The view point of this section is from that of the corporation which must choose which financing mix to implement, as in some cases taking the view of the provider of the type of finance, can reverse the viewpoint, as they take the opposite position in the security.

2.1.1 Equity

Equity is the owners stake in the firm, there are two major delineations of equity, internal equity and external equity. External equity are funds that are sourced from entities outside of the firm, this could be the owners or any other investor including the general public. Shares or ownership stakes are given in exchange for their funds. As a reward for ownership of the firm, any profits can be returned to owners via a dividend or cash flow which will be paid to owners pro rata to their stake of ownership. The profits that the firm generates can either be paid back to owners or it can be retained to be used for furthering the operations of the firm, these retained earnings are an internal source of equity for the firm. The value added to the firm by retaining these funds, should be reflected in an increase in the value of the equity stake the owners have, this capital appreciation benefits the shareholders.

Advantages of equity financing:

- Ownership interest has a voting/control element

- Equity provides permanent financing and has no legal obligation to repay, dividends are paid when declared thus the cash flow is manageable

Disadvantages of equity financing:

- Dividend is a return to shareholders and not tax deductible
- Ownership rights can dilute the control of the firm (most notably with new issues)

Cost of Equity financing:

The cost of equity financing is the returns equity holders expect to receive, these expectations are based on returns they could expect from a safe or risk free asset plus an additional return premium based on the amount of risk they perceive in the equity.

Utilising the Capital Asset Pricing Model (CAPM) the cost of equity is calculated with the following equation:

$$\boldsymbol{E_R = RFR + \beta\,(R_m - RFR)}$$

Where:

- E_R is the expected return for equity holders which is equivalent to the cost for the firm
- RFR is the risk free rate of return
- β is the risk of the equity
- R_m is the return on the market portfolio

There are other methods of calculating the cost of equity for a firm, such as the arbitrage pricing theory and multiple variants of the dividend growth model. The CAPM is the most widely used and provides the logic of the investors thought process when evaluating different securities; as such it is highly popular.

2.1.2 Liabilities (debt)

Debt is when one entity borrows money from another, and is contractually bound to repay the money lent and usually an additional amount of money in consideration for the use of these funds over time. The contract can be in the form of notes, certificates, bonds, debentures, mortgages and leases. It will usually stipulate repayment terms such as number of payments, timing of payments, length of contract, amount of interest to be paid and parties to the agreement, some may have other clauses which govern the agreement. Some of the clauses create further delineations and classifications of the debt type such as priority of repayment (seniority of debt in relation to other debt contracts), default mitigation clauses (minimum

working capital levels etc.) and pledges of other assets in lieu of the monetary debt repayment. One thing however remains constant, it is a contract and therefore payment is enforceable and this requires listing on the balance sheet, as equity holders are only entitled to what remains after debt holders are paid and this obligation needs to be disclosed. Should default occur, debt holders have first claim on repayment via financial distress mechanisms.

Advantages of debt financing:

- Tax Shield provision as interest payments are tax deductible
- Agency problem control mechanism, whereby management is forced to perform to ensure it meets debt obligations which are enforceable
- Debt does not hold an ownership right on the firm
- Debt is usually faster to obtain than equity

Disadvantages of debt financing:

- Obligation to pay is set
- Defaults will reduce credit rating, and cause cost of debt to increase
- Defaults can cause bankruptcy, insolvency and dismantlement of the corporation

Cost of debt financing:

The cost of debt, is the rate of interest paid to service the debt on the basis of a risk free rate, plus a premium paid on the perceived riskiness of the debtor, this is then converted to an after debt amount, as the interest payments are tax deductible.

The cost of debt is shown by the following:

$$\boldsymbol{K_d = (RFR + CR)\ (1 - T)}$$

Where:

- K_d = Cost of debt
- RFR = Risk free rate of return
- CR = Credit Risk premium, as a percentage
- T = Tax rate

2.1.3 Weighted Average Cost of Capital

While finding a balance between the types and sources of financing, a vitally important concept is one of the Weighted Average Cost of Capital (WACC).

$$\boldsymbol{WACC} = \boldsymbol{W_d}\ \boldsymbol{K_d}\ (\mathbf{1} - \boldsymbol{T}) + \ \boldsymbol{W_e}\ \boldsymbol{K_e}\ + \boldsymbol{W_P}\ \boldsymbol{K_P}$$

A firm will use its WACC as the discount rate for projects it is evaluating to undertake, unless there is a project specific rate of financing. Firms can also be valued using their WACC as the discounting factor for future cash flows. Thus the lowering of WACC is able to mathematically increase firm growth, as access to finance at a lower cost allows for greater returns on projects using a Net Present Value evaluation methodology. This makes more projects feasible and thus increases investment opportunities for the firm, leading to growth. Lowering WACC therefore increases the value of the firm for two reasons, one being a higher growth rate (if not systematically determined by other factors) and secondly as the discounting factor decreases in valuation calculations, the resultant value increases. Admittedly, both the reasons are due to the same arithmetical phenomenon, as the discounting factor reduces, a higher resultant value is produced, they are however two very different channels, through which the effects can be measured. It can therefore be concluded that a lowering of WACC will cause the firm value to rise, which is to the benefit of the owners of the firm and is therefore important for firms.

2.2 The origin of capital structure theory

The seminal works of Modigliani and Miller (1958, 1963), are the basis from which all work on capital structure originated. The pioneers in the field of capital structure have been instrumental in the formation and interest in capital structure. They have been rewarded with Nobel Prizes for their work, a sure sign of the significance of their contribution to the field of finance. Due to its importance, their work will be reviewed independently of the theories predicated on the theoretical underpinnings developed by MM.

2.2.1 Modigliani and Miller capital structure irrelevance

Modigliani and Miller (1958) proposed that the value of the firm is not affected by the capital structure of the firm and that as you gain more weight in debt your equity becomes more expensive. Their work is predicated upon a set of assumptions which enable them to neglect certain realties of financial markets and to work towards their aim of understanding investor behaviour.

The key assumptions made by Modigliani and Miller (1958) are:

- No taxes (they relaxed this across their work, leaving the same results if average cost of capital remains the same as the true cost of capital)
- No brokerage costs (transaction costs)
- No bankruptcy costs
- Individuals and firms borrow at the same rate
- No information asymmetry between firms managers and investors
- Cash flows are in perpetuity
- Arbitrageurshave the ability to undo or inversely create "corporate" leverage by building a portfolio of their own

Modigliani and Miller (1958) made two propositions which hold true under the listed assumptions. These two propositions initiated a dialogue across academia which has lasted for decades and still remains unsolved.

MM Proposition 1: The market value of a firm is independent of its capital structure.

$$\boldsymbol{V_{unlevered} = V_{levered}}$$

MM Proposition 2: The expected return on equity relates in a linear manner to the debt to equity ratio of the firm. This is to say that the capital structure or mix of debt and equity used to finance the firm has no effect on the market value of the firm and that as you have more debt in the structure your equity becomes more expensive.

$$\boldsymbol{K_e = K_{e\,unlevered} + \frac{D}{E}(K_{e\,unlevered} - K_d)}$$

One is able to deduce from the two propositions that the firms value is derived from its income and not the manner in which it is split to capital providers. As leverage increases, the expected return on equity will increase, as equity investors perceive the level of risk in the investment to be increasing. The rise in the cost of equity is offset by the lower cost of debt which is taking up a higher percentage allocation of the capital being utilised.

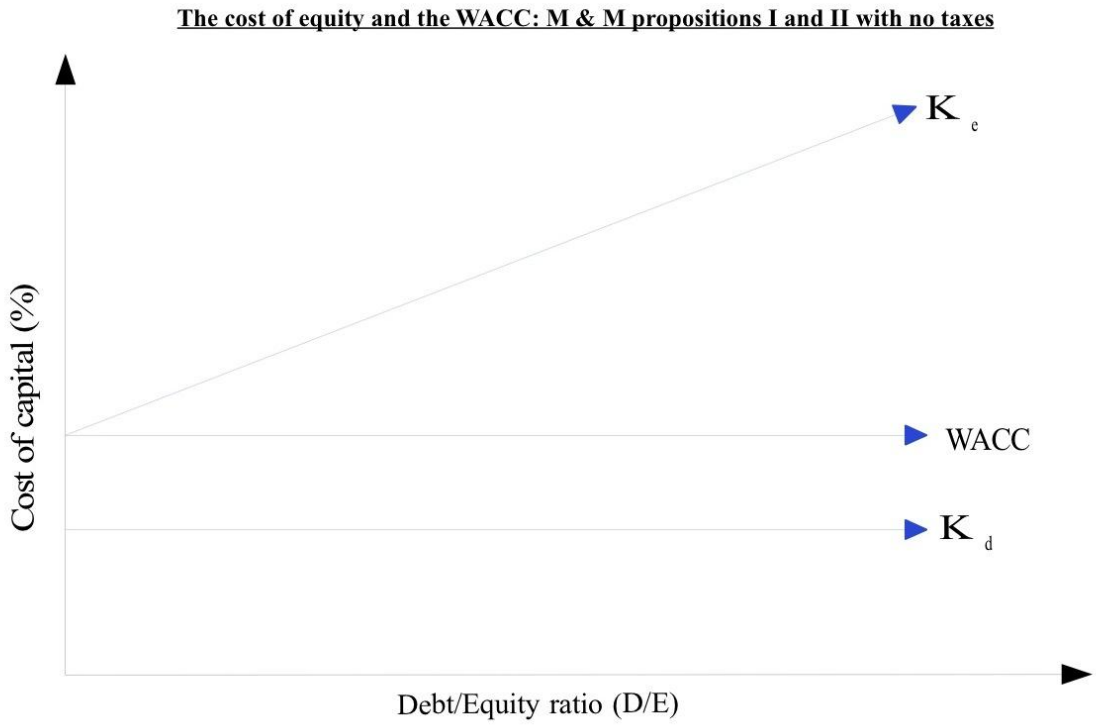


Figure 1: MM and WACC with no taxes

Adapted from: Firer, Ross, Westerfield and Jordan (2012:499)

The above figure illustrates that as the Debt to Equity ratio increases, the cost of equity rises, this is offset by higher usage of a lower cost debt and results in the WACC remaining constant, as it is a weighted combination of the two. This shows both Modigliani and Miller's (1958)propositions are related, as the cost of equity financing changes, the capital structure allows for more debt and the WACC is constant, thus the firms discounting factor in valuation also remains constant, leaving the value of the firm unchanged.

2.2.2 Modigliani and Miller adjusted to account for corporate taxes

Modigliani and Miller (1963) issued a correction to their work, which incorporated corporate taxes and their effect on the cost of capital. This correction was issued as corporate taxes are a reality that cannot be avoided, the original model was heavily criticised based on this specific assumption. Interest payments on debt are tax deductible, as such the effect of debt is to create a tax shield. A tax shield is the present value of the tax saving due to having a lower net profit/operating income from which to levy the taxes due to the deductibility of interest payments on debt. This in essence makes debt a cheaper source of financing than the stated interest rate and as such the after tax cost of debt is utilised when working with debt. This

makes the WACC decrease as more debt is utilised in the capital structure, resulting in a higher firm value, as its discounting factor has reduced. .

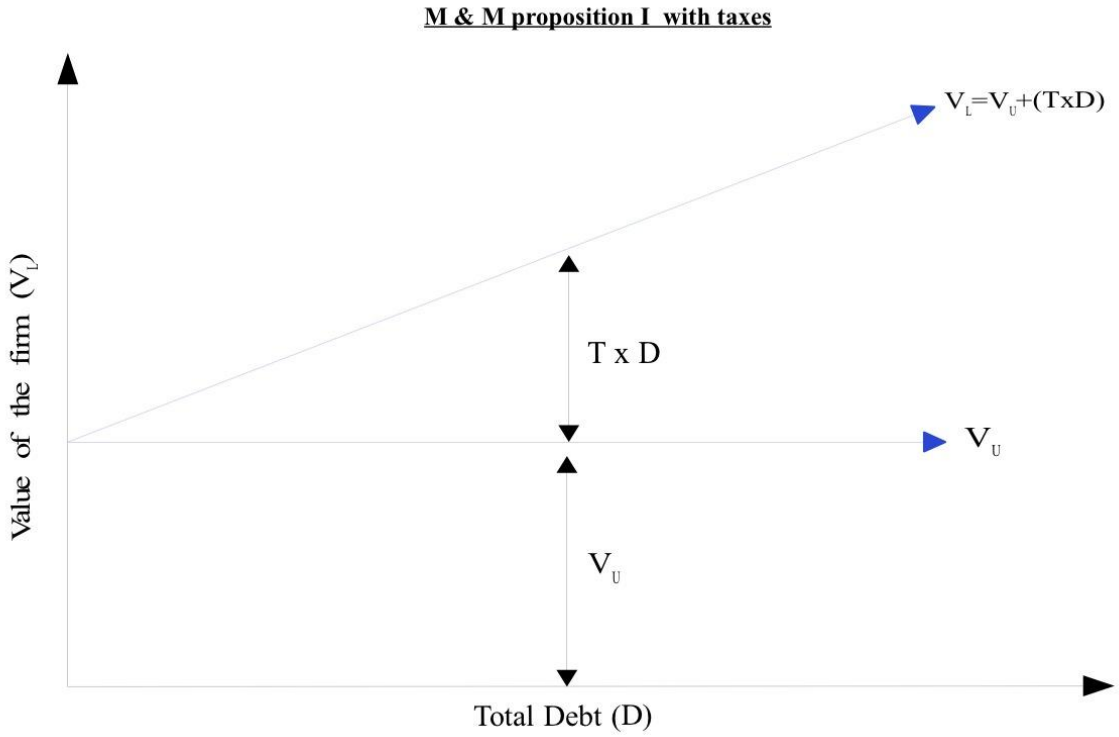


Figure 2: MM Value of firm with debt

Adapted from : Firer, Ross, Westerfield and Jordan (2012:503)

The above figure illustrates, that the tax shield provided by debt, causes the leveraged firm to have a higher value, thus $\boldsymbol{V_{levered}}$is higher by the anticipated tax shield.The values of the unlevered firm $\boldsymbol{V_{unlevered}}$is constant, in reality the line showing $\boldsymbol{V_{unlevered}}$is extended for ease of comparison, but it should only be the intercept with the firm value. The X-axis is showing usage of debt, of which there should be none in an unlevered firm, or if we revert back to Modigliani and Miller's (1958)original work which assumes no tax and there being no existence of a tax shield, meaning WACC remains constant resulting in firm value also remaining constant.

Therefore the inclusion of tax and tax shields, shows that a levered firm can in fact have a higher value, this creates the argument that firms should utilise debt and create leverage in their capital structures. The following figure shows that as the tax shield lowers the WACC, the discounting factor utilised to value firms will decrease, thus producing a higher value. The figures 2 and 3 are thus a linked explanation of the incorporation of tax into the

framework as proposed by Modigliani and Miller (1958) to produce the Modigliani and Miller's (1963) framework, which is the basis utilised in further capital structure theorems.

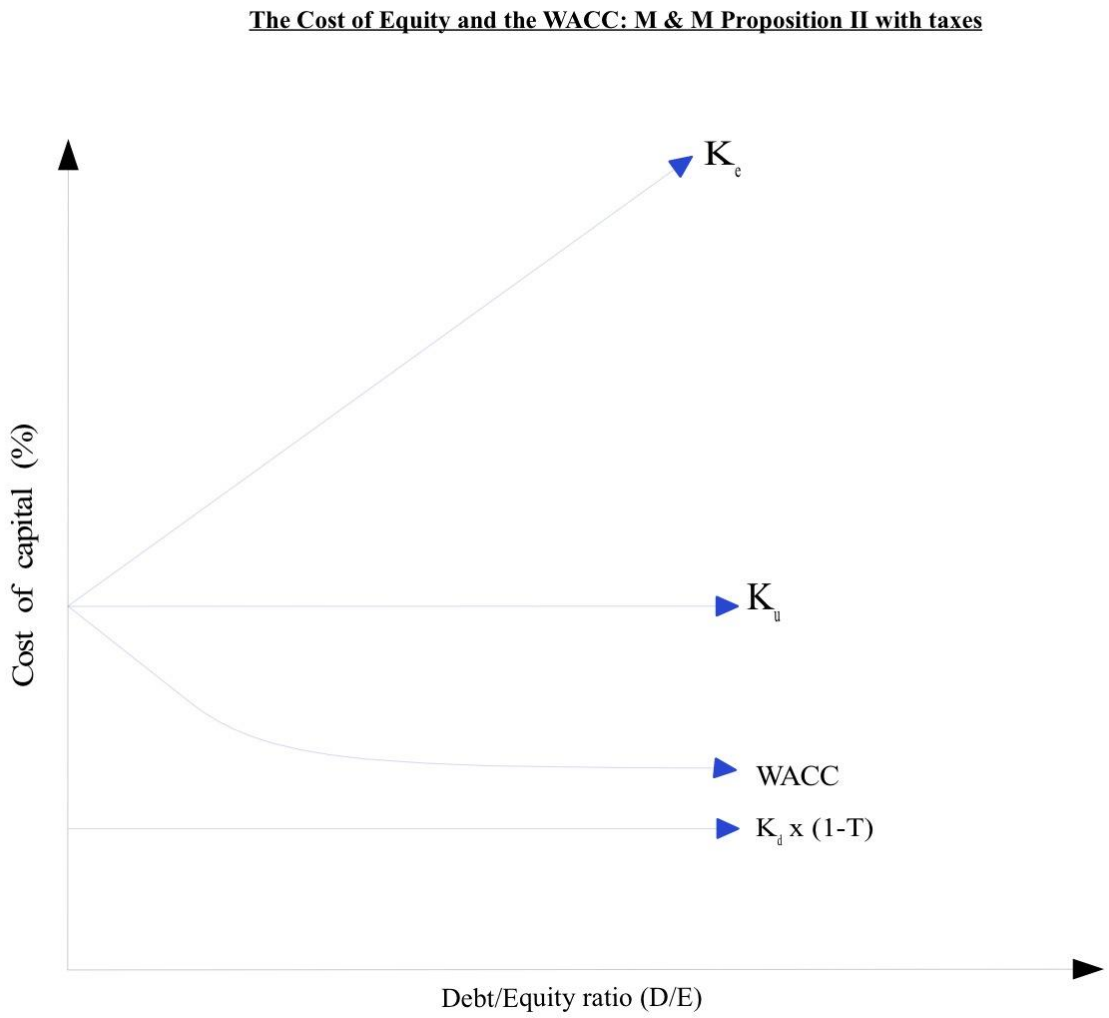


Figure 3: WACC with taxes

Adapted from: Firer, Ross, Westerfield and Jordan (2012:505)

2.3 Competing theories on capital structure

Due to the assumptions under the MM propositions (both 1958 and 1963) not being realistic in a world with capital market imperfections, as well as the dynamic nature of markets much work has been conducted empirically and a few competing theories on capital structure have been spawned. This topic has come to the forefront of the financial discourse, as it has significantly risen in importance, due to the credit boom over the past few decades having added significant amounts of leverage into most balance sheets. The credit boom was caused

by low costs of debt, causing firms to be able to rapidly expand on borrowed funds and further increase their valuations as WACC'S dropped.

The majority of the discourse revolves around the concept of an optimal capital structure, that it is impossible to prove with any certainty or rigid formula remains no surprise to the researcher. To extrapolate a mechanical mechanism applicable to all firms in all situations should be impossible. Variability in firm's behaviour will always cause any rules of thumb to fail. This is not to say that there is not an optimal structure for each individual firm, as there clearly must be, what form it takes and how to get there, however is dependent on its unique characteristics and situation. Each firm is unique and thus possesses a unique form. There may be many homogenous outcomes but the formulation of the optimal capital structure is speculation from firm outsiders and determined by management on the inside. Management is invariably made up by humans who base their own decisions on their specific knowledge sets which differ immensely. What we can conclusively deduce is that each firm analyses their situation to the best of their understanding and makes their decisions based on achieving their set objectives, which can be radically different from the financial worlds acceptance of increasing shareholder value.

The credit boom of the last few decades, lead to low cost debt being utilised to capitalise on growth opportunities, leading to vast increases in the levels of leverage on balance sheets. Many firms are now aiming to deleverage and are once again reviewing their capital structure policy. The major loss of liquidity in global capital markets, damaged heavily leveraged firms, while financially conservative firms weathered the crises significantly better. The hangover effects of the credit crises have once again placed the topic capital structure, and its theoretical advancements into the lime light of financial discourse of late.

It is commonly understood that the maximisation of shareholder wealth is the ultimate goal of management, this can be said to be universally true, however in the short term there are a variety of other goals which may appear to be contradictory, this truly makes one wonder if the optimal capital structure can ever be found as it is actually a moving point or form. Ramjee and Gwatidzo (2012) postulate a similar idea, whereby they recognised that most capital structure research designs are static and thus assume firms to be at their optimal point however shocks move firms away from optimal. They concluded that capital structuring is far more dynamic than that and "firms may be forced to move towards a moving target" (Ramjee & Gwatidzo, 2012:53). Much like modern economic theory which is equilibrium based as it allows us to understand the dynamic nature of that which we are studying, it is however not

able to accurately place the true exact spot (at least for any prolonged period of time) as it is constantly in flux. Thus what is optimal today is in fact not optimal tomorrow or the day thereafter. There is a multiplicity of competing theories for how a firm forms its capital structure. Each theory has a point to it and is useful in understanding capital structure holistically, therefore each major theory must be reviewed to glean the wisdom it enshrines. Rasiah and Kim (2011) performed a theoretical review of the capital structure theories and concluded that the two major theories, the static trade off theory and the pecking order theory, are not mutually exclusive, although they are usually pitted against each other as contesting theories.

2.3.1 Static Trade off theory

The tax deductibility of interest payments on debt provides a tax shield for the use of the debt. This tax shield provides a benefit to the firm, which is offset against the costs of repayment and issuance of the debt. Rasiah and Kim (2011), show the static trade off theory estimates the optimal capital structure as the point where the net tax advantage of debt balances the leverage related costs such as financial distress and bankruptcy.

Myers (1984) argued that firms following this theory are likely to have target level of leverage, when the move away from this, they will adjust back towards their optimum, this optimum will shift as the firm's assets and investment opportunities change. Rasiah and Kim (2011), argue that in light of the target adjustment nature of the model, we can expect firms which exceed their target ratio to reduce their debt, as the costs of holding the debt exceeds the tax benefit received. The opposite remains true, firms below their target level of debt, are expected to issue more debt as there are still potential tax benefits to realise.

Rasiah and Kim (2011) recognised the agency cost mitigation benefit debt provides as an alternative benefit beyond the tax shield benefit, as interest payment on debt are fixed obligations and managers of firms are forced to repay this, where as they might misuse free cash flows on perquisites or poor investments. This provides a link to the agency cost theory of debt and shows the interrelated or not mutually exclusive nature of the theorems.

2.3.2 Pecking order theory

Pecking order theory states that there is an order of preference in which firms acquire additional funds, based on the properties of the various sources available. Firms will utilise

their internal equity first such as retained earnings, they then prefer debt and lastly will issue new equity.

There a various reasons for the order, Rasiah and Kim (2011) argue that information asymmetry plays a key role in the pecking order theorem. Information asymmetry, is very crudely when one party knows more than another, thus giving it a knowledge advantage. Internal funds such as retained earnings require no disclosure to be used, while debt and external equity requires partial disclosure of propriety financial information. Retained earnings enjoys first place as it does not bear floatation cost, or costs to access it, while debt and external equity does. Debt is second as it provides a tax shield benefit and has a relatively low floatation cost to attain it, where as external equity has many flotation costs. External equity has the possibility to affect the control of the firm, which is why it is the least preferred method of raising capital according to pecking order theory. External equity could be raised via a private placement which would not affect the control of the firm, if all parties partake. This is however a costly exercise as debt can usually be attained at lower rates. Debt equity hybrids such as preferred stock could arguably be second, third or fourth in preference based on the covenants attached to it, it is usually after debt (thus third) and before equity in its level of preference.

Matemilola and Bany-Ariffin (2011) state that according to the theory, a negative relation between profit and debt is expected. This is due to profitable firms having large amounts of retained earnings to finance their expansion and the preference for internal equity to be utilised first.

2.3.3 Agency Cost theory

Agency cost theory, revolves around finding an optimal structure by minimising the costs associated with conflicts of the parties involved. The parties involved would be shareholders, debt providers and management of the firm. Management which controls the firm's funds may be inclined to taking perquisites and/or pursuing poor investments, as this is likely to benefit themselves at the cost of shareholders. Debt has fixed payment obligations and potentially the right to liquidate the firm's assets, a situation detrimental to both shareholders and management. The legal redress offered by debt provisions, thus causes management to operate efficiently, ensuring their job longevity by meeting interest payments timely and thus align themselves to the ideal of shareholder wealth maximisation. Rasiah and Kim (2011) postulate that when approaching financial distress, equity holder may push firms to in essence

expropriate funds from debt holder to equity holders. This is mitigated by savvy debt holders will thus require a higher rate of return, if the potential for this wealth transfer exists.

One can deduce from the agency cost theory that, it is a universal theory, which is not mutually exclusive of either pecking order or static trade off. The agency problem exists and needs to be managed in both static trade off and pecking order models. Thus many see it a secondary model, one with insights into agency issues rather than purely a decision tool for capital structure. This could be brought about as empirically, agency cost theory is very complicated to measure and quantify, where as pecking order one tests for the order in which funds are accessed and static trade off one tests for a target leverage level.

2.3.4 Market timing theory

The market timing theory states that firms issue equity when management perceives equity to be overvalued in the market, and to repurchase them when undervalued, thus the firm can profit from the markets incorrect pricing. Thus a firm's capital structure is dependent on previous market valuations and not on achieving an optimal structure or following an order of preference.

This theorem has received little attention academically when compared to trade off theory and pecking order theory. This could be due to it being highly challenging to prove mispricing has happened in the equities market, when following an efficient market viewpoint, and proving what management values the equities at, as their variance on the market valuation is due to information asymmetry.

On the face of it, it is logical that firms would attempt to time the market when issuing equity, but would that constitute a valid reason for needing the funds in the first place? A firm first needs a reason for requiring additional funds, when the need is identified at that point, the firm weighs the costs and benefits as well as their situation with regards to an optimal point and base their decision on which financing source to utilise. When the issuance of equity is required, all firms would attempt to time the market for maximum benefit of the firm.

2.4 The economy and capital structure

Baum, Caglayan and Rashid (2013) argue that the current capital structure theorems, attempt to explain the factors affecting a firms capital structure decisions, but much empirical research is contradictory. With various studies providing contradictory results, as well as not

being fully explained by the theories currently proposed, Baum, et.al (2013) concluded that there must be more to the picture. Baum, et.al (2013) proposed that macroeconomic risk as well as firm specific risks, did not only affect the credit risk of firms but the security issuance decisions as well. Their results showed that firms are more sensitive to their own risk factors than macroeconomic factors. They did however conclude that the larger business environment does have a meaningful impact and that more research is needed on this topic.

Matemilola and Bany-Ariffin (2011) state that South Africa has experienced rapid changes in recent history, as shown by the business cycle phases, having effects on the manner in which firms operate and causing capital structure decisions to change with the up and down movements. Ramjee and Gwatidzo (2012) discuss various studies completed with dynamic models for capital structure speed of adjustment towards an optimal structure. They found that in many studies, there are differences in the speed of adjustment based on the economic cycle, and that shocks, such as macroeconomic factors do exert influence on capital structure. The modern economists research capital structure with dynamic models, which attempt to capture the speed of adjustment of capital structure towards an optimal or target structure when various shocks occur. Baum, et.al (2013) showed that this speed of reversing deviations away from a target, will have the power to show if there is in fact a target (as trade off theory maintains) or if firms behave in a manner more consistent with operating without a target.

The linkage from the economy to firms capital structure decisions, has been proven, this paper intends to identify in a South African context the extent of the effect and to glean further insights into it.

2.4.1 Economic indicators

Yeh and Roca (2010) in a study on Taiwan's plastic, textile and electronics industry, split the business cycle into peaks and troughs. When at a peak in the business cycle, growth opportunities were seen as severely limited and vice versus, when in a trough, growth opportunities were seen as many. Yeh and Roca (2010) utilised an external body, they utilised the Business Indicators as compiled by the Council for Economic Planning and Development of executive Yuan of Taiwan. They thus utilised discrete periods of time, whereby the factors combined into the business cycle, confirmed a point of peak or trough of that business cycle. Thus, they did not investigate individual economic indicators, but sought to understand the combined economic indicators effects at points in time.

Mans (2010) conducted a study on JSE listed industrial firm's response to economic variables, utilising the following indicators her results are documented as follows:

- Gross Domestic Product (GDP) growth, is an important and widely quoted economic indicator. Is shows the growth of GDP which is the percentage change in real GDP. GDP is the total market value of all products and services produced by the economy, in a given year (Mans, 2010). When GDP is expanding more economic widgets are changing hands. This is a desired factor, as trade increases, profits are also expected to increase. Mans (2010) also discussed that slow growth is associated with low investment and as such diminishes the available financing sources for firms.
- Inflation (CPI) measured by the Consumer Price Index, shows the price changes of goods and services typically purchased by consumers. Mans (2010) argues that inflation effects the interest rate and confidence in a economy, with high inflation typically matched by high interest rates to control the inflation. The higher interest rates increase the cost of debt as well as reducing domestic demand and slowing economic growth.
- Interest rates as measured by the Repurchase rate of South Africa (Repo rate), which is a short term lending rate set by South Africa's central bank the Reserve Bank of South Africa. It is a benchmark rate and sets other interest rates such as those paid on debt covenants.
- Rand Dollar Exchange Rate R/$, Mans (2010) states that exchange rate appreciation (increase in price of domestic currency relative to the foreign currency) tends to cause large capital inflows into a country and can provide liquidity and access to foreign capital for firms.

Mans (2010) concluded that the economic variables had no significant effect of the capital structure of firms in South Africa. She believes that it is the interrelationships of the economic variables which are difficult to capture that lead her results to be insignificant. The

lack of a direct measure to account for multi- co-linearity in her study reduces the predictive power of her study. The study used the debt equity ratio as the dependant variable for leverage and ran the regressions against the economic indicators. Thus the critical failure of the research methodology could be the lack of measuring firm specific factors affecting capital structure (such as size, age, asset tangibility, tax and profitability).

2.4.2 Boom and bust periods

The ability of a firm to access finance from capital markets is linked to the health of those markets. When markets are rapidly expanding and in a boom phase, credit conditions are favourable and debt may be accessed at lower costs. The inverse also remains true, as the economy suffers, debt becomes more expensive and is less likely to be taken on by firms which focus on the cost of the debt. Although the cost of debt is not the only factor which affects firms decisions on which forms of financing to access. The various economic forces at play form a situation which is firm specific based on their unique situation and exposure to each factor. Although a change in one factor alone is not likely to have a severe impact, when combined, changes to multiple factors could have a larger effect.

Amaral, Lima, Filho and Neto (2012) argue that it is by capitalisms very nature, that firms should utilise their own profits to expand. This implies that when firms are profitable they are less likely to engage in extensive use of leverage. Firms are however susceptible to the prevailing economic situation and could be less profitable or even unprofitable in periods of economic hardship. One would therefore expect the usage of debt, most notably short term debt to increase, in order to keep the company functioning, the view of Amaral, et. al (2012) is thus consistent with the pecking order theory of capital structure.

2.4.3 Business cycle's in South Africa

The South African Reserve Bank (SARB) reports the composite business cycle indicator. It is constructed from various time series generated from statistical data recorded by various government departments. The component time series include:

- Building plan approvals
- Volume of manufacturing orders
- Interest rate spread (10year Gov bonds minus 91 Day Treasury bills)
- Passenger vehicle sales

- Composite leading business cycle indicators of South Africa's major trading partners
- Job advertisements
- USD base commodity price index for RSA main export commodities
- JSE index
- Growth rate of M1 money
- Average hours worked by manufacturing labourers
- Gross operating surplus as a percentage of GDP
- Business confidence index

It is constructed with various time series which will accurately capture the business cycle in South Africa. The SARB reports the composite business indicator in a leading series, a coincident series and a lagging series. Additionally the SARB provides a quarterly bulletin which states the business cycles South Africa has experienced since 1945.

Auret, Chipeta, and Krishna (2013) conducted a study to analyse the effects of the macroeconomic conditions on the capital structure adjustment speed for JSE listed firms. They produced a robust and insightful study which provides much insight into the South African economy and the way firms adjust their capital structure to variations in the economic cycle. Auret et.al. (2013) concluded that there is evidence showing macroeconomic conditions do affect the speed at which firms adjust their capital structures towards a target. There is a significant difference in the speeds of adjustment in certain macroeconomic states than others, however the degree to which the adjustment speeds alter is highly sensitive to the definition of macroeconomic states used and the measure of debt (total, long term or short term).

Auret et.al. (2013) defined the macroeconomic states with the following indicators: GDP, term spread, CPI, equity index, Composite business cycle indicators (leading, coincident and lagging). The authors argued that there may be many more indicators which could provide insights, they all essentially capture the business cycle and its movements, and as such utilising variables which capture this cycle would be adequate.

The (Auret, et. al, 2013) study revealed that for total leverage, adjustment was higher in good states when defined by equity index, CPI, leading indicator and lagging indicator. While the

opposite occurred when the state was defined by term spread, GDP and the coincident indicator that speeds of adjustment were faster in poor economic states.

The (Auret, et. al, 2013) study revealed that for long term debt the speeds of adjustment reduced significantly, almost by half when compared to total leverage adjustment speeds, showing firms take longer to position themselves for long term targets. Of specific interest is that firms were found to adjust towards long term targets faster in unfavourable states, when utilising all the indicators bar one, the CPI is the only indicator which showed the reverse, that firms adjust faster in good economic states.

The (Auret, et. al, 2013) study revealed that with regards to short term leverage, speeds were extremely high, in some cases even exceeding 100% showing that the firm moved from one side of the target and overshot it, and ended up over adjusting. In most cases they found adjustment speeds to be higher in states of macroeconomic downturn.

Overall Auret et.al. (2013) found weak evidence to support the notion that firms adjust towards targets faster in good states than in bad states. The evidence suggested that firms adjust faster in bad states, which Auret et.al. (2013) suggested shows that there is a higher cost when deviating from the target in these states. The speeds of adjusting short term leverage were significantly higher than for long term debt, Auret et.al. (2013) believes this is due to the low transaction cost and high impact of such an adjustment, as well as South African firms relying on short term debt more heavily overall. This conclusion should come as no surprise as in its name, short term, the nature of the contract itself is a quick one, and as such they can be entered and exited with relative ease.

Bosch and Ruch (2012) conducted research whereby they tested the current SARB business cycle identification and classification model against various other models to determine and classify business cycles. Their purpose was to unify theory and statistical approaches and enhance the accuracy of the SARB method. There results found that the SARB current methodology that dates the business cycle generally coincide with the alternate dating methodologies (Markov switching, Principal components analysis and Bry Boschan method). Bosch and Ruch (2012) concluded with their findings that the alternate methods confirm the validity of the SARB dating methods.

2.5 Conclusion

Capital structure is still a contentious topic, there are supporters of most theories and empirical data shows conflicting evidence. There are numerous studies on factors affecting capital structure, resulting in there being two major competing theories. The static trade off theory which states firms balance the costs and benefits of holding debt and find an optimal level and target that level. While the pecking order theory, does not find an optimal level, it states that firms merely have a preferred order of the manner in which they source additional funds, being internal equity, debt, and the external equity.

Macroeconomic factors do have an influence on capital structure. Modern day financial economists utilise speed of adjustment measures to identify the speed at which firms adjust their capital structure to various macroeconomic factors. In a South African context Auret et.al. (2013) found that the manner in which the economic state is defined has a large effect on the results of various studies, and also that the measure of debt (short term, long term or total) showed varying results. The South African Reserve bank provides an accurate measure of the business cycles as corroborated by additional studies (Bosch & Ruch, 2012). The purpose of using macroeconomic variables is to capture the business cycle's effects on firms financing choices.

This research is valid as there is a scope to further document the relationships identified, as the business cycle will have an effect on firms financing choices and the resultant capital structure. It could aid them in managing their risk profile according to credit cycles.

3 Chapter 3: Research questions and hypothesis

Due to the ongoing nature of the capital structure debate and the lack of study in an emerging market context, this research is intended to provide insights into the decision making process of firms on the Johannesburg Securities Exchange.

Corporate managers require benchmarks, to ensure they are able to set targets relevant to their firm as well as their relative industry. Knowing whether there are significant differences in capital structure across firms in one's industry will enable managers to identify if they are over or under leveraged, and what options they have available to finance their firms. This is in the spirit of understanding their respective industries norm and if they are satisfied with their position relative to it. Knowing how the industry reacts to boom or bust cycles, will provide insight for managers to position their firms correctly and make well informed capital structure decisions.

The differences across industries in terms of capital structure will provide insights into the operations of the industries and their need for the different sources of capital. This will enable the industries as well as capital providers to determine which industries could be targeted for increased usage of their capital offerings. Understanding of the nature of capital structure changes during economic cycles as well as which cycle the sector is currently in, will provide valuable insight into the nature of the decisions firms are likely to take. Will they be taking on/seeking equity, debt and/or a combination in the near future and how will the firm be structured after this decision.

3.1 Research hypothesis

Based on extant empirical studies, the followinghypotheses will be tested statistically.

3.1.1 Hypothesis 1

H_0: There is no significant difference in capital structure between industries

$\mu_{it} = \mu_{it} = \mu_{it}$ (Industry mean Debt/Assets ratio is homogenous)

H_A : There is a significant difference in the capital structure between industries

$\mu_{it} \neq \mu_{it} \neq \mu_{it}$ (Industry mean Debt/Assets ratio is heterogeneous)

3.1.2 Hypothesis 2

Hypothesis 2 will establish if there is a difference in capital structure during boom periods and bust periods of the macroeconomic cycle.

H_0: There is no difference in the mean Debt/Assets ratio (capital structure) between the boom periods and recessionary periods of the macroeconomic cycle

$\mu_{ib} = \mu_{ir}$ (Debt/Assets ratio is homogenous, capital structure constant in boom periods and in recessionary periods. This will be shown by the use of a dummy variable (D1), which if insignificant shows homogeneity)

H_A : There is a difference in the mean Debt/Assets ratio (capital structure) between the boom periods and recessionary periods of the macroeconomic cycle

$\mu_{ib} \neq \mu_{ir}$ (Debt/Assets ratio is heterogeneous, capital structure is not constant in boom periods and in recessionary periods of the macroeconomic cycle)

3.2 Research Questions

Below are the research questions and following each question, is a discussion on each question and its relevance to the study. These questions are stepping stones in the research process. Once they have all been answered, the two main hypothesis can be tested and the results analysed.

3.2.1 Is the proposed model the best model to provide the required insight?

Further literature review wasconducted to ensure that the major independent variables are accounted for and are applicable to the South African context. Previous models utilised in similar studies were assessed and an applicable model was constructed to capture the effects under study. Please refer to Chapter 4 for the model which this study will utilise.

3.2.2 Which industries should be studied?

Question 2 relates to the Johannesburg Securities Exchange (JSE), which has many firms. They are categorised into industries which are homogenous in terms of products and or services offered and their regulatory and operating environments. In order to capture if

industry difference in debt level exists, a selection of industries which are heterogeneous is needed.

Yeh and Roca (2010) conducted their study on Taiwanese firms and argued that a sample of firms which included industries which are capital intensive, labour intensive as well as technology intensive would suffice in capturing industry specific effects. They need not utilise all listed firms for their study but could utilise the various industries to capture differences Yeh and Roca (2010) selected, textiles, plastics and electronics industries as these stratified the various factors intensities (capital, labour and technology).

Talburg, et.al. (2008) selected five industries to conduct their study on industry level difference in capital structure. They argued that growth industries have more opportunities to grow and thus could need more debt. However they made various arguments around each industry they studied, Talburg, et.al. (2008) did so as they believed that each industry is operating under different economic conditions which were expounded upon in relation to each industry. Talburg, et.al. (2008) argue that food industries are more stable as food is a necessity, whereas the construction industry is more volatile as building plans get cancelled in economic downturns. They also highlighted the capital intensive industry of oil and gas (which is very limited in South Africa) and the new economy with the Information Technology industry as it showed new growth prospects and significantly different debt levels.

For a Study in South Africa, the Industries of the Johannesburg Securities Exchange were reviewed and the industries of interest selected. This will be in line with Talburg, et.al. (2008) and a stable industry, a highly variable industry and a new economy industry have been selected.

Heavy construction industry is known to be very sensitive to changes in the macroeconomic environment (Talburg, et.al. 2008) and therefore is expected to produce significant results.

Farming and Fishing industry is a food generation industry and is a more stable industry (Talburg, et.al. 2008), and is expected to be less inclined to move with the macroeconomic environment.

Computer Services industry is a new world industry heavily rooted in the use of technology and also a service oriented industry and typically posses small amounts of fixed assets

compared to other industries (Talburg, et.al. 2008) while maintaining strong growth prospects.

3.2.3 How should the boom/bust cycle be classified?

The economic cycle needs to be defined for the study period and then the periods in the study can be allocated to be either boom or bust depending on the definition of the cycle. The South African Reserve bank, publishes a quarterly bulletin which classifies the periods for years subsequent to 1945. Bosch and Ruch (2012) confirmed the validity of the SARB dating methodology and found it to be accurate when compare to other econometric methodologies, thus confirming its validity. Chapter 2 provides insight into macroeconomic indicators usefulness in determining the business cycles, while chapter 4 allocates the years in the study according to the SARB's dating schedule.

4 Chapter 4: Data and methodology

This chapter will lay out the methodology utilised in this study, specific emphasis will be placed on the model utilised to test the hypothesis.

4.1 Base unit of study

Firms are the base unit of study, as the research intends to provide insight into their behaviour, specific financial variables are utilised from each firm. The base units (firms) are then grouped into their industry to show if a trend exists.

4.2 Population and Sample

The population for this study is all listed firms on the Johannesburg Securities Exchange, with more than 5 years of financial data publically available in the period 1995 – 2012 within the three selected industries: Heavy construction, Farming and fishing and Computer services. This sample was selected as it would provide insight into the industry specific reactions to variations in the business cycle. It is an unbalanced panel (Brooks, 2008) of firms, as the number observations for each firm varies, and may occur at different times.

The financial sector and industries will be excluded from the study, as is the norm for capital structure studies, such as those completed by;Amaral, et.al. (2012); Gwatidzo and Ojah (2009); Matemilola and Bany-Ariffin (2011). There are various reasons for this, the major issue is that financial institutions list deposits as liabilities, which distorts the picture in terms of the firm having taken up debt in a more classic sense of having leverage. It is the very nature of the firm to have these liabilities and to delineate and separate them from debt taken from capital sources is both complex and time consuming. As such the financial industries were not considered to be included in the industries to be studied.

4.3 Sources of data

Secondary data will be the main type of data utilised. The data will be sourced from two sources, the South African Reserve Bank and the McGregor BFA database.

The South African Reserve Bank will be the source for the data, which shows how the years of the study need to be allocated to boom or recession. The SARB releases a quarterly bulletin which states how the SARB has classified the business cycle in South Africa. This paper utilised the full quarterly bulletin, which was released in December 2013.

The firm specific financial data, was extracted from their annual published financial statements, which are created and released to the public as part of their public listing requirements. This data is warehoused into databases, the McGregor BFA database was utilised to access the data. Dates of incorporation were located on the company's websites, this was utilised to capture the age of the firms, where a founding date was found it took precedent over a corporation registration date or a listing date.

4.4 Data Analysis

A statistical analysis software suite, namely EVIEWS (Version 7) will be utilised to analyse the data. Descriptive statistics on the data will be provided as well as inferential statistics which provide insight into the data.

4.4.1 Descriptive statistics

Various descriptive statistics will be utilised to gain an understanding of the data to be worked with. The mean is the arithmetic average of observations, with is their sum divided by the number of observations in the data set. Standard Deviation is the measure of deviation in which 64% of the observations will be found around the mean, both above and below the mean. The range of observations includes maximum values and minimum values of each type of observation. These descriptive or summary statistics, provides the researcher with a basic grasp of the variables with which they will be working and gives insights into the behaviour of the firms.

4.4.2 Regression

Regression will be the core method of analysing the relationships in the data. Brooks (2008) argues that it is one of the most powerful tools to analyse data, the core of the tool is the ability to explain movements of one variable by movements in other variables. It is the standard tool used in financial research. A regression uses a straight line model, where X and Y value are plotted and a line which minimises the distance between the points is fitted, this line is then analysed according to its intercept (α) and slope (β) along with a error term (u_t) which shows the effects the model did not capture. It generally takes the form of:

$$y_t = \alpha + \beta x_t + u_t$$

4.4.3 Panel data analysis

Panel data is data which has both cross sectional and time series properties. Brooks (2008) states that panel data encompasses information across both time and space. The basic panel data formula can be expressed as:

$$y_{it} = \alpha + \beta x_{it} + u_{it}$$

This expression is very similar to a regression, except it has various entities being regressed (represented as i) over time (t). These entities must remain the same over time, i.e. the same firm over many time periods.

The error term (u_{it}) captures the effects which the model did not capture, thus when it is very large, the model might not accurately capture all the effects, potentially showing a lack of relevant independent variables. When considering panel data the error term should be decomposed. Decomposing the nature of the error term, will show the researcher which panel methodology is correct, either Fixed Effects Modelling or Random Effects Modelling.

Fixed Effects Modelling (FEM) has an error term which can be decomposed as follows (Brooks, 2008): $u_{it} = \mu_{it} + v_{it}$. Where the μ_{it} captures individual specific effects, which are variables which affect y_{it} cross-sectionally but do not vary over time, such as the industry of the firm. While v_{it} is the remainder disturbance (Brooks 2008) which varies over time and entities, and captures everything left unexplained about y_{it} .

Random Effects Modelling (REM) has an error term which can be decomposed as follows (Brooks, 2008): $u_{it} = \varepsilon_i + v_{it}$. Where ε_i is a random variable that varies cross-sectionally but is constant over time (Brooks, 2008). Thus the major difference in the FEM and REM is the assumption on the randomness of a component of the error term (Gwatidzo & Ojah, 2009).

Due to the sample not being exhaustive, it is expected that REM will provide more accurate results, however due to convention, both REM and FEM will be utilised and the Hausman test results provided, to show which methodology is superior. Brooks (2008) shows that for Hausman test, P-values that are significant are either less than 0.05 (5% for 95 % confidence interval) or less than 0.01 (1% for 99 % confidence interval), p-value significance indicates that REM is not appropriate and that FEM would be the appropriate test.

4.5 Industries for study

Ramjee and Gwatidzo (2012) conducted a study which did not separate firms by sector (which is to group them for further analysis), they stated as a limitation in their study that "financial decisions may also be affected by the sectorin which a firm operates". This is an effect that this research intends to capture. Auret et.al. (2013) found median industry debt levels to be heterogeneous across different industries. Industries are groupings of firms integrated into the nearest homogenous group. They can be seen to be operating in the same environment, and thus the financial decisions taken with regard to capital structure may be expected to be similar.

Yeh and Roca (2010) and Talburg, et.al. (2008) selected certain industries for their studies on capital structure. Yeh and Roca (2010) selected, textiles, plastics and electronics industries as there stratified the various factors of production intensities (capital, labour and technology).Talburg, et.al. (2008) selected five industries as they believed that each industry is operating under different economic conditions. They focused on the magnitude of the expected movements to be identified, stable versus highly variable across the business cycle. As such the industries to be studied on the JSE should include a stable industry, a highly variable industry and a new economy industry.

Heavy construction industry is known to be very sensitive to changes in the macroeconomic environment (Talburg, et.al. 2008) and therefore is expected to produce significant results.

Farming and Fishing industry is a food generation industry and is a more stable industry, and is expected to be less inclined to move with the macroeconomic environment as food requirements are basic necessity (Talburg, et.al. 2008).

Computer Services industry is a new world industry heavily rooted in the use of technology and also a service oriented industry. Technology firms, tend to utilise equity financing for initial growth stages and there after utilise retained earnings, thus they are expected to be sparse users of debt, they also have relatively low levels of fixed assets when compared to other firms (Talburg, et.al. 2008).

4.6 Constructing a Model

This section of the paper, will identify the relevant firm specific variables based on extant studies, then it provides the framework by which the study will identify boom or bust periods and lays out the final model to be utilised in the study.

4.6.1 Firm specific variables:

Gwatidzo and Ojah (2009) utilised the following model to determine the capital structure determinants in 5 African countries including South Africa. Their data fit the model well and produced significant results which are relevant to emerging markets:

$$D_{it} = \beta_0 + \beta_1 AT_{it} + \beta_2 Tax_{it} + \beta_3 Pro_{it} + \beta_4 Size_{it} + \beta_5 Age_{it} + \varepsilon_{it}$$

- D_{it} = leverage of firm i in time t, computed as total debt divided by total assets or as long-term debt divided by total assets or as short-term debt divided by total assets.
- AT_{it} = asset tangibility of firm i in time t, calculated as non-current assets divided by total assets.
- Tax_{it} = average corporate tax rate of firm i in time t.
- Pro_{it} = the profitability, a ratio of operating income to total assets for firm i in time t.
- $Size_{it}$= size of firm i in time t, calculated as the log of total assets.
- Age_{it} = number of years since the incorporation of firm i in time t.

Ramjee and Gwatidzo (2012), built a model to identify the speed of adjustment of capital structure, they based their variables of factors which are known to affect capital structure. It included the dependent variable of leverage, both long and short term leverage. The independent variables they utilised include asset tangibility, profitability, firm size, reputation, growth, taxes and risk. Gwatidzo and Ojah (2009) utilised many of the same variables as Ramjee and Gwatidzo (2012) except they excluded the growth variable as they believe that profitability is a suitable proxy for growth, which is in contrast with Talburg et.al (2008) whom also utilised a growth capturing variable like Ramjee and Gwatidzo (2012) . Age, is proxy for the reputation of the firm, Ramjee and Gwatidzo (2012) argue that as firms age, they develop track records, have increased transparency and therefore lower information asymmetries. Allowing them easier access to external funds, thus age is used as a proxy for reputation, and is used interchangeably in some studies. De Vries (2010) utilised Earnings before interest and tax (EBIT) divided total assets as her measure of firm profitability, this measure makes sense as tax shields have not yet come into effect so higher debt firms will not have a skewed profitability based on their larger tax shields. Baum, et.al (2013) utilised Earnings Before Interest Tax and Depreciation to calculate the profitability. This study will

utilised the EBIT to calculate profitability. The more profitable a firm, the more free cash flows it will have available, these could be used to service interest payments and access more debt, however pecking order would expect more profitable firms to grow using internal equity. Asset tangibility provides insights into the amount of potential collateral assets a firm could use to access debt. The more tangible a firms assets are, the more collateral it has available, the higher the firms debt capacity will be, this capacity is however not always fully utilised and a prudent firm, would prefer to retain a sufficient buffer to absorb shocks.

Auret et.al. (2013) utilised the industry median debt ratio, based on previous studies which showed managers place value on their industries debt ratio as a contributing factor to determining their own policy. Firms in a similar industry could face homogenous adjustment costs, while firms in different industries could face heterogeneous adjustment costs (Auret et.al. 2013).

4.6.2 Macroeconomic variables

As per chapter 2, the allocation of periods into boom or bust periods of the macroeconomic cycle could be based on the following indicators, GDP growth, Inflation, Interest rates and the Rand Dollar (R/$) exchange rate as Mans (2010) did, however the results were insignificant. Auret et.al. (2013) found significance when utilising the composite business cycle indicators as reported by the South African Reserve Bank. Auret et.al (2013) argue that although there is a potential for use of extensive macroeconomic variables, the effect they capture is the business cycle, thus utilising an indicator which captures the business cycle is all that is necessary. This study will allocate years into either boom or bust periods based on the business cycle as shown by the South African reserve bank, in their quarterly bulletin releases which classifies the business cycle phases. Mostarac and Suzana (2013) conducted a study on Croatian enterprises, where they ran separate regressions on a year in either a boom (2005) or a bust period (2008). This provided significant results but is purely a snapshot of two discrete points in time, and might distort the results based on the nature of the cause of the crisis, as 2008 was a liquidity and financial crises, thus the results would show a lack of use of debt, as it was not available at reasonable rates. This study will see if JSE listed firms behaved in a similar manner in the recessions they experienced.

Business cycle phases of South Africa since 1945

Upward phase			Duration in months	Downward phase			Duration in months
Post war	–	July 1946	7	August 1946	–	April 1947	9
May 1947	–	November 1948	19	December 1948	–	February 1950	15
March 1950	–	December 1951	22	January 1952	–	March 1953	15
April 1953	–	April 1955	25	May 1955	–	September 1956	17
October 1956	–	January 1958	16	February 1958	–	March 1959	14
April 1959	–	April 1960	13	May 1960	–	August 1961	16
September 1961	–	April 1965	44	May 1965	–	December 1965	8
January 1966	–	May 1967	17	June 1967	–	December 1967	7
January 1968	–	December 1970	36	January 1971	–	August 1972	20
September 1972	–	August 1974	24	September 1974	–	December 1977	40
January 1978	–	August 1981	44	September 1981	–	March 1983	19
April 1983	–	June 1984	15	July 1984	–	March 1986	21
April 1986	–	February 1989	35	March 1989	–	May 1993	51
June 1993	–	November 1996	42	December 1996	–	August 1999	33
September 1999	–	November 2007	99	December 2007	–	August 2009	21
September 2009	–						

Table 1: South African business cycle phases

Source: SARB Quarterly bulletin December 2013

The study has a time frame from 1995 until 2012, resulting in the following distribution of years:

Boom or upward phase years will be: 1995 , 1996 , 2000-2007 , 2010 - 2012

Bust or downward phase years: 1997 – 1999 , 2008 and 2009

Business cycle time periods		
Period	**Nature**	**Years**
1	Boom	1995, 1996
2	Recession	1997, 1998, 1999
3	Boom	2000 until2007
4	Recession	2008, 2009
5	Boom	2009 until 2012

Table 2: Allocation of years in sample to business cycle phase

A major limitation of this method is that firms report their financial statements yearly and have differing year ends. The years as allocated to boom/bust are done so based on the majority of the year being in that state as reported by the SARB. The result is that the financial statements reported and the economic environment might not align perfectly in their timeframes.

4.7 The combined model

$$D_{it} = \beta_0 + \beta_1 AST_{it} + \beta_2 Tax_{it} + \beta_3 PRO_{it} + \beta_4 SIZE_{it} + \beta_5 AGE_{it} + D_1 Boom_t + \varepsilon_{it}$$

Where:

- D_{it} = leverage of firm i in time t, computed as total debt divided by total assets (TDR) or as long-term debt divided by total assets (LDR) or as short-term debt divided by total assets (SDR).
- AT_{it} = asset tangibility of firm i in time t, calculated as, non-current assets less intangible assets, divided by total assets.
- Tax_{it} = average corporate tax rate of firm i in time t, calculated as the tax paid divided by the profit before tax of the firm.
- Pro_{it}= the profitability, a ratio of Earnings Before Interest and Tax (EBIT) to total assets for firm i in time t.
- $Size_{it}$ = size of firm i in time t, calculated as the log (base 10) of total assets.
- Age_{it} = number of years since the incorporation of firm i in time t.
- $D_1 Boom_t$ = a dummy variable equal to 1 to capture if a bust period for time t, 0 otherwise.
- ε_{it} = an error term

4.8 Validity and reliability

All results will be analysed by conducting the appropriate statistical tests so that their statistical significance can be identified. Where significant the results will be appropriately discussed.

To add to the robustness of the results, both fixed effect and random effect panel modelling will be run, the Hausman test will be utilised to identify which results are more suitable to the model (Gwatidzo & Ojah, 2009; Brooks 2008).

4.9 Assumptions and limitations

The potential mismatch of firms financially reported data and the allocation of the year's economic state because firms report their financial data according to their year end, which may not line the actual year of operation with the year classification of boom or bust perfectly, thus causing a potential mismatch of the activity reported on in the financials not having the having occurred in the economic state as classified.

Delisted firms may or may not have accurately stored information accessible to the public. It is assumed their reported financial statements as captured by BFA McGregor were captured correctly for the time periods they were listed. It is assumed that the date of incorporation of a listed entity is a perfect substitute for the date of incorporation of a previously existing entity operating unlisted which transformed into the listed entity.

The cause of the crisis being studied, will have large effects on the outcomes on capital structure, the SARB business cycle identifier selected will not provide insight into causes, and thus there is a potential for unexplained results based on effects not captured in the model.

One limitation is the exclusion of financial firms and other industries which may engage in more complex financial transactions. The rise in financial engineering and the shifting of risks around market participants via extremely complex financial instruments may be obscuring the true state of the effects of capital structures in some of the largest firms, most especially those in the financial sectors of the economy. Although they (financial firms) are explicitly excluded from this study, it is a topic that requires more study in the future. One of the reasons capital structure investigations occur, is to understand the level or risk the firm is exposed to by utilising borrowed capital and the conditions of the use of said capital. The more debt utilised the more risky the firm is, yet many capital structure theorists have found that there is a scope for the use of debt in a positive manner as it opens the firm to new growth opportunities. However, with complex engineered financial products and our lack of the understanding of the integrated nature of the risk of said products, firms may be significantly more risky to provide capital to and need more analysis that merely peering into their balance sheet capital structure as a risk proxy, as many of the instruments are not listed on the balance sheets or are only listed at book risk and not potential risk.

5 Chapter 5: Presentation and analysis of results

The organisation of the chapter is such that the arguments around the hypothesis are presented in order, initially full descriptive statistics are provided and then inferential statistics with relevance to the hypothesis are presented, the chapter ends with a summary of the results.

5.1 Descriptive statistics table for pool and all industries

Pooled Data

	TDR	LDR	SDR	AST	TAX	PRO	SIZE	AGE
Mean	0.120355	0.048187	0.072168	0.282095	0.297787	-0.02666	5.580807	31.89865
Median	0.074706	0.010859	0.033989	0.242095	0.27049	0.082846	5.592127	22
Maximum	1.190575	0.416136	1.129726	0.975596	61.6	0.572107	7.446357	110
Minimum	0	0	0	0	-16.8181	-19.0654	3.226084	0
Std. Dev.	0.143856	0.076057	0.111846	0.208544	2.870048	0.943011	0.847805	27.43637
Observations	592	592	592	592	592	592	592	592

Farming and Fishing Industry

	TDR	LDR	SDR	AST	TAX	PRO	SIZE	AGE
Mean	0.157412	0.052662	0.10475	0.486844	0.601541	0.075034	5.583306	49.37342
Median	0.089361	0.00284	0.054844	0.477698	0.256659	0.092515	5.60794	49
Maximum	0.641683	0.416136	0.598759	0.975596	61.6	0.401198	6.99233	99
Minimum	0	0	0	0	-3.54944	-0.97669	3.606811	2
Std. Dev.	0.171403	0.091194	0.139188	0.248866	4.911521	0.161341	0.774587	30.11453
Observations	158	158	158	158	158	158	158	158

Heavy Construction Industry

	TDR	LDR	SDR	AST	TAX	PRO	SIZE	AGE
Mean	0.150351	0.06868	0.08167	0.283678	0.300994	0.075333	6.204499	47.75658
Median	0.121798	0.044912	0.059938	0.284516	0.277709	0.077435	6.156227	41
Maximum	0.535118	0.393355	0.405008	0.670189	9.694293	0.381426	7.446357	110
Minimum	0	0	0	0.020128	-0.91679	-0.30521	4.755059	1
Std. Dev.	0.121254	0.07138	0.077287	0.103652	0.788352	0.090126	0.647339	26.22294
Observations	152	152	152	152	152	152	152	152

Computer Services Industry

	TDR	LDR	SDR	AST	TAX	PRO	SIZE	AGE
Mean	0.083425	0.034634	0.048791	0.166525	0.125871	-0.13861	5.243232	13.56028
Median	0.023285	0.004555	0.007306	0.140754	0.263353	0.088362	5.312119	12
Maximum	1.190575	0.373945	1.129726	0.841706	20.05233	0.572107	6.989539	33
Minimum	0	0	0	0	-16.8181	-19.0654	3.226084	0
Std. Dev.	0.12877	0.066023	0.105269	0.118805	1.852277	1.351808	0.791542	7.85896
Observations	282	282	282	282	282	282	282	282

Table 3: Descriptive statistics

TDR represents Total Debt Ratio, LDR represents Long term Debt Ratio, SDR represents Short term Debt Ratio, AST represents Asset Tangibility, Tax represents corporate tax rate, Pro represents profitability, Size represents size and Age is for the age of the firm. These abbreviations will be utilised throughout this chapter

The mean debt ratios will be discussed with relevance to hypothesis one (see next section), the other descriptive statistics also provide valuable insights into the structure of the industries under study.

Asset tangibility is highly variable between the three industries. Farming and fisheries has an asset tangibility of 48% indicating they are highly tangible, this is due to the industry working natural resources to produce their goods. Heavy construction has an asset tangibility of 28%, which is to be expected as heavy construction requires heavy machinery to be able to execute their contracts. Due to these being listed firms and having a size advantage their heavy machinery is usually owned by the firm and not leased as some of the smaller firms might do, which contributes to their tangibility. Computer services have mainly intangible assets, a tangibility of 17% is the lowest of all the industries. As they are working with intellectual property and software systems with usually relatively small hardware needs this result is not unexpected.

The pooled tax mean is 29%, which is correct as the South African company marginal tax rate is 29%. The industries however vary significantly in the amounts they pay, this statistic however needs to be related to the profitability of the firms, as firms only pay tax (income/company tax) when profitable. Computer services industry is not profitable as their profitability is -14%, they therefore paid the least taxes which is corroborated by their mean tax rate being 13%, the lowest of all three industries. Heavy construction with profitability of 8% and a tax rate of 30% is not that exciting, while farming and fisheries having a similar profitability of 8%, pays an exorbitant 60% in taxes.

Size computed as a log of total assets shows that heavy construction firms are the largest, followed by farming and fisheries, and computer services being the smallest. As technology allows firms to innovate distribution channels, computer service firms need not be as large as industrial age firms.

Computer services as a new economy industry is expected to be the youngest of the industries at an average age of 14 years, with heavy construction and farming and fisheries aging 48 and 49 years on average respectively.

5.2 Hypothesis 1: Differences in capital structure between industries

In order to test whether industries have differing capital structures, the means of the dependant variables of the research should be investigated, namely:

- **Total Debt Ratio (TDR)** as total debt divided by total assets
- **Long Term Debt Ratio (LDR)** computed as long-term debt divided by total assets
- **Short Term Debt Ratio (SDR)** computed as short-term debt divided by total assets
- Only interest bearing debts were analysed, there are multiple other liabilities that were excluded

Means of debt ratios

	Pooled	Farming and Fisheries	Heavy Construction	Computer services	Statistically Significant
Total Debt Ratio (TDR)	0.120355	0.157412	0.150351	0.083425	Yes*
Long Term Debt Ratio (LDR)	0.048187	0.052662	0.068680	0.034634	Yes*
Short Term Debt Ratio (SDR)	0.072168	0.104750	0.081670	0.048791	Yes*

Table 4: Debt ratio means

*see below for test results of significance

It becomes evident that the industries do have differing capital structures, the total use of debt between farming & fisheries and heavy construction does not vary by much, and both use around 15% debt in their structures.Computer services however use far less debt at around 8% total debt use. This is purely a quantum difference in the levels of leverage, and does not however show statistical significance, as such to add robustness to the results, the appropriate tests were run to analyse if the mean differences are in fact statistically significant.

Statistical significance of difference in means tests between industries

Test	TDR		LDR		SDR	
	Value	Probability	Value	Probability	Value	Probability
Anova F-Test	18.92053	0.0000	10.60238	0.0000	14.00248	0.0000
Welch F-Test	19.68408	0.0000	12.22663	0.0000	12.34156	0.0000

Table 5: Mean difference tests

All of the industries over both ANOVA F and Welch F tests showed a 0.0000 probability thus we can accept that the differences in the means are statistically significant.

5.2.1 Conclusion for Hypothesis 1

The means are different in quantum and bear statistical significance in their differences. Meaning that industries do in fact have differing capital structures, these findings corroborate the findings of Auret et.al (2013). We therefore reject the null hypothesis of capital structure homogeneity across industries.

There is a trend, all the industries on average utilise short term debt more than long term debt. This preference on short term debt is consistent with the findings of Gwatidzo and Ojah (2009) which found South African firms relied more on short term debt for their financing needs. The overall debt levels appear to be lower than most studies find, this is due to the definition of debt utilised in this study, where specifically interest bearing debt was the only type considered. There are multiple other liabilities that could have been included and would have raised the perceived quantum, such as non-interest bearing loans, inter-group or subsidiary loans and trade payables accounts (proxy for debt as slow repayment terms means cash flow distributions can be delayed).This however is not material as the findings are similar to other studies on firms listed on the JSE.

The Computer Services industry had the lowest usage of debt of the three industries studied. Talburg, et.al. (2008) found similar results and concluded that this is due to new technology firms having and needing comparatively less fixed assets that other industries firms. They operate in the knowledge economy where their assets are more likely to be intangible, such as intellectual property and they are heavy users of highly skilled labour. Farming and Fisheries and heavy construction are both expected to have extensive fixed assets, farming and fisheries and heavy construction are both industries which can achieve scale economies by having size and being mechanised.

The null hypothesis is rejected, as the capital structure across industries is proven to be different. Hypothesis two will shed some light as to when and where they are different and if recessions have a significant effect on the usage of leverage.

5.3 Hypothesis 2: Differences in capital structure during booms and recessions

The following regression results are related to Hypothesis 2, and will establish if there is a difference in capital structure during boom periods and bust periods. To capture this effect the use of a dummy variable D1 which captures recessions, was required. The dummy variable shows to what extent(coefficient) recessions had an impact on the dependant variables of capital structure and if this effect was statistically significant as based on the P-value results. In the following tables, values at a 10% level of significance are in bold and those at 5% are in bold and bear * (one asterisk) next to their significance.

5.3.1 Pooled data set

The results for the pooled data set for both FEM and REM panel data structure regressions are tabulated and are discussed thereafter.

Pooled data set

Fixed Effects Modelling (FEM)

Explanatory Variable	TDR		LDR		SDR	
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
Asset Tangibility	0.072181	0.1174	**0.059841**	**0.0154***	0.012341	0.7665
Tax	**0.002377**	**0.0900**	0.001191	0.1124	0.001187	0.3479
Profitability	**-0.011582**	**0.0127***	0.002163	0.3831	**-0.013745**	**0.0011***
Size	0.019944	0.1377	0.002335	0.7450	0.017609	0.1464
Age	0.001911	0.1271	**0.002028**	**0.0025***	-0.000117	0.9171
Recession (D1)	-0.009842	0.2792	0.001395	0.7742	-0.011238	0.1711
C	-0.070664	0.2571	-0.047087	0.1583	-0.023577	0.6751
R-Squared	0.616129		0.60694		0.482761	

Random Effects Modelling

Explanatory Variable	TDR		LDR		SDR	
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
Asset Tangibility	**0.100098**	**0.0119***	**0.056345**	**0.0083***	0.054215	0.1100
Tax	0.002168	0.1209	0.001049	0.1605	0.001071	0.3947
Profitability	**-0.011430**	**0.0124***	0.001569	0.5202	**-0.012738**	**0.0019***
Size	**0.025452**	**0.0199***	**0.013930**	**0.0174***	0.009626	0.3006
Age	0.000287	0.6242	0.000192	0.5414	0.000109	0.8082
Recession (D1)	-0.010557	0.2374	-0.000811	0.8653	-0.009221	0.2518
C	-0.041745	0.4692	-0.044693	0.1485	0.009543	0.8463
R-Squared	0.036164		0.031904		0.024726	
Hausman Chi-Sq	18.337658		**18.783149**		12.027334	
Hausman Prob.	0.0054		**0.0045***		0.0614	

Table 6: Regression results pooled data set

For Long term Debt Ratio (LDR) the Hausman test is significant (with a p-value of 0.0045) indicating that the FEM is a more appropriate test and the results are more robust, for both Total Debt Ratio (TDR) and the Short term Debt Ratio (SDR) the REM results are more robust.

For Total Debt Ratio (TDR) asset tangibility and size are positively related to leverage while profitability is negatively related, all at the 5% level of significance. Long term Debt Ratio (LDR) found asset tangibility and age to be significantly (5% and 1% levels respectively) and positively related to use of long term leverage. This is due to having assets to use as collateral for loans, while age is a proxy for reputation, thus firms with better reputations have access to and utilise more long term debt. Short term Debt Ratio (SDR) found profitability to be at a 1% level significantly and negatively related to the use of short term debt. This follows a pecking order hypothesis as profitable firms are more likely to finance their short term needs with internal equity.

The dummy variable for capturing recessionary periods was not significant in any of the three debt categories. For TDR and SDR the levels would be significant at a 25% level as their p-values are 0.2374 and 0.2518 respectively. This 25% level is far from conclusive, but does indicate that there is a form of relationship although not adequately captured by this model, sample and/or test.

5.3.2 Farming and Fisheries

The results for the farming and fisheries industry for both FEM and REM panel data structure regressions are tabulated and are discussed thereafter.

Farming and Fisheries

Fixed Effects Modelling (FEM)

Explanatory Variable	TDR		LDR		SDR	
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
Asset Tangibility	0.061438	0.4300	0.036180	0.2649	0.025258	0.7374
Tax	0.001971	0.2720	**0.001253**	**0.0943**	0.000717	0.6791
Profitability	**-0.298179**	**0.0001***	-0.044688	0.1619	**-0.253491**	**0.0008***
Size	**0.190800**	**0.0001***	**0.059517**	**0.0033***	**0.131283**	**0.0052***
Age	-0.002020	0.4644	0.000096	0.9331	-0.002116	0.4288
Recession (D1)	-0.002502	0.8940	-0.007005	0.3706	0.004504	0.8043
C	**-0.816173**	**0.0001***	**-0.297464**	**0.0007***	**-0.518709**	**0.0102***
R-Squared	0.680026		0.804018		0.544746	

Random Effects Modelling

Explanatory Variable	TDR		LDR		SDR	
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
Asset Tangibility	0.085148	0.2385	0.036254	0.2415	0.054296	0.4167
Tax	0.002141	0.2272	0.001215	0.1018	0.000998	0.5587
Profitability	**-0.293898**	**0.0001***	**-0.050249**	**0.0996**	**-0.242780**	**0.0005***
Size	**0.162182**	**0.0000***	**0.061726**	**0.0004***	**0.089216**	**0.0073***
Age	-0.001587	0.2940	-0.000512	0.5106	-0.000662	0.5590
Recession (D1)	-0.002302	0.9013	-0.007738	0.3188	0.005782	0.7473
C	**-0.674088**	**0.0007***	**-0.271353**	**0.0020***	**-0.361185**	**0.0383***
R-Squared	0.179398		0.13156		0.103101	
Hausman Chi-Sq	4.529818		3.739844		5.307631	
Hausman Prob.	0.6054		0.7118		0.505	

Table 7: Regression results Farming and Fisheries industry

For Total Debt Ratio (TDR), Long term Debt Ratio (LDR) and the Short term Debt Ratio (SDR) the Hausman test is insignificant indicating that REM is the appropriate methodology and the results are expected to be robust.

Farming and fisheries results indicate that profitability and size are the two major determinants of capital structure. Profitability is negatively related to leverage in total, the long run and short run scenarios. It is significant at the 1% level for total and short run while in the long run only at a 10% level. This could indicate that in the long run, internal funds may not be sufficient to service the firm's growth aspirations and debt may be utilised. While in the short run, the use of debt is greatly diminished if a firm is profitable. This indicates a pecking order theory may be followed as firms with higher profits, have less debt, indicating

the use of internal funds is preferred over debt. Size is positively related to leverage at the 1% level form total, long run and short term leverage. This may suggest that large firms utilise more debt than smaller ones.

The recession has very little explanatory impact for the farming and fisheries industry. Although when considering LDR, it has a p-value of 0.3188, this is the lowest recessionary p-value for farming and fisheries with regards to all forms of leverage under study. This is very weak evidence that a form of relationship does exist between capital structure and recessions, although it is not statistically significant.

5.3.3 Heavy Construction

The results for the heavy construction industry for both FEM and REM panel data structure regressions are tabulated and are discussed thereafter.

Heavy Construction

Fixed Effects Modelling (FEM)

Explanatory Variable	TDR		LDR		SDR	
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
Asset Tangibility	**0.338328**	**0.0001***	**0.250035**	**0.0006**	0.088294	0.2509
Tax	-0.000594	0.9271	0.000613	0.9091	-0.001207	0.8356
Profitability	**-0.202744**	**0.0029**	-0.037171	0.5014	**-0.165573**	**0.0064**
Size	0.043833	0.1069	**0.039489**	**0.0793**	0.004344	0.8577
Age	-0.002751	0.2663	-0.002784	0.1743	0.000033	0.9881
Recession (D1)	0.002230	0.8520	0.001345	0.8918	0.000885	0.9341
C	-0.071435	0.4737	-0.112104	0.1750	0.040669	0.6486
R-Squared	0.791187		0.587864		0.587584	

Random Effects Modelling

Explanatory Variable	TDR		LDR		SDR	
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
Asset Tangibility	**0.328064**	**0.0001***	**0.249631**	**0.0001***	0.074369	0.2763
Tax	-0.000966	0.8809	-0.000296	0.9555	-0.001113	0.8468
Profitability	**-0.206751**	**0.0020***	-0.036471	0.4937	**-0.174101**	**0.0032***
Size	**0.032740**	**0.0760**	0.017716	0.1650	0.003849	0.7890
Age	**-0.002156**	**0.0764**	**-0.001064**	**0.0794**	-0.000832	0.2663
Recession (D1)	0.003729	0.7419	0.005154	0.5773	-0.000147	0.9883
C	-0.004945	0.9598	-0.050106	0.4915	0.102210	0.2097
R-Squared	0.211608		0.125013		0.094613	
Hausman Chi-Sq	5.988351		7.241626		5.396746	
Hausman Prob.	0.4245		0.2991		0.494	

Table 8: Regression results Heavy Construction industry

For Total Debt Ratio (TDR), Long term Debt Ratio (LDR) and the Short term Debt Ratio (SDR) the Hausman test is insignificant indicating that REM is the appropriate test and the results are expected to be more robust than the FEM results.

Total Debt Ratio (TDR) is affected,positively by Asset tangibility at a 1% level and size at a 10% level, while profitability at a 1% level and age at a 10% level affect it negatively. Implying polder and more profitable firms have less debt overall, while larger and more tangible firms utilise more debt over all.

Long term Debt Ratio (LDR) is affected by asset tangibility positively at a 1% level while age affects it negatively at a 10% level. The use of assets as collateral is highly likely as firms with more assets and with higher tangibility's have higher levels of debt. Older firms however utilise less debt than their newer counterparts, this could indicate that assets have long life spans and once purchased are maintained and utilised for many years, thus requiring less debt to acquire new assets, thus newer firms still need to build their asset base from which to operate.

Short term Debt Ratio (SDR) is affected negatively by profitability at a 1% level of significance. Indicating that in the short term more profitable firms utilise less debt.

The recession has very little to no explanatory power over the use of leverage in heavy construction. This could be due to the very cyclical nature of the business, in boom periods it fares well while in recessions it does not do very well, the forms may be run to mitigate the effects of recessions and as such they would not exhibit much explanatory power for their debt structure. As an alternative hypothesis for the result, one would need to consider why do heavy construction firms utilise debt in the first place. They on average have 6.8% long term debt while 8.2 % short term debt, thus they have more short term debt, if this is utilised to finance short term operating costs to ramp up operations to meet large contracts. These large contracts would probably not be entered into in recessions, thus they would not have a need for the debt in recessionary periods.

5.3.4 Computer services

The results for the computer services industry for both FEM and REM panel data structure regressions are tabulated and are discussed thereafter.

Computer Services

Fixed Effects Modelling (FEM)

Explanatory Variable	TDR		LDR		SDR	
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
Asset Tangibility	-0.051999	0.4888	0.024256	0.5554	-0.076255	0.2509
Tax	0.001842	0.5802	-0.000400	0.8266	0.002242	0.4462
Profitability	**-0.010126**	**0.0376***	0.002542	0.3389	**-0.012668**	**0.0034***
Size	0.015853	0.3374	-0.005184	0.5665	0.021038	0.1500
Age	0.001230	0.5088	**0.003277**	**0.0015***	-0.002047	0.2136
Recession (D1)	-0.021435	0.1300	0.004190	0.5882	**-0.025625**	**0.0408***
C	-0.004258	0.9562	0.012744	0.7641	-0.017001	0.8040
R-Squared	0.492986		0.42156		0.408018	

Random Effects Modelling

Explanatory Variable	TDR		LDR		SDR	
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
Asset Tangibility	-0.023060	0.7413	0.000550	0.9878	-0.025080	0.6801
Tax	0.000986	0.7647	-0.001087	0.5437	0.001597	0.5825
Profitability	**-0.009742**	**0.0416***	0.001847	0.4721	**-0.011792**	**0.0052***
Size	0.009327	0.5223	0.001076	0.8811	0.009151	0.4663
Age	0.001834	0.2409	**0.002581**	**0.0007***	-0.000847	0.5259
Recession (D1)	-0.020358	0.1469	0.001762	0.8174	**-0.022787**	**0.0660**
C	0.018815	0.7914	-0.006199	0.8597	0.022171	0.7171
R-Squared	0.03044		0.05992		0.039247	
Hausman Chi-Sq	7.870475		**14.194177**		7.787123	
Hausman Prob.	0.2477		**0.0275**		0.2541	

Table 9: Regression results Computer Services industry

For Long term Debt Ratio(LDR) as the Hausman test is significant indicating the FEM is a more appropriate test and the results are more robust, for both Total Debt Ratio (TDR) and the Short term Debt Ratio (SDR) the REM results are more robust.

Computer services short term debt ratio(SDR) is affected by recessions, at a 10% level of significance. The coefficient of -0.023 shows that a 2% reduction in short terms loans occurs during recessionary periods. The total debt ratio (TDR) if we utilise a 20% level of significance would at 0.1469 be a valid result showing that computer services is affected by recessions, the goal posts however should not be shifted to match the data and it is not a significant result but indicate a form a relationship does in fact exist.

The short term debt ratio (SDR) is also negatively affected by profitability at a 1% level. Showing more profitable firms have less the short term debt. The Total Debt Ratio (TDR) is also negatively affected by profitability at a 5% level. Showing more profitable firms have less debt.

Long term Debt Ratio (LDR) is affected by age positively at a 1% level. This indicates that as firm's age they grow in stature and reputation they utilise more debt. This could be due to a reduction is perceived risk from lenders stand points, this is due to a reduction in information asymmetry as track records for performance and repayments of debt are established.

5.3.5 Conclusion Hypothesis 2

Hypothesis two is that capital structure is affected by recessions. There is weak evidence to support this hypothesis. There are however interesting and significant results for firm specific capital structure determinants.

Asset tangibility, is expected to be positively related to leverage as it plays a role in providing collateral for loans, thus the more tangible the assets, the more collateral a firm would have. Heavy construction showed significant results for total debt and long term debt.

Tax was insignificant for all statistically relevant results. It has significance in the pooled FEM but the REM was the correct test statistically according to the Hausman tests results. Although not significant, it has a positive relationship to debt, which indicates that firms may be utilising debt to create tax shields.

Profitability being negatively related to leverage would indicate a preference for pecking order theory. Total debt, and short term debt showed significance to profitability for all industries studied, farming and fisheries also found it significant for long term debt. All the signs were negative, which indicates a pecking order hypothesis for these three South African industries.

Size, for heavy construction total and long term debts were significant although long term debt only shows significance from the FEM which is not the appropriate model, but it was not very far out of the 10% range for REM. For Farming and fisheries all debt categories were significant. The relationship is always positive showing that larger firms tend to have higher levels of leverage than their smaller counter parts. Gwatidzo and Ojah (2009) proffered a reason for this namely that they have lower levels of information asymmetry and could also be more diversified which both reduce risk from a lenders points of view.

Age, is a proxy for reputation, which is a lowered information asymmetry, which reduces the perceived risks from lenders. Older firms have developed track records of successfully managing and paying their obligations on time and as such the positive relationship that computer services had for their long term debt makes sense, the older firms have access to more sources of long term debt. Heavy construction however had a negative relationship for both total debts and long term debts to age, showing older firms utilise less debt. This could indicate that newer firms still need to build their asset base from which to operate and thus require more debt to do so.

Recessions, please see below for a summary of the results for recession affecting the capital structure of the various industries and the pooled data set.

Industry	Test		TDR		LDR		SDR	
	FEM	REM	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
Pooled data set	LDR	TDR, SDR	-0.010557	0.2374	0.001395	0.7742	-0.009221	0.2518
Farming and Fisheries		All	-0.002302	0.9013	-0.007738	0.3188	0.005782	0.7473
Heavy Construction		All	0.003729	0.7419	0.005154	0.5773	-0.000147	0.9883
Computer services	LDR	TDR, SDR	-0.020358	0.1469	0.004190	0.5882	**-0.022787**	**0.0660**

Table 10: Recession regression results summary

One in twelve results are significant. The short term use of debt by computer services firms is affected by recessions at a 10% level. Four more results were not statistically significant but were not that far removed from being significant, Total Debt Ratios for the pool (0.2374) and computer services (0.1469), Long term Debt Ratios for farming and fisheries (0.3188) and Short term Debt Ratios for the pool (0.2518).

It becomes evident that there is relationship between recessions and the capital structure of firms, in the farming and fisheries, heavy contraction and computer services industries in South Africa that are listed on the JSE. This relationship has not be been captured very well in this research, as the model and / or variables utilised might not have been the optimal ones. Just as Auret et.al. (2013) concluded that there is evidence showing macroeconomic conditions do affect the speed at which firms adjust their capital structures towards a target. There is a significant difference in the speeds of adjustment in certain macroeconomic states than others, however the degree to which the adjustment speeds alter is highly sensitive to the

definition of macroeconomic states used and the measure of debt (total, long term or short term). There is space for the results to be improved by an improved research design.

The computer services industry is the most sensitive to the recession's effects on its capital structure and has one result for short term leverage significant at a 10% level and another result for total debt significant at a 15% level. This is sufficient evidence for failing to accept the null hypothesis of capital structure homogeneity across the business cycle. Capital structure is heterogeneous across recessions and booms, when defined by the South African Reserves Banks business cycle phases. The evidence is weak, but does support the rejection of the null hypotheses. The computer services industry is clearly affected, while farming and fisheries has very weak evidence that long term debt may be affected, while there is no evidence to show that the heavy construction industry is affected at all. There is also evidence which shows that firms in the studied industries follow a pecking order theorem when determining their capital structures. This is in line with the findings of the Gwatidzo and Ojah (2009), de Vries (2010) and de Wet (2006) studies, which also found JSE listed firms to follow a pecking order when constructing their capital structures.

6 Chapter 6 Summary and Conclusions

6.1 Summary

Firms utilise different sources of finance at differing levels, thus they construct their own capital structure. Capital structure is the varying levels of use of debt and equity to finance a firms operations. Firms have an overall leverage rate, a long term rate and a short term rate of leverage. There are currently two main theorems which are argued to be followed by firms, a pecking order theory and a trade off theory. The pecking order states that a firm's preference for funds is that they prefer internal equity first, then when sourcing external funds prefer debt and then lastly issue new equity. Trade off theory, argue that firms weigh the costs and benefits of the use of debt and make a decision based on their needs.

The economy has different phases over the business cycle ranging from boom cycles where business prosper to recessions when they may have difficulties. This cycle can be identified utilising various economic indicators such as GDP, credit growth, inflation rates, interest rates and other composite indicators. These indicators are to identify the stage of the cycle, so a combined indicator should be sufficient to identify the stage of the cycle. The South African Reserve Banks has a methodology to classify time periods into the boom and recessionary periods which is accurate and was utilised for this study.

Specific industries were selected to attempt to prove the studies hypothesis of industry capital structure heterogeneity and that recessions affect capital structure. A stable industry - farming and fisheries was selected, a highly variable industry - the heavy construction industry was selected and a new age industry - the computer services industry were selected. The study proved that capital structure varies across industries as proven by the mean differences of leverage for total debt, long term debt and short term debt being statistically significant.Finding that the computer services industry of the JSE utilised the least debt over all for the sample period of 1995 until 2012. The industries all showed a preference for the use of short term debt.

Panel data analysis following both Fixed Effect Methodology and Random Effect Methodology was conducted to analyse the firm specific factors which affect capital structure as well as the use of a dummy variable to capture the effects of recessions. The firm specific effects include, asset tangibility, tax, profitability, age and size.

Asset tangibility for the heavy construction showed significant results for total debt and long term debt, it was found to be positively related to leverage as it plays a role in providing collateral for loans.

Tax was insignificant for industries over all types of debt although not significant, it has a positive relationship to debt, which indicates that firms may be utilising debt to create tax shields.

Total debt, and short term debt showed significance to **profitability** for all industries studied, farming and fisheries also found it significant for long term debt. All the signs were negative, which indicates a pecking order hypothesis for these three South African industries.

Size affected the heavy constructions total and long term debts while for farming and fisheries all debt categories were significant. The relationship is always positive showing that larger firms tend to have higher levels of leverage than their smaller counter parts.

Age, is a proxy for reputation, older firms have developed track records of successfully managing and paying their obligations on time and as such the positive relationship that computer services had for their long term debt makes sense, heavy construction however had a negative relationship for both total debts and long term debts to age, showing older firms utilise less debt.

There is relationship between recessions and the capital structure of firms. The computer services industry is clearly affected, while farming and fisheries has very weak evidence that long term debt may be affected, while there is no evidence to show that the heavy construction industry is affected at all. There was sufficient evidence to prove the relationship, however this relationship has not be been captured very well in this research, as the model and / or variables utilised might not have been the optimal ones.

6.2 Conclusions

This research intended to identify the capital structure norms of three separate industries. The farming and fisheries industry, the heavy construction industry and the computer services industry. The research then aimed to study firm specific determinants of capital structure and if there was an effect on capital structure caused by the macroeconomic environment of South Africa.

Industries do posses differing capital structures and utilise debt differently. Some industries prefer short term debt over long debts and vice versa. Computer services industry utilise the least debt of the industries studied.

South African firms prefer short term debt over long term debts, the level varied within the industries studied but the preference was clear.

South African firms follow a pecking order as shown by the negative relationship observed between profitability and long and short term debts. This is stating that the more profitable firms had less debt and are thus utilising internal funds and have a preference for this, they then preferred short term debt and then long term debts.

There is weak evidence in this study to show that recessions affect the capital structure of some of the industries studied. The computer services industry is clearly affected, while farming and fisheries has very weak evidence that long term debt may be affected, while there is no evidence to show that the heavy construction industry is affected at all.

6.3 Further research

The results for capturing the recession's effect on capital structure were weak thus there is scope to improve the research design, perhaps by utilising differing methods of classifying the business cycle, such as utilising individual indicators. The results are known to be highly sensitive to the manner in which the cycle is classified (Auret et.al.. 2013), by utilising various classifications more significant results could be produced.

There is scope to add lags into the model, to attempt to locate the length of time it actually takes for the recessions to have the effectscaptured. This could potentially have superior explanatory power when conducted as a speed of adjustment model. Where the previous period is considered against the current one and the difference or movement is recorded.

Expanding the sample to include all JSE firms, not just a stable, variable and new technology industry, would be valuable in providing insights into all the industries and the JSE as a whole.

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8 Appendix A – List of Firms utilised in Study

Firm Ticker and Name	
Computer Services (CS) Delisted	**Farming & Fishing (FF) Listed**
DDT - Dimension Data Holdings PLC	ARL - Astral foods limited
IDI - Idion Technology Holdings Limited	CKS - Crookes Brothers limited
PCN - Paracon Holdings Limited	OCE - Oceana Group Limited
PIM - Prism Holdings Limited	AFR - Afgri Limited
SPS - Spescom Limited	RCL - Rcl Foods Limited
UCS - Ucs Group Limited	SOV - Sovereign Food Investments Limited
FRO - Frontrange Limited	CBH - Country Bird Holdings Limited
BEE - Beget Holdings Limited	**Heavy Construction (HC) Delisted**
BTG - Bytes Technology Limited	CNC - Concor Limited
Computer Services (CS) Listed	RAC - Racec Group Limited
ADI - Adapt It Holdings Limited	**Heavy Construction (HC) Listed**
SVB - Silverbridge Holdings Limited	AEG - Aveng Limited
GIJ - Gijima Group Limited	BSR - Basil Read Holdings Limited
CCL -Compu-Clearing Outsourcing Limited	GRF - Group Five Limited
DCT - Datacentrix Holdings Limited	MUR - Murray & Roberts Holdings Limited
DTC - Datatec Limited	WBO - Wilson Bayly Holmes-Ovcon Limited
EOH - Eoh Holdings Limited	ESR - Esor Limited
FRT - Faritec Holdings Limited	SAN - Sanyati Holdings Limited
SQE - Square One Solutions Group Limited	RBX - Raubex Group Limited
CVN - Convergenet Holdings Limited	BWI - B&W Instrumentation & Electrical Ld
ISA - Isa Holdings Limited	SSK - Stefanutti Stocks Holdings Ltd
ALM - Alliance Mining Corporation Limited	PKH - Protech Khuthele Holdings Limited
SDH - Securedata Holdings Limited	SKY - Sea Kay Holdings Limited
BCX - Business Connexion Group Limited	CGR - Calgro M3 Holdings Limited
SHB - Sherbourne Capital Limited	ERB - Erbacon Investment Holdings Limited
TCS - Total Client Services Limited	
Farming & Fishing (FF) Delisted	
CNX - Conafex Holdings Societe Anonyme	
ITR - Intertrading Limited	
NMS - Namibian Sea Products Limited	
WBH - W B Holdings Limited	
MKX - Milkworx Limited	