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Financing Practices on the JSE - an Empirical Test of the Trade-off and Pecking Order Theories of Capital Structure

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Abstract

This study offers an empirical test of the trade-off and pecking order theories of capital structure by examining the financing practices of a panel of 104 non-financial JSE-listed companies observed over the 1999-2011 period.

At its core, the trade-off theory predicts that firms will balance the marginal benefits of additional leverage against the marginal costs, such that achieving an optimal, value-maximising, target debt-to-equity ratio becomes the focal point of the capital structure decision. On the other hand, the pecking order theory rejects the notion that firms focus on a target debt-to-equity ratio and instead make the financing decision based on a hierarchy of preference derived from the relative informational costs of internal and external financing (in the form of debt and equity issuances).

Although the two theories have classically been viewed as mutually exclusive characterisations of the capital structure decision, an examination of the available empirical evidence reveals that it is difficult, if not impossible, to clearly reject any one theory in favour of another. Indeed, Myers (1984) famously speaks of the 'capital structure puzzle'. This study will argue and attempt to demonstrate that in a dynamic sense, it is likely that firms apply aspects of each theory when making the capital structure decision, and the relevance of each is context-dependent and time-varying. In other words, these theories are not applied with mutual exclusivity through time, and thus one should find that aspects of each appear to hold a degree of explanatory power in an empirical capital structure model. Although beyond the scope of this study, it is likely that dynamic market-timing, industry and macroeconomic conditions play an important role too.

Against this backdrop, it is unsurprising that this study finds varying levels of support for both the trade-off and pecking order theories. Examining the relationship between leverage and firm-specific factors, there is evidence of a negative relationship between profitability and leverage; a positive relationship between size and leverage; a positive relationship between asset tangibility and leverage; a positive relationship between the industry median debt ratio and leverage; and a positive (but insignificant) relationship between perceived growth opportunities and leverage. This suggests that larger firms and firms with a higher degree of asset tangibility tend to carry greater levels of debt in their capital structures, while firms experiencing greater profitability tend to carry less leverage. The positive coefficient on industry median leverage suggests a significant role played by industry-specific factors.

A test of Frank and Goyal's (2003) pecking order model shows that decreases in both sales/turnover and profitability are associated with increases in leverage; and a financing deficit (surplus) is associated with an increase (decrease) in leverage. This is notably consistent with the pecking order model, in which declining sales and profitability puts pressure on the ability of the company to generate sufficient internal funds to meet investment and payout demands (thus creating a possible financing deficit), which shows up as an increased demand for external funds (with debt as the first choice) and consequently higher leverage.

Finally, the speed of adjustment for JSE-listed firms is estimated to lie in the 30-50% range (i.e. a half-life for capital structure shocks of between 1 – 2 years), slightly higher than US-based estimates, and suggesting that achieving and maintaining an optimal leverage outcome may be an important aspect of the capital structure decision (as per the trade-off model). It must be noted, however, that methodological drawbacks make it difficult to effectively disentangle true adjustment (as per the trade-off model) from mean reversion.

Overall, these results suggest that the predictions of the trade-off and pecking order theories each seem to play a role in the capital structure decision of JSE-listed companies, which is consistent with the idea that they are not applied with mutual exclusivity in practice. An accurate characterisation of financing practices in this context should thus incorporate aspects of both theories. Further studies in this area should look into the role played by capital market, macroeconomic and industry conditions in the capital structure decision of JSE-listed companies.

Contents

List of Tables and Figures....6

1. Introduction....7

   a. Background and overview....7

   b. Objectives and hypotheses....12

   c. Motivation and contribution....13

   d. Structure of the study....13

2. Capital structure irrelevance under perfect markets....15

   a. A description of Modigliani and Miller's (1958) irrelevance theorem....15

   b. Is the theory of capital structure irrelevance descriptive of the reality?....17

3. The trade-off theory....19

   a. The role of taxes....19

   b. The role of bankruptcy and costs of financial distress....21

   c. The trade-off between tax benefits and costs of financial distress....23

   d. Static vs. dynamic trade-off and adjustment....26

4. The pecking order theory....26

5. Agency cost theories of capital structure....29

6. The market-timing theory....31

7. Determinants of leverage: stylised facts regarding the predictions of the trade-off and pecking order theories....33

   a. The trade-off theory....33

   b. The pecking order theory....34

   c. The role of industry factors....35

8. Capital structure research: the empirical evidence....36

   a. Evidence on the trade-off and pecking order hypotheses....36

      i. Evidence from the USA....36

      ii. International evidence ex-USA....38

b. Evidence on the market-timing hypothesis 39
c. Survey evidence 40
d. Evidence from Africa 41
9. Integrating the theory: a unified view 42
10. Research methodology and sample construction 45
a. A comment on econometric methodology in capital structure research 45
i. Panel data 45
ii. Endogeneity 46
iii. Dynamic adjustment 47
b. Model construction and hypotheses 48
i. Determinants of leverage: the role of classic factors 48
ii. Changes in leverage and the role of the financing deficit 49
iii. Measuring the speed of adjustment 50
c. Sample construction and data collection 50
11. Results and discussion 52
a. Summary statistics and industry leverage 52
b. Leverage and the role of classic factors 57
c. The role of the financing deficit – a test of the pecking order 60
d. Speed of adjustment 63
12. Conclusion 65
13. Delimitations and directions for future research 67
References 69
Appendix 74

List of Tables and Figures

Table 1: Summary statistics (pg. 53)

Table 2: Analysis of industry leverage and gearing (pg. 56)

Table 3: Determinants of leverage (pg. 59)

Table 4: Analysis of changes in leverage (pg. 61)

Table 5: Estimation of the speed of adjustment (pg. 64)

Figure 1: The relationship between K_e, K_d and WACC for varying D/E under Modigliani and Miller (1958) (pg. 17)

Figure 2: The trade-off theory of capital structure (source: Myers, 1984) (pg. 25)

Figure 3: The relationship between K_e, K_d and WACC under trade-off theory (pg. 25)

Figure 4: Breakdown of sample by industry (pg. 53)

Figure 5: Trends in industry median debt ratios (1999-2011) (pg. 55)

Figure 6: Trends in industry median gearing [Net Debt/Assets] (1999-2011) (pg. 55)

1. Introduction

a. Background and overview

The objective of this study is to analyse the capital structure practices of a sample of 104 JSE-listed companies over the 1999-2011 period by empirically examining the core predictions of the trade-off and pecking order theories of capital structure. This will allow for a characterisation of the capital structure decision-making process for South African companies, thereby contributing to the body of empirical research in corporate finance in this country.

What is termed the 'capital structure' or 'financing' decision traditionally refers to the decision-making process surrounding the choice of what mix of debt versus equity a company should use when looking to finance its underlying investments and strategic and operational activities. Although not limited to debt and equity – other forms of funding may include preferred stock, convertible bonds and other hybrids – the capital structure decision typically focuses on the leverage outcome (that is, the ratio of debt-to-equity [D/E] or debt-to-total assets [D/D+E]), and the impact of alternative outcomes on the cost of capital and firm value.

An important aspect of corporate finance, the capital structure decision is considered to be highly complex and has challenged researchers for a long time. Myers (1984) famously describes it as a "puzzle"; and indeed, Frank and Goyal (2008, pg. 137) suggest that " . . . the complexity of the problem of financing was at one point considered so great as to defy the development of reasonable theories". At the simplest level, increasing the use of debt relative to equity provides a means to enhance return on equity (ROE) through the leverage effect, but at the cost of greater financial risk. On this basis, the financing decision becomes a classic risk-return analysis. But more broadly, the study of capital structure seeks to create an optimal decision-making framework for the capitalisation process that is consistent with the goal of maximising shareholder wealth. As will be seen, there is a complex web of firm-specific, industry and macroeconomic factors that may play a role in this decision. Nonetheless, substantial progress has been made in producing a number of decision-making frameworks and a set of testable theories.

In coming to grips with the problem, it is best to first understand the defining characteristics and idiosyncrasies of both debt and equity.

Debt represents a legally-binding contractual agreement between the borrower and lender: the lender agrees to lend a certain amount under a promise from the borrower to make interest

payments and a repayment of principal over an agreed and defined time horizon (with debt-holders generally protected by a range of legally-binding protective covenants). If the borrower fails to meet these conditions and defaults on its obligations, it may be forced into a position of bankruptcy, where the company's assets may be liquidated to pay off its debt-holders according to the seniority and collateral structure. Interest payments on debt are usually considered a tax-deductible expense.

Equity, on the other hand, has an indefinite horizon. Unlike debt-holders, equity-holders control the company (with an individual shareholder's degree of voting power dependent on what class and percentage of the company's shares they own). An advantage of the use of equity is that it gives the owners of the company (i.e. shareholders) limited liability; but as the residual owners of the company, such equity-holders receive their claim on the firm's income only after interest payments to debt-holders have been made. In the event of bankruptcy and liquidation, debt-holders are paid off before anything goes to equity-holders. This makes an equity investment in a company relatively more risky than a debt investment; accordingly, the cost of equity is generally higher than the cost of debt. Unlike interest payments to debt-holders, dividends paid to shareholders are considered a distribution of profits and are accordingly non-tax deductible.

The basis for the formal analysis of the capital structure decision was arguably laid by the highly influential paper of Miller and Modigliani (1958), who showed that under conditions of perfect, frictionless capital markets, the proportion of debt versus equity used in the capitalisation of the balance sheet will not affect the overall cost of capital, and thus carries no impact on the value of the firm or shareholder wealth. In other words, the capital structure decision is irrelevant.

However, the assumptions made by Miller and Modigliani (1958) are not necessarily descriptive of the reality: things like taxes, costs of bankruptcy and financial distress, information asymmetries (and the costs thereof) and other market frictions most certainly do exist – rendering the conclusion of the paper somewhat tenuous in a real-world setting. But essentially, what Miller and Modigliani are able to achieve is to create a baseline world in which the capital structure does not matter *under a set of specified conditions*. The question then becomes, if these conditions are relaxed and a more realistic setting is assumed, how can capital structure affect firm value? And what framework should an optimal, value-maximising

capital structure policy follow? In response, three competing hypotheses have been generated in the literature: the trade-off, pecking order and market-timing theories.

In the trade-off theory, the optimal capital structure policy entails a trade-off of the marginal benefits of a higher level of leverage – including the value-enhancing effects of the interest tax-shield and the disciplinary role that debt carries on managerial control over free cash flows, as per Jensen (1986) – against the marginal costs of additional leverage (most notably the costs of financial distress, i.e. the value destruction arising from the consequences of excessively high debt levels). At the level of leverage where the marginal benefits of additional debt are equal to its marginal costs, the cost of capital will be minimised and firm value maximised. Achieving and maintaining this level of debt-to-equity, known as the 'target' capital structure, becomes the focal point of the financing policy. Following any shocks to the capital structure that cause a deviation from the target, appropriate adjustments must take place (by substituting debt for equity or vice-versa) in order to return to the target. The speed of this adjustment will depend on a trade-off of the importance of being at the target against the costs of adjustment (including transaction and informational costs).

The pecking order theory rejects the notion that firms have some target, optimal and value-maximising leverage ratio in mind, but still views the capital structure decision as highly relevant and dominated by information costs. Developed by the insights of Myers (1984), and Myers and Majluf (1984), the theory suggests that companies maximize value by systematically choosing to finance new investments with the informationally cheapest available source of funds, without any explicit leverage target. When raising external capital, the general rule should be to issue safe and informationally 'cheap' securities before risky ones (namely debt before equity), because of the lower information costs associated with debt issues. Equity issues will occur only when debt becomes excessively costly, when, for example, the firm is already at a dangerously high debt ratio and the costs of financial distress become severe. Consequently, if a firm does seek *external* funds in order to finance some investment opportunity (for which retained earnings – carrying practically zero information costs – are insufficient as a funding source), it is better off issuing debt rather than equity.

The trade-off and pecking order theories are considered the primary frameworks for the capital structure decision. But a third hypothesis, the market-timing theory, is also influential. Formalised in the seminal work of Baker and Wurgler (2002), it views the capital structure decision as primarily shaped by conditions in external capital markets. The theory predicts that

managers will attempt to time the market and issue equity when their market values are high, relative to book and past market values, and to repurchase equity when their market values are low. Similarly, conditions of high liquidity and low interest rates in the debt capital market will create conditions in which debt issues may be preferred. At any point in time then, a firm's capital structure is largely the cumulative outcome of past attempts to time capital markets.

Although somewhat difficult to reduce to a direct and econometrically testable framework, these theories have been subject to extensive empirical examination – internationally by Rajan and Zingales (1995), Shyam-Sunder and Myers (1999), Fama and French (2002) and Frank and Goyal (2009), among others; and to a lesser extent in South Africa, by the likes of Ramjee and Gwatidzo (2012) and Moyo, Wolmarans and Brümmer (2013).

But what becomes apparent in the existing literature is that researchers appear unable to decisively reject any one theory in favour of another. Aspects of each theory appear to carry empirical and practical relevance in varying degrees. In explaining the continued existence of the capital structure puzzle, Barclay and Smith (1999) suggest that:

i. Models of capital structure are far less precise than asset pricing models, for example, and at best only provide qualitative or directional predictions.
ii. The competing theories are not entirely mutually exclusive. Evidence in favour of one theory does not necessarily render the others invalid.
iii. Many of the variables hypothesised to affect capital structure are difficult to measure (often, at best, only a proxy can be used).

Overall, a key idea that this study will attempt to demonstrate is that it is likely that a dynamic capital structure policy will consider and apply aspects of each of the trade-off, pecking order and market-timing theories. That is, in a dynamic sense, these theories are not applied with mutual exclusivity – and the relevance, importance and applicability of each theory is likely to be context-dependent and time-varying. At a given point in time and depending on the perceived and context-dependent hierarchy of importance of the range of factors in the capital structure decision (namely taxes, costs of financial distress, agency costs, macroeconomic and capital market factors, information asymmetries and industry conditions), a given company should follow a particular financing pattern based on what its managers believe to be optimal at that point in time. As conditions and the relative importance of these factors change through time, financing patterns may accordingly change. For example, an optimal leverage ratio might be the focal target of a given company's capital structure policy and thus deviations should be

eliminated under ‘typical’ conditions (as per trade-off theory); but if typical conditions do not hold, if informational asymmetries or capital market conditions become such that the elimination of deviations is not aligned with value-maximisation or not even possible, the company may be better off ignoring the trade-off framework and following the tenets of a possible pecking order or market-timing framework, as appropriate. It is also likely that the outcome of the financing decision made *today* will have some impact on the nature and process of the financing decision *in the future*, as suggested by Denis (2012). In such a dynamic and intertemporal decision-making framework, where many iterations of the capital structure decision-making process are possible, it would be difficult to decisively reject any one theory in favour of another.

Apart from a focus on the dynamics of the D/E–firm value relationship as outlined in the preceding discussions, other practical factors and outcomes considered in the capital structure decision will include, among others, the maturity, seniority and collateralisation structure of debt; the voting and control structure for different classes of shareholder; control of the firm’s credit rating; the currency denomination of different tranches of debt (and potential exchange rate risk); the basis of interest payments – that is, whether tied to a fixed or floating (market) rate – and thus the implicit market risk of debt; hedging of financing risk; the structure of embedded optionality or hybridisation of capital (if any), for instance with convertible debt; anticipation of the ability to refinance debt obligations; the use of preference share capital; the relevant institutional and legal framework; and in the case of equity issues, the impact on earnings dilution. There is also a substantial level of interaction between capital structure and payout policy. Nonetheless, these factors are for the most part incorporated into aspects of parts of the trade-off, pecking order and market-timing theories; and their roles in the capital structure decision will be introduced and discussed where appropriate. If they are not explicitly discussed in this study, it is safe to assume that they are second-order concerns in the financing decision and have been excluded for the sake of brevity.

With this background in mind, this research aims to provide a characterisation of the capital structure practices of JSE-listed firms by focussing on the dynamics of the financing decision and the debt/equity (leverage) outcome in the style of the trade-off and pecking order hypotheses. The implicit underlying hypothesis to be tested is that it will be difficult to clearly reject any one theory in favour of another – that is, mixed levels of support will be found for each – since the capital structure decision for a firm is context-dependent and time-varying. This analysis will be achieved through a comprehensive examination of the underlying theory

and empirical evidence, and an application of key empirical models and econometric methodology. Although some comment will be made on the role of macroeconomic and market-based factors in the capital structure decision, the focus will lie on the role of firm-specific (fundamental) factors in the leverage outcome. It is hoped that this research will be able to confirm and extend the results of existing work on South African capital structure practices, and lay a foundation for further extensions and refinements in this area.

b. Objectives and hypotheses

The main objective of this study is to characterise the capital structure decision for JSE-listed companies by empirically examining the predictions of the trade-off and pecking order theories of capital structure. To achieve this overall goal, specific research objectives are as follows:

i. To investigate patterns in industry leverage and gearing over the 1999-2011 period
ii. To investigate the role played by classic firm-specific determinants of leverage (namely size, profitability, growth opportunities and asset tangibility) in capital structure outcomes
iii. To investigate the role played by changes in fundamentals and the financing deficit in leverage adjustments, using Frank and Goyal's (2003) model
iv. To estimate the average speed of adjustment towards an underlying leverage target

The broad null hypothesis being tested is that there is no significant association between leverage outcomes and the posited drivers thereof, rendering the capital structure decision unclear and perhaps irrelevant. But a finding of significant and logical trends or relationships would lead to an apparent rejection of the null, with the conclusion that there is relevance to the capital structure decision and perhaps support of aspects of the trade-off and/or pecking order theories.

An over-riding hypothesis that this study will posit and attempt to demonstrate is that the capital structure decision is indeed relevant, but due to a lack of complete mutual exclusivity between the trade-off and pecking order theories, it will be difficult to reject one in favour of the other. That is, aspects of both theories are expected to play a role in the capital structure decision for JSE-listed firms.

c. Motivation and contribution

This study is primarily motivated by a desire to understand the fundamentals and dynamics of the capital structure decision (and more broadly, the corporate finance practices) of JSE-listed companies.

But more pragmatically, it is hoped that this study will contribute to the growing body of empirical corporate finance research in South Africa. As was touched upon earlier, by comprehensively examining the predictions of the trade-off and pecking order theories a foundation will be laid for refinements and further research into the capital structure decision in this country – viz. a formal investigation into the market-timing hypothesis and the role of debt and equity capital market conditions, in the style of Baker and Wurgler (2002) and DeAngelo, DeAngelo and Stulz (2010)**;** an examination of the role of local macroeconomic factors on the financing decision and speeds of adjustment, in the style of Cook and Tang (2010) and others; a formal investigation into the role of industry factors in financing practices, in the style of Leary and Roberts (2010a); and an examination of the impact of South Africa's particular legal and institutional environment on the financing decision.

d. Structure of the study

The rest of the study is organised as follows.

A background and review of the seminal literature and empirical evidence in the field of capital structure will be presented in the first part of the study, covering Sections 2-9. The theoretical background is first presented, entailing discussions of Miller and Modigliani's (1958) capital structure irrelevance theory (Section 2); the trade-off theory (Section 3); the picking order theory (Section 4); the role of agency costs (Section 5); and the market-timing theory (Section 6). With a view to refining the theory into a testable empirical model, Section 7 summarises the measurable determinants of leverage as espoused in the trade-off and pecking theories (and their hypothesised roles). Section 8 provides an outline of the available empirical evidence in capital structure research, taking both an international and South African perspective. Section 9 will then attempt to reconcile the empirical evidence with the underlying seminal theory by constructing a unified view of the capital structure decision.

An analysis of the capital structure practices of firms listed on the JSE over the period 1999-2011 is presented in the second part, covering Sections 10-13. A discussion of the selected

empirical models, econometric methodology, sample construction and data collection is contained in Section 10. In Section 11, the results of this analysis are presented, interpreted and discussed at length. Section 12 summarises the core findings of this study and concludes, whereafter Section 13 will provide a brief outline of the potential delimitations concerning these results and some directions for further research.

Theoretical background and empirical evidence on the capital structure puzzle

2. Capital structure irrelevance under perfect markets

a. A description of Modigliani and Miller's (1958) irrelevance theorem

In their seminal work on capital structure, Modigliani and Miller (1958) assume a world with perfect and frictionless markets: no taxes; no transaction costs; no costs associated with bankruptcy or financial distress; no agency costs; perfect information (i.e. no information asymmetries between market participants); and efficient capital markets. The key implication of these assumptions is that the sum of all future cash flows available for distribution to the firm's debt and equity holders will not be affected by how it is financed. Accordingly, in the presence of these assumptions, the capital structure decision – being the decision of what proportion of debt versus equity (and other sources of capital, such as preference shares or hybrid securities) should be used to finance a firm's operating and investment activities – does not affect firm value and is thus irrelevant. Further, the nature of the debt structure – the degree to which debt is secured or unsecured, senior or subordinated, and so on – will carry no impact either. Instead, firm value is determined purely by the performance and risk characteristics of its underlying real assets: indeed, Modigliani (1980, pg. 13) explains that the theory predicts that "the market value of the firm – debt plus equity – depends only on the income stream generated by its assets. It follows, in particular, that the value of the firm should not be affected by the share of debt in its financial structure . . ."

More formally, Modigliani and Miller (1958) suggest three propositions:

Proposition I

The market value of any firm is independent of its capital structure and is given by capitalising its expected return (operating profit) at the class-appropriate rate. Equivalently, the average cost of capital is completely independent of the firm's capital structure and is equal to the capitalisation rate of a pure equity stream of its class. In other words, for two otherwise identical firms, the overall value of each is not affected by the relative proportions of debt and equity in its capital structure. The value of the all equity-financed (unlevered) firm (V_U) would be identical to that of the firm employing leverage (V_L), and thus $V_U = V_L$.

The authors show that should two firms, identical except for their capital structures, differ in terms of total value, the opportunity for arbitrage would arise and necessarily force the restoration of the equality between total firm values.

Proposition II

Following on directly from Proposition I, the expected yield of a share of equity is equal to the appropriate capitalisation rate for a pure equity stream in its class, plus a premium related to financial risk equal to the D/E ratio times the spread between the unlevered cost of equity and the cost of debt. Formally, this can be stated as:

$$k_e = k_o + \frac{D}{E}(k_o - k_d) \quad \ldots\ldots \quad (1)$$

where k_e is the required rate of return on equity (the cost of equity)

k_o is the unlevered cost of capital (the cost of capital under all-equity financing)

k_d is the required rate of return on borrowing (the cost of debt)

$\frac{D}{E}$ is the ratio of debt (D) to equity (E) in the firm's capital structure

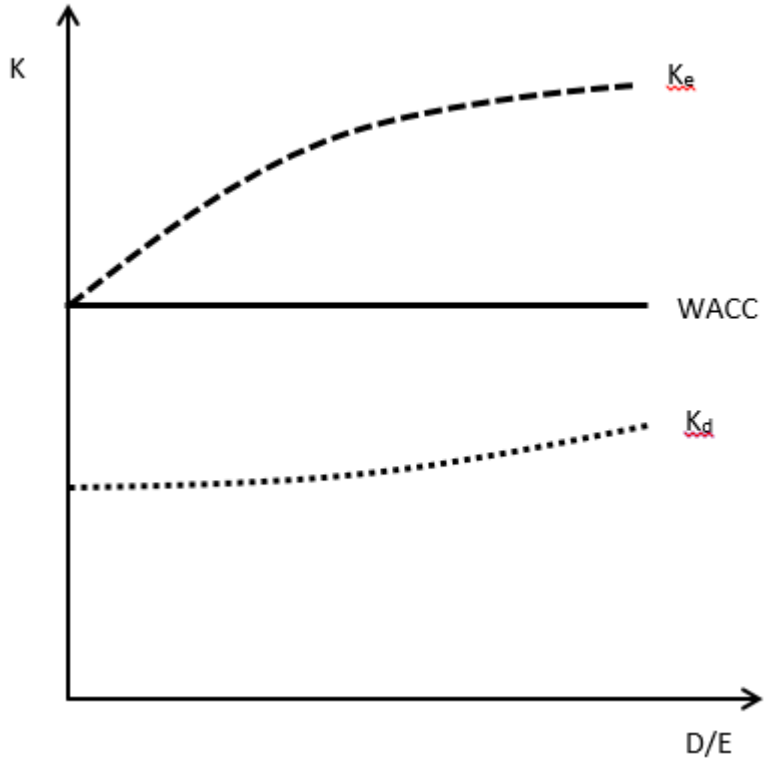
For a given firm, its overall weighted average cost of capital (WACC) is defined as:

$$k_a = \left(\frac{E}{D+E}\right) k_e + \left(\frac{D}{D+E}\right) k_d \quad \ldots\ldots \quad (2)$$

where the other variables are defined as before, and k_a is the WACC.

The idea presented by Equation 1 is that a higher D/E ratio (an increase in a firm's use of leverage) leads to a higher cost of equity, as compensation for the higher level of financial risk borne by equity-holders in a leveraged firm. Additionally, high levels of leverage can increase the inherent riskiness of its debt, and would lead to an increase in the cost of debt as compensation for this risk. But the implication arising from Propositions I and II is that any increase in the risk and cost of the two sources of capital (from higher debt levels) will be exactly offset by shifts in their relative weights in the WACC formula (Equation 2), leaving the overall average cost of capital unchanged, and thus firm value unaffected, for varying levels of debt (Hillier, Grinblatt and Titman, 2008). This idea is graphically presented in Figure 1.

Figure 1: The relationship between K_e, K_d and WACC for varying D/E under Modigliani and Miller (1958)



Proposition III

The cut-off point for investments undertaken by the firm is the average cost of capital in all cases and will be unaffected by the type of security used to finance the investment. The interpretation of this is that the type of instrument used to finance an investment is irrelevant to the question of whether or not the investment is worthwhile. In other words, the firm's financing decision will not affect its investment decision.

b. Is the theory of capital structure irrelevance descriptive of the reality?

How does the strict interpretation of this theory stand up to empirical tests? Myers (2001) observes that the theory is exceptionally difficult to test directly, and Mahagaonkar and Qiu (2008) suggest that it is difficult, if not impossible, to effectively disentangle the impact of capital structure on firm value from the effects of other more fundamental changes. Frank and

Goyal (2008) further highlight that with debt and firm value being both plausibly endogenous and driven by other factors such as profits, collateral, and growth opportunities, it is not possible establish an accurate structural test of the theory by regressing value on leverage.

Nonetheless, Elsas and Florysiak (2008) suggest that because the theory predicts that one should not observe systematic patterns of within-group (i.e. intra-industry) homogeneity and between-group (i.e. inter-industry) heterogeneity in capital structures, anecdotal evidence, such as the existence of industry-specific leverage ratios that persist within and across financial systems, would imply the relevance of the capital structure decision. Additionally, the Graham and Harvey (2001) survey of US CFOs strongly illustrates that the majority of firm managers consider the capital structure decision important for firm value.

The key point to note here is that although Modigliani and Miller's (1958) theorem would appear to strongly suggest the irrelevance of the capital structure decision, it is subject to strict, and in many ways unrealistic, simplifying assumptions. Of course, the reality is very different from the perfect, frictionless capital markets model used in the development of the theory. But indeed, the authors explicitly state (pg. 296) that "these and other drastic simplifications have been necessary in order to come to grips with the problem at all. Having served their purpose they can now be relaxed in the direction of greater realism and relevance, a task in which we hope others interested in this area will wish to share". A popular defence of the theorem, according to Frank and Goyal (2008), is that "while the Modigliani–Miller theorem does not provide a realistic description of how firms finance their operations, it provides a means of finding reasons why financing *does* matter".

Thus, when one adopts a more realistic view - and allows for the existence of capital market imperfections in the form of taxes, costs of bankruptcy and financial distress, agency costs and information asymmetries between market participants - the capital structure decision may indeed affect firm value and become highly relevant. This idea gives rise to several branches of the theory of capital structure that incorporate capital market imperfections: most importantly the trade-off and pecking order theories (the focus of this study), as well as the market-timing hypothesis and theories incorporating the role of agency costs theories. The discussion will now turn to these theories.

3. The trade-off theory

Overall, the trade-off theory effectively describes a family of related theories. Under this broad hypothesis, a decision-maker running a firm evaluates the various costs and benefits of alternative leverage plans. An optimal, firm value-maximising target D/E ratio is obtained where the marginal costs and marginal benefits of debt are balanced (Frank and Goyal, 2008). Identifying, achieving and maintaining this D/E target then becomes the focal point of the capital structure decision.

At this point, the discussion will primarily focus on the static trade-off between the tax benefits of debt versus the costs of financial distress associated with higher debt levels, but agency costs may too play an important role (discussed under Section 5), and the trade-off target may be time-varying/dynamic (discussed under Section 3.d).

a. <u>The role of taxes</u>

Following on from their earlier work, Modigliani and Miller (1963) consider the role of taxes in a firm's capital structure decision. Because of the tax-deductibility of interest payments on debt financing (under most corporate tax systems, including that of South Africa), they suggest that increasing the relative amount of debt adds value to the firm by effectively shielding earnings from taxes. They show that, in the presence of corporate taxes (and assuming a static and perpetual level of debt), the value of a levered firm is given by:

$$V_L = V_U + \tau D \qquad \ldots\ldots \qquad (3)$$

where V_L is the value of the levered firm

V_U is the value of the unlevered firm

τ is the statutory corporate tax rate

D is the permanent debt level in the firm's capital structure

Equation 3 shows that τD is the amount of value that would be added to the firm through the interest tax-shield arising from the use of leverage. But as Myers (2001) points out, this can only be considered a remote upper bound: firstly, the firm may not always be profitable, so the average 'effective' future tax rate would be less than the statutory rate; secondly, the level of debt *D* is not permanent and fixed – that is, the level of debt in a firm may be adjusted depending on changes in profitability and industry conditions, among others (making the value of future

interest tax-shields to investors somewhat risky); and thirdly, as Barclay and Smith (1999) note, it overstates the tax advantage of debt by only considering corporate taxation – the corporate-level tax advantage of debt may be partly offset by the tax advantage of equity to individual investors (namely, the ability to defer capital gains on equity claims and pay taxes at the generally lower capital gains rate). This makes it unlikely that the incremental tax advantage of debt on firm value (and thus to investors) is fully τD.

Nonetheless, empirical and anecdotal evidence does exist to suggest that, to some extent, the tax advantage of debt plays a role in the capital structure decision, especially when focusing on incremental financing decisions. For example, MacKie-Mason (1990) finds that publicly traded US firms are more likely to issue debt when faced with a high marginal tax rate, and to issue equity when faced with a low marginal tax rate.

An analogous interpretation of the tax benefit of debt can be made in light of the cost of equity (Equation 1) and WACC (Equation 2). In the presence of corporate taxes, the cost of equity becomes:

$$k_e = k_o + \frac{D}{E}(k_o - k_d)(1 - T_c) \qquad \ldots\ldots\ldots \qquad (4)$$

and WACC becomes:

$$k_a = \left(\frac{E}{D+E}\right) k_e + \left(\frac{D}{D+E}\right)(1 - T_c) k_d \qquad \ldots\ldots\ldots \qquad (5)$$

This can be restated as:

$$k_a = k_o - \left(\frac{D}{D+E}\right) T_c k_d \qquad \ldots\ldots\ldots \qquad (6)$$

where the other variables are defined as before, and T_c is the corporate tax rate. As is clear from Equation 6, when interest on debt is tax deductible, WACC will decline as leverage ($\frac{D}{D+E}$) increases, and thus firm value will increase with leverage (Hillier, Grinblatt and Titman, 2008).

The tax benefits hypothesis suggests that consistently highly profitable firms with a high tax burden would benefit most from the interest tax shield, and should thus favour higher leverage. Nonetheless, since no offsetting cost of debt is offered, Modigliani and Miller's (1963) result would seem to imply that a capital structure made up completely of debt, that would maximise the value-enhancing impact of the interest tax-shield, is the optimal result. To avoid this

extreme (and anecdotally unrealistic) prediction, there needs to exist some offsetting cost of debt.

b. The role of bankruptcy and costs of financial distress

Kraus and Litzenberger (1973) were the first to suggest that the tax advantage of debt needs to be traded off against the potential deadweight costs of bankruptcy, which will generally arise when debt levels become excessive relative to the firm's asset value – typically when the value of outstanding debt is greater than total asset value. But Warner (1977) and others suggest that the direct costs of bankruptcy (including lawyers' and accountants' fees, and the value of managerial time spent administering the bankruptcy) are small relative to the market value of the firm.

It is likely that the indirect costs of bankruptcy play a greater role. Although difficult to observe and quantify in a direct manner, these indirect costs may take the form of lost sales, lost profits and the inability of the firm to raise capital except under onerous terms when the firm is merely threatened by bankruptcy (Warner, 1977). In other words, indirect costs of bankruptcy are not related to the direct reorganisation of the firm when in an actual position of bankruptcy; but rather, they arise among financially distressed firms, or firms with high debt levels that are somewhat close to bankruptcy but never actually go bankrupt (Hillier, Grinblatt and Titman, 2008). Because of this, they are referred to as the costs of financial distress.

The costs of financial distress can arise and adversely affect firm value in a number of ways. A particularly strong effect comes from distortions in the firm's investment policy that arise from excessively high debt levels: specifically, they arise from attempts by equity-holders to extract wealth from debt-holders through the conduct of the investment decision, and can essentially be seen as an agency cost arising from conflicts of interest in the equity-holder/debt-holder relationship. Generally, one will find that debt-holders respond to such concerns by charging higher interest rates and demanding (sometimes restrictive) protective covenants, among other measures. Four distortions will be described in this study.

First, Myers (1977) describes the underinvestment (or debt overhang) problem: a firm with a high level of risky debt outstanding and which acts in shareholder's interests will follow a different investment decision rule than one with risk-free or no debt. The firm financed with high levels of risky debt will, in some states of nature, pass up valuable, positive NPV projects.

In other words, high levels of risky debt can weaken the firm's incentive to undertake good future investments, which will adversely affect firm value. High-growth companies which derive most of their value from intangible investment opportunities ('growth options') are most likely to choose low levels of debt in their capital structures, since the underinvestment/debt overhang problem is likely to cause a greater loss in value in these types of firms. On the other hand, mature companies with few investment opportunities, that derive most of their value from assets-in-place, are likely to be less vulnerable to the underinvestment problem, and thus should choose higher relative debt levels (Barclay and Smith, 1999).

A second distortion in investment policy is known as the asset substitution effect. Originally postulated by Jensen and Meckling (1976) and Galai and Masulis (1976), firms financed with debt have the incentive to take on unnecessary risk, possibly being driven to the point of substituting positive-NPV, less risky investment projects for riskier, possibly negative-NPV ones. This is since equity-holders tend to gain at the expense of debt-holders when business risk increases (through operating and financial leverage effects). Clearly, this sort of investment policy is sub-optimal and will adversely affect firm value.

A third distortion may be a reluctance to liquidate. As suggested by Titman (1984), the management of a firm, acting in the interest of equity-holders, may be reluctant to liquidate the firm when its liquidation value exceeds its going concern value. Because debt-holders have priority in the event of liquidation, equity-holders mostly lose out under liquidation and would thus capture any potential upside benefits should the firm continue to operate. Accordingly, managers may attempt to delay liquidation as long as possible. This may be done, for example, by cutting corners on maintenance, research and development; through accounting changes designed to conceal the true extent of trouble; and encouraging false optimism concerning firm affairs, in order to make current operating performance appear better than it actually is (Brealey, Myers and Allen, 2008). Such delaying tactics are not aligned with maximising firm value.

A final investment distortion may come through short-sightedness in the investment decision. A company carrying an excessive debt burden (where refinancing may be difficult) may find itself rejecting high-NPV investment opportunities that pay off over a long time horizon in favour of low-NPV opportunities that pay off over a shorter time period. This is due to the need for cash to be generated quickly in order to service the debt burden; and clearly, if such a debt burden did not exist, the long-term high-NPV project would be selected – in line with a value-

maximising investment decision. Once again one observes a sub-optimal investment decision being induced by excessive levels of debt.

An additional category of costs of financial distress may arise and adversely affect firm value through reputational concerns among non-financial firm stakeholders. Titman and Parsons (2009) define non-financial stakeholders as parties that have either a direct or indirect interest in the firm's long-term viability, but are not investors in the company – such as employees, customers and suppliers. Known as the stakeholder theory, a firm's financial condition affects how it is perceived as a reliable supplier, customer and employer, and thus affects the terms and conditions under which it operates with such stakeholders. A firm perceived to be under financial distress would likely be subject to onerous contracting relationships with such stakeholders, and may find its competitive position weakened. Firm value would clearly be adversely affected by such conditions. In particular, this type of financial distress is especially costly for firms with products involving quality that is important yet unobservable; for firms with products that require future servicing; and for firms engaged with employees and suppliers that require specialised capital or training (Hillier, Grinblatt and Titman, 2008). These types of firms should have relatively lower levels of debt in their capital structures.

To summarise the role of the costs of financial distress, Myers (1984) suggests that, in general, financially risky firms should borrow less, all else equal. Here, risk is defined as the variance rate of the market value of the firm's assets. The higher the variance rate, the greater the probability of default on any given package of debt claims, and thus the higher will be the costs of financial distress. That is, financial distress can be directly tied to credit risk. And although difficult to quantify precisely, the costs of financial distress to a firm operating under excessively high debt levels are likely to significantly affect firm value. For example, using risk-adjusted default probabilities derived from corporate bond spreads, Almeida and Philippon (2007) suggest that the present value of financial distress is substantial: for a BBB-rated firm, the NPV of financial distress is 4.5% of pre-distress firm value.

c. The trade-off between tax benefits and costs of financial distress

Myers (1984) defines the outcome of the trade-off hypothesis as the focus by the firm on an optimal debt ratio that is usually viewed as determined by a trade-off of the costs and benefits of borrowing, holding the firm's assets and investment plans constant. More formally, the trade-off theory predicts that firms target an optimal, value-maximising D/E ratio that balances the

marginal benefits of debt financing (such as the interest tax-shield) with the marginal costs of additional debt (such as the costs of financial distress). This idea is graphically presented in Figure 2: as the firm takes on more debt, the value of the firm will rise with increasing interest tax-shields. But eventually, as debt levels become excessively high, the costs of financial distress begin to have a significant adverse effect on firm value. The optimal, value-maximising capital structure is reached where these marginal benefits and costs of additional debt perfectly offset each other.

An analogous interpretation of the trade-off theory can be made in terms of firm WACC. Brealey, Myers and Allen (2008) suggest that although on the one hand increasing leverage will lower WACC to some extent because of the tax benefit of debt (see Equation 6), firms that borrow excessively and begin to incur costs of financial distress will be subject to significantly higher costs of equity and debt as compensation for this higher level of business and financial risk (which in turn would begin to increase WACC). Thus, at some level of leverage WACC will be minimised, and this will indicate the optimal D/E ratio for the firm. This idea is graphically presented in Figure 3.

As has been indicated, the relative costs and benefits of debt are likely to vary firm-to-firm. Under the trade-off theory, consistently highly profitable, low-risk firms with a high tax burden, few investment opportunities and which derive most of their value from tangible assets-in-place should take on relatively more debt financing. Conversely, high-risk firms with inconsistent profitability, an abundance of investment opportunities and which derive much of their value from growth prospects should be subject to relatively lower levels of debt financing.

Figure 2: The trade-off theory of capital structure (source: Myers, 1984)

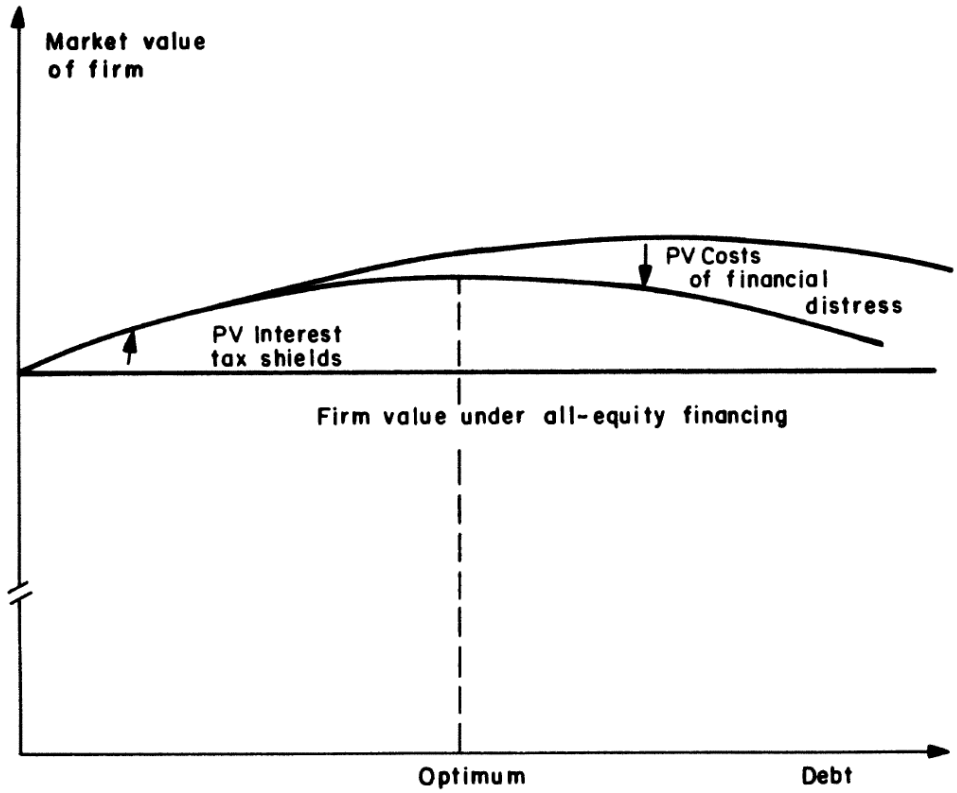
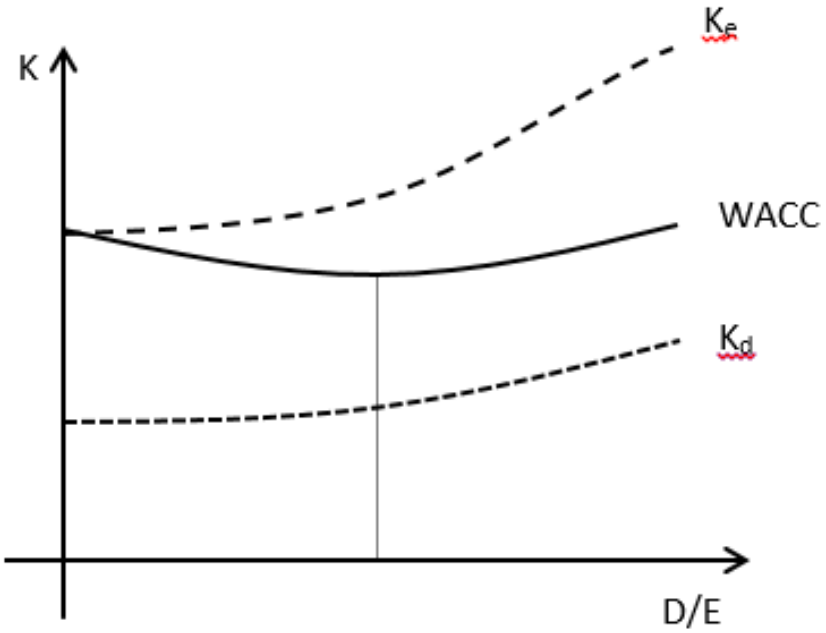


Figure 3: The relationship between K_e, K_d and WACC under trade-off theory



d. Static vs. dynamic trade-off and adjustment

A firm is said to follow the static trade-off theory if the firm's leverage target is determined by a single period trade-off between the tax benefits of debt and the deadweight costs of bankruptcy/financial distress (Frank and Goyal, 2008). On the other hand, it may be that the determinants of capital structure (namely, the perceived marginal benefits and costs of debt) vary over time as firm circumstances and fundamental characteristics change. If the optimal target leverage ratio varies over time, this is labelled dynamic trade-off theory (Elsas and Florysiak, 2008).

Fundamental or market-based shocks may move the firm away from its optimal D/E ratio. The firm is supposed to substitute debt for equity, or equity for debt, until the firm returns to its D/E target and value of the firm is once again maximized. The pace at which the firm adjusts back towards its optimal capital structure target will depend, among other things, on the costs of adjustment (incorporating the role of transaction and information costs). Hovakimian and Li (2011) thus suggest that firms may adjust toward target debt ratios only occasionally, when the benefits of adjusting exceed adjustment costs (including transaction and information costs).

Thus a key to testing the validity of the trade-off theory is to determine whether or not firms adjust towards a target following shocks to leverage, and to measure the speed of this adjustment (Myers, 1984). The methodology used to measure the speed of adjustment is a vital and somewhat contentious aspect of capital structure research, and is discussed at length in Section 10.

4. The pecking order theory

The pecking order theory of capital structure rejects the notion that firms have some target, optimal and value-maximising leverage ratio in mind, but still views the capital structure decision as highly relevant and dominated by information costs.

First suggested by Donaldson (1961), the contemporary interpretation is in large part based on Myers and Majluf's (1984) adverse selection model: management is assumed to know more about the firm's value and prospects than investors (in other words, there exists a degree of information asymmetry between managers and investors), and investors interpret the firm's actions accordingly. For a firm with assets-in-place and an investment opportunity requiring funding, the firm may choose to finance it with an equity issue. But management, acting in the

interest of existing shareholders, will refuse to issue equity if it believes the shares are *under*valued (issuing shares at too low a price transfers value from existing shareholders to new investors) - even if it means passing up the investment opportunity - unless the transfer from existing to new stockholders is more than offset by the net present value of the growth opportunity (Myers, 2001). Investors, aware of this information asymmetry, will reason that a decision not to issue shares signals 'good news'. The news conveyed by an equity issue is 'bad', signalling that the shares are overvalued. This affects the price investors are willing to pay for the issue. Further, the potential dilutionary impact that an issue of equity would carry may also convey a negative signal.

The widely observed significant drop in share prices on average upon announcement of an equity issue is consistent with this hypothesis - see, for example, the seminal work of Asquith and Mullins (1986) - and the negative impact is likely to be greater the larger are perceived information asymmetries between shareholders and managers.

In contrast, the use of debt may, in some circumstances, be seen as conveying a positive signal – perhaps because of a signal of management being confident enough in the investment opportunity to take on additional financial leverage (and thus be willing to take on additional financial risk); because of the potential ROE-enhancing effect of increased financial leverage combined with a profitable, value-enhancing opportunity; or because of the disciplinary role that debt carries on management control over free cash flows, as per Jensen (1986). At the very least, however, debt issues carry a lower informational cost than equity issues, according to this hypothesis. Seminal work by Mikkelson and Partch (1986) demonstrated a statistically insignificant impact on share prices upon announcement of a debt issue, in contrast to the significant negative impact of equity issues.

At this point it is important to consider the role of retained earnings as a funding source. In the pecking order framework, internal funds (that is, retained earnings) are generally considered to carry zero informational costs by definition – only externally raised capital carries an informational signal. The implication is that retained earnings would be the first choice source of funding in a financing model based on informational costs. But an argument can be made that internal funds are not immune from informational costs: the level of retained earnings is a function of payout policy (such that dividend cuts will increase the level of retained earnings, *ceteris paribus*, and vice-versa), and there exists the widely observed empirical pattern that dividend cuts carry a substantial and significant negative impact on share prices - most recently

discussed by Jensen, Lundstrum and Miller (2010). Thus, in the pecking order model, dividend cuts are not used as a mechanism to fund capital expenditure because of high informational costs. That is, retained earnings will not be explicitly tailored to meet capital expenditure requirements through dividend cuts.

All considered, the pecking order theory suggests that companies maximize value by systematically choosing to finance new investments with the informationally cheapest available source of funds, without any explicit leverage target (Barclay and Smith, 1999). If a firm does seek *external* funds in order to finance some investment opportunity (for which retained earnings – carrying practically zero information costs – are insufficient as a funding source), it is better off issuing debt rather than equity. When raising external capital, the general rule should be to issue safe and informationally 'cheap' securities before risky ones (namely debt before equity), because of the lower information costs associated with debt issues. Equity issues will occur only when debt becomes excessively costly, when, for example, the firm is already at a dangerously high debt ratio and the costs of financial distress become severe. Overall then, information costs dominate all other considerations in the context of the capital structure decision (Myers, 1984).

Myers (2001) formally states the pecking order as follows:

i. Firms prefer internal funds (such as retained earnings) to external capital (information asymmetries are assumed relevant only for external financing).
ii. Dividends are 'sticky', such that dividend cuts are not used to finance capital expenditure. Thus, changes in cash requirements are not soaked up in short-run dividend changes, such that changes in net cash will show up as changes in external financing.
iii. If internally generated cash flow exceeds capital investment, the surplus is used to pay down debt rather than repurchasing and retiring equity. If external funds are required for capital investment, firms will issue the safest security first; that is, debt before equity. As the requirement for external financing increases, the firm will work down the pecking order, from safe to riskier debt, perhaps then to preferred stock or hybrid securities (such as convertible bonds), and finally to equity as a last resort.
iv. At any point in time, a firm's debt ratio therefore reflects its cumulative requirement for external financing.

The pecking order theory predicts that low-growth firms with few investment opportunities, that are highly profitable and generate substantial cash flow, have a lower need for external financing and thus would have lower debt ratios. Conversely, high-growth firms facing an abundance of investment opportunities, which already use up most internally generated cash flow in the pursuit of growth, are likely to have a greater need for external financing and thus have higher debt ratios. Note that this prediction is exactly opposite to that of the trade-off theory.

5. Agency cost theories of capital structure

Although aspects of agency theory are implicit in aspects of the trade-off and pecking order theories (some of which have been discussed in previous sections), their impact on the capital structure decision is deserving of a more thorough discussion.

In their seminal work on agency theory, Jensen and Meckling (1976) argue that while Modigliani and Miller (1958) assume that the probability distribution of future cash flows to the firm is independent of the capital structure decision, agency costs – arising from conflicts of interest between shareholders and firm management – provide a strong reason that the probability distribution of future cash flows is *not* independent of capital or ownership structure. Correspondingly, the respective agency costs of debt and equity may be an important determinant of a firm's optimal capital structure. Specifically, from the owner-manager's standpoint, the optimal proportion of new funds to be obtained from equity versus debt, for a given level of internal equity, is that resultant D/E level which results in minimum total agency costs.

A particular way in which agency costs may influence the capital structure decision is outlined in Jensen's (1986) free cash flow hypothesis. It is suggested that one of the symptoms of the agency problem is that managers have an incentive to cause their firms to grow beyond the optimal size. Growth increases managers' power by increasing the resources under their control, and it is also associated with increases in managers' compensation (as well as satisfying managers' desire for prestige and status). The extraction of excessive 'perks' is also an important concern. These sorts of 'managerial inefficiencies' will be a particular problem for firms that generate substantial free cash flow, defined as cash flow in excess of that required to fund all projects that have positive NPV. Monitoring by the firm's internal control systems

(such as the board of directors) and the market for corporate control are important disciplinary tools for firm management, but the problem may remain of how to motivate managers to disgorge excess cash to investors rather than investing at below the cost of capital or wasting it on organisational inefficiencies, in an effort to sub-optimally grow the firm.

Paying dividends is one way, but such promises are weak because dividends can be reduced. But debt creation, without retention of the proceeds of the issue, enables managers to effectively bond their promise to pay out future cash flows. The legally-binding contractual nature of debt and the threat of bankruptcy makes this a firm commitment, and may impose an effective motivating force on management to make their organisation more efficient. Thus debt can reduce the agency costs of free cash flow by reducing the cash flow available for spending at the discretion of managers, and in this regard contributes to maximising firm value. The control function of debt would be more important in organisations that generate large cash flows but have low growth prospects, and these types of firms should be subject to greater levels of relative debt financing.

Of course, as was discussed earlier, value-destroying distortions in investment policy (namely the underinvestment/debt overhang, asset substitution and short-sightedness effects), that arise from increasing the relative level of debt in the capital structure, can be viewed as agency costs arising from conflicts of interest between equity- and debt-holders. They represent attempts by managers (acting in the interest of shareholders) to expropriate wealth/value from debt-holders, who respond by demanding higher interest rates and stronger convenants. Ultimately this particular agency cost will be reflected in reduced firm value. Firms most at risk of this problem are those that are presented with an array of investment/growth opportunities and derive most of their value from such intangible growth prospects, and thus should favour lower levels of debt financing (Barclay and Smith, 1999).

Overall then, in the context of agency costs, the use of debt financing can be seen as offering two opposing influences on firm value:

i. Benefitting the firm by controlling managerial discretion over free cash flow (i.e. controlling the agency problem between firm managers and shareholders).
ii. Adversely affecting the firm by encouraging a sub-optimal investment policy and restrictive borrowing conditions under excessive debt levels (i.e. creating agency costs arising from the relationship between equity- and debt-holders).

This idea fits in well with trade-off theory. In the presence of these agency issues, the optimal, value-maximising capital structure will involve a trade-off of the marginal benefits of increased debt financing (including the tax benefit and agency control function of debt) with its marginal costs (including the costs of financial distress, which can be substantially made up of the costs of the 'agency' relationship between debt- and equity-holders).

6. The market-timing theory

Although not to be empirically examined in this particular study, the market-timing theory is nonetheless an important piece of the capital structure puzzle, and as such a comprehensive review of the literature would be incomplete without a discussion of this hypothesis. According to the market-timing theory, companies are not particularly concerned with whether they are financed by debt or equity, but rather choose the form of financing which, at that point in time, seems to be most valued by capital markets. In other words, market conditions are a key determinant of the capital structure decision.

In their seminal work on market-timing, Baker and Wurgler (2002) consider this hypothesis in detail: subject to the effect of transaction costs, managers will attempt to time the market and issue equity when their market values are high, relative to book and past market values, and to repurchase equity when their market values are relatively low. In this theory, there is no optimal capital structure, so market-timing financing decisions just accumulate over time into the capital structure outcome. A firm's capital structure at any point in time, then, is largely the cumulative outcome of past attempts to time the capital market.

Although the market-timing literature usually focuses on the equity market, a similar case can be made for timing the debt market. For instance, a low interest rate environment may make debt a relatively cheap source of capital, thus encouraging a preference for debt over equity and possibly a tolerance for higher leverage. In a related context, liquidity in capital markets is another vital concern. As a consequence of vigorous and extensive global monetary easing by central banks in recent years, conditions of unprecedented high liquidity (and a corresponding environment of exceptionally low interest rates) have arguably played a key role in shaping global capital markets in the aftermath of the financial crisis of 2007/2008. Although beyond the scope of this study, the link between market liquidity and leverage is a fascinating aspect

of the study of capital structure. It is explored in detail by Ivashina and Scharfstein (2010) and Adrian and Shin (2010), among others.

On a related note, several recent papers – for example, Korajczyk and Levy (2003) – suggest that the interaction of broader macroeconomic and capital market conditions offer an important factor in analysing firm leverage. Looking specifically at the adjustment to target leverage under the trade-off theory, Cook and Tang (2010) provide evidence that during the recent financial crisis, firms' ability to raise capital in either the debt or equity markets (in order to adjust capital structure) has been substantially hampered. For example, in the U.S. only 624 debt and equity issues worth $301.8 billion came to market in the fourth quarter of 2008 compared to 2343 issues worth $718.9 billion in the final quarter of 2007. On this issue they quote Alan Greenspan (pg. 74): "Banks, fearful of their own solvency, all but stopped lending. Issuance of corporate bonds, commercial paper and a wide variety of other financial products largely ceased." Consistent with this anecdotal evidence, the authors use two dynamic partial adjustment capital structure models to estimate the impact of several macroeconomic factors on the speed of capital structure adjustment toward target leverage, and find evidence that firms adjust their leverage towards a target faster in 'good' macroeconomic states relative to 'bad' states. This is an intriguing line of research, but suffice it to say once again that it lies somewhat beyond the scope of this study, which largely focuses on firm-specific 'micro' determinants of leverage practices.

Finally, Frank and Goyal (2009) suggest that if managers strictly follow market-timing behaviour, it can lead to situations where the raising of external funds becomes somewhat unrelated to the actual current need for capital: for example, if the debt and/or equity capital market is looking particularly favourable at a given point in time, funds may be raised from either source (or both) even if new capital is not needed in the business – rather than run the risk of tighter capital market conditions in the future. In contrast, even if there is a clear need for external capital, adverse conditions in the debt/equity capital market can cause funding to be deferred. This is clearly in contrast to the predictions of the pecking order hypothesis, where accessing external funds is driven purely by the needs of the cash flow deficit as the first-order concern.

7. Determinants of leverage: stylised facts regarding the predictions of the trade-off and pecking order theories

Based on the theoretical outline of the capital structure decision as presented previously, this section summarises the predictions under the trade-off and pecking order theories concerning the relationship between firm leverage and a number of classically identified fundamental factors – including growth opportunities, size, tangibility of assets, profitability and the financing deficit – that form the basis of the empirical model used in this study (see Section 10). Comment will also be made on the role of industry-specific factors.

a. <u>The trade-off theory</u>

The trade-off theory predicts that maintaining the firm's capital structure at or near its optimal/value-maximising D/E ratio is the first-order concern of the capital structure decision. Thus when a given shock moves the firm away from its optimal capital structure, there will be adjustment back towards the optimal structure. The theory predicts that:

- The level of *growth opportunities* (measured by variables such as M/B or Tobin's Q) is predicted to be negatively related to leverage, since firms with greater growth opportunities are more likely to be affected by the costs of financial distress and to a greater extent, reducing their debt capacity.
- *Firm size* (measured by the logarithm of assets or sales, or age of the firm) is predicted to be positively related to leverage, because larger and more mature firms are likely to be more established and less opaque than smaller firms, thus having lower default risk and lower potential costs of financial distress, and thereby increasing their debt capacity.
- *Tangibility of assets* (measured by the ratio of fixed assets to total assets) is predicted to be positively related to leverage, since tangible assets serve as better collateral for debt financing, thereby reducing the potential costs of financial distress and increasing the firm's debt capacity.
- *Profitability* (measured by return on assets [ROA] and similar measures) is predicted to be positively related to leverage, since higher profitability implies reduced likelihood and costs of financial distress, greater free cash flows (and with it an increased role for debt as a managerial disciplinary tool) and greater value arising from interest tax-shields, all of which would increase the desirability of debt financing.

- The *financing deficit*, defined as the net difference between cash flow generated from operations (after adjusting for depreciation and working capital) and cash flow from investing activities, would bare an ambiguous relationship with leverage. The posited logic is that the trade-off theory asserts that the preference for debt or equity (and thus the leverage outcome) will not be driven by cash flow needs as a first-order concern, but rather by other factors.

b. <u>The pecking order theory</u>

The pecking-order theory predicts that the informational costs of debt and equity issues are the first-order concern of the capital structure decision, and that firms do not have an explicit leverage target in mind. When financing is needed by the firm for incremental investment, retained earnings are used first. When external financing is needed, firms will issue the safest (and informationally cheapest) security first, namely debt. Because of its high informational costs, equity is issued as a last resort. Based on this insight, the theory predicts that:

- The level of *growth opportunities* is predicted to be positively related to leverage, since current and future growth must arise from real investments which should ultimately be financed externally and with more debt as the first choice.
- An ambiguous effect of *firm size* on leverage. On the one hand, larger firms might have more assets in place and thus greater absolute damage is inflicted by adverse selection as in Myers and Majluf (1984); but on the other hand, larger firms might be less opaque and suffer less information asymmetry than smaller firms, and thus will suffer less damage by adverse selection, as suggested by Fama and French (2002).
- *Tangibility of assets* is predicted to be positively related to leverage, since tangible assets serving as collateral may reduce the effects and costs of information asymmetries, making external debt informationally 'cheap'.
- *Profitability* is predicted to be negatively related to leverage, since highly profitable firms would be expected to generate greater levels of retained earnings, thereby reducing the necessity to issue debt.
- The *financing deficit* will be positively related to leverage (with a financing surplus negatively related to leverage). Any shortfall in required cash (after taking into account payout policy and investment opportunities) should result in the use of debt financing as the first choice, which should show up in increased leverage. At the same time,

excess cash flow will be used to pay down debt as a first choice (rather than repurchasing shares), thereby reducing leverage.

c. The role of industry factors

This study predominantly focuses on the role played by firm-specific fundamental/'micro' factors in the capital structure decision. But as has been indicated, broader 'macro' factors, such as macroeconomic and/or market-based conditions, may play a significant role in an individual firm's choice between debt and equity. Although it would be highly relevant to consider such factors in the interests of an accurate characterisation and test of the capital structure decision, it nonetheless lies somewhat beyond the scope of this study. As will be discussed in Section 13, this offers an intriguing and important line of inquiry in future capital structure research in this country.

Industry factors (that is, the role of industry-specific conditions such as the nature of competition, business cycle risk and product market interactions) are also likely to play a role in an individual firm's capital structure decision. For example, Leary and Roberts (2010a) show that financing policies are highly interdependent, with firms making financing decisions in large part by responding to the financing decisions of their peers. MacKay and Phillips (2005) show that in competitive industries, a particular firm's level of financial leverage depends on its natural hedge (its proximity to the median industry capital–labour ratio), the actions of other firms in the industry, and its status as entrant, incumbent, or exiting firm. Financial leverage is higher and less dispersed in concentrated industries, where strategic debt interactions are also stronger, but a firm's natural hedge is not significant.

Although the objective of this study is not to comprehensively examine the dynamics of industry conditions and their influence on the capital structure decision in South Africa, some effort shall be devoted to investigating trends in industry leverage/gearing (see Section 11.a) and accounting for industry effects in the empirical model. Although a fairly crude approach, there is a straightforward method to capture a portion of the potential role played by industry factors. As discussed by Elsas and Florysiak (2008), the inclusion of the industry median debt ratio (IMDR) as an explanatory variable in the model tends to provide substantial explanatory power. The rationale is that the IMDR may provide a catch-all proxy for additional factors not explicitly accounted for in the model, including industry-specific fundamentals such as product market interactions, the nature of competition, business risk and operating leverage as

mentioned previously, and possibly the filter-down impact of macroeconomic conditions on the industry and thus the firm itself. In other words, it is posited that the IMDR captures the influence of broad factors common to all firms in the particular industry on a given firm's financing decision. Consequently, the IMDR is included as an explanatory variable in the model employed in this study.

8. Capital structure research: the empirical evidence

Having presented an outline of the seminal theoretical work on capital structure in Sections 2-7, the study now turns to a discussion of the empirical evidence. Although having been subject to substantial empirical testing since the 1980s, the focus here will be on the progression of influential contemporary empirical work on capital structure, and looks at both the international and South African perspective.

a. Evidence on the trade-off and pecking order hypotheses

i. Evidence from the USA

Shyam-Sunder and Myers (1999) test traditional capital structure models along the lines of the trade-off theory against the alternative of a pecking order model of corporate financing. Using a sample of 157 US firms over the 1971-1989 period, they find that a basic pecking order model, which predicts external debt financing driven by the internal financial deficit, has much greater time-series explanatory power than a static trade-off model.

Looking at a somewhat more comprehensive sample, Fama and French (2002) test the predictions of the trade-off and pecking order theories on a sample of more than 3,000 US firms over the 1965-1999 period. They find that highly profitable firms tend to be less levered, in confirmation of the pecking order model; firms with greater investment opportunities tend to have less market leverage, which is consistent with the trade-off model; and as the pecking order model would predict, short-term variation in investment and earnings is mostly absorbed by changes in debt.

Frank and Goyal (2003) derive a novel pecking order model that views changes in leverage as being driven by changes in the financing deficit (scaled to assets), in addition to classic factors. This model forms an important basis of the empirical methodology employed in this study and

is discussed further under Section 10. Their model is tested on a broad cross-section of publicly traded US firms over the 1971-1998 period. In contrast to the predictions of the pecking order theory, net equity issues appear to track the financing deficit more closely than do net debt issues. Although large firms exhibit some aspects of pecking order behaviour, the financing deficit does not challenge the role of conventional leverage factors (such as size and profitability) in explaining capital structure patterns. Indeed, they find that the relevance of the pecking order theory appears to have declined over time for firms of all sizes.

In their analysis of US firms observed over the 1965-2003 period, Lemmon, Roberts and Zender (2008) find that the majority of variation in leverage ratios is driven by an unobserved time-invariant effect that generates surprisingly stable capital structures, with high (low) levered firms tending to remain so for over two decades. This finding is largely unexplained by previously identified determinants, is robust to firm exit, and is present prior to the IPO, suggesting that variation in capital structures is primarily determined by factors that remain stable for long periods of time. Their evidence is thus somewhat damning for existing theories of capital structure and suggest a need for a more refined picture of capital structure theory.

Frank and Goyal (2009) comprehensively summarise and examine the relative importance of 39 fundamental factors (previously identified in the literature) in explaining capital structure decisions of a wide sample of publicly traded US firms. Their overall results suggest that the capital structure decision is somewhat better described by the trade-off theory than pecking-order or market-timing theories. Specifically, they find that the most reliable factors are median industry leverage (+ effect on leverage); bankruptcy risk as measured by Altman's Z-Score (- effect on leverage); firm size as measured by the log of sales (+); dividend-paying (-); tangibility of assets (+); market-to-book ratio (-); and collateral (+). Less reliable effects are the variance of own stock returns (-); net operating loss carry forwards (-); financially constrained (-); profitability (-); change in total corporate assets (+); the top corporate income tax rate (+); and the Treasury bill rate (+).

Leary and Roberts (2010b) investigate the capital structure decision using a novel empirical model and testing strategy that addresses power concerns. Although on its own it lacks significant explanatory power, they find that once a pecking order-based model is extended to include 'classic' capital structure determinants typically used in tests of the trade-off theory, the explanatory power of the model improves greatly (being able to explain upwards of 80% of observed debt and equity issuance decisions). They suggest that this is consistent with the

'stocks and flows' hypothesis of Barclay and Smith (1999) discussed in Section 9, as well as Fama and French's (2005) conjecture that the trade-off and pecking-order models are not entirely mutually exclusive, each having some power in explaining the leverage decision.

ii. International evidence ex-USA

A number of empirical studies on capital structure have been conducted in the international context. In a widely cited study, Rajan and Zingales (1995) examine the capital structure practices of non-financial corporations in G-7 countries (namely the USA, UK, France, Germany, Italy, Canada and Japan). They find that, at an aggregate level, firm leverage is fairly similar across G-7 countries, with only the United Kingdom and Germany being relatively less levered. In examining what firm-specific factors drive the capital structure decision, they find a remarkable consistency in the correlations between leverage and specific factors (namely asset tangibility, size, profitability and M/B) across sample countries. The factors identified to be related to leverage in previous cross-sectional studies in the United States seem similarly related in other countries as well – tangibility and size generally being positively related to leverage, and M/B and profitability generally being negatively to leverage. As before, note that this mixed evidence doesn't clearly favour the trade-off hypothesis over that of the pecking order, and vice-versa. It is conceded that an examination of the United States and foreign evidence suggests that the theoretical underpinnings of the observed correlations are still largely unresolved.

Tong and Green (2005) test the trade-off and pecking order theories on a sample of the 44 largest firms traded on the Shanghai and Shenzen stock exchanges. They find a significant negative relationship between leverage and profitability, consistent with the predictions of the pecking-order theory, and tilting in its favour over the trade-off theory in this sample.

Elsas and Florysiak (2008) investigate the roles of profitability, size, growth opportunities and tangibility of assets in explaining the capital structure decision of publicly-listed German firms over the 1987-2006 period. They find that leverage is negatively related to profitability and positively related to asset tangibility, consistent with the pecking order theory. At the same time, since leverage is positively related to size, negatively related to growth opportunities, and positively related to tangibility of assets, support for the trade-off theory is also found. Notably, they find that most significant determinant of leverage is the industry median debt ratio: firm managers may be using this as a benchmark towards which they adjust their own capital

structures, or it could be that the industry median debt ratio proxies for omitted factors common to the industry, such as industry risk, product market interactions and the nature of competition.

b. Evidence on the market-timing hypothesis

Baker and Wurgler (2002) provide the seminal work on the market-timing theory of capital structure. They hypothesize that firms are more likely to issue equity when their market values are high, relative to book and past market values, and to repurchase equity when their market values are low. From their sample of publicly-traded US firms over the 1968-1999 period, they document that the resulting effects of this market-timing on capital structure are very persistent: fluctuations in market valuations have large effects on capital structure that persist for at least a decade. Low-leverage firms tend to be those that raised funds when their valuations were high, and conversely high-leverage firms tend to be those that raised funds when their valuations were low. As a consequence, current capital structure is strongly related to historical market values.

In contrast, however, Hovakimian (2004) finds that although the raising of equity may be timed to equity market conditions, it does not have significant long-lasting effects on capital structure – suggesting a re-evaluation (but not necessarily a rejection) of the conclusions of Baker and Wurgler (2002). Debt transactions themselves exhibit timing patterns, but it is suggested that this is unlikely to induce a negative relation between market-to-book and leverage.

DeAngelo, DeAngelo and Stulz (2010) find that a firm's market-timing opportunities and its corporate lifecycle stage both exert statistically and economically significant influences on the probability that it conducts a seasoned equity offering (SEO), with the lifecycle effect empirically stronger. But neither effect adequately explains SEO decisions because a near-majority of issuers are not growth firms, and the vast majority of firms with high M/B ratios and high recent and poor future stock returns fail to issue stock. Near-term cash need is the primary SEO motive, with market-timing opportunities and lifecycle stage exerting only ancillary influences. In other words, this can be taken to suggest that the financing deficit (as per the pecking order theory) is the primary driver of access to the external equity capital market, with market-timing considerations a second-order concern.

c. Survey evidence

Graham and Harvey (2001) conduct a survey of 392 CFOs of US firms in an effort to gather evidence on the corporate finance practices of these companies. In the context of capital structure, varying degrees of support are found for the trade-off, pecking-order and market-timing theories. The following findings are noted:

i. In the context of the trade-off theory, mixed support is found for the notion that firms trade off the marginal costs and benefits of additional debt and arrive at an optimal D/E ratio. Cash flow volatility and the tax deductibility of interest payments are moderately important factors affecting the leverage choice, but expected bankruptcy/financial distress costs are not.

   44% of firms say that they have a strict or somewhat strict target level of leverage. However, among investment-grade firms, this figure rises to 64%. The survey evidence suggests that a target D/E level is moderately important for the equity issuance decision. Although the respondents say that same-industry debt ratios are not an important benchmark for their own capital structure decisions, the evidence confirms industry patterns in reported debt ratios. This would suggest an intra-industry commonality of factors affecting a given firm's capital structure target.

ii. In the context of the pecking-order theory, the responses indicate that debt and equity issuance decisions are to some extent dependent on the availability of internal funds: specifically, in line with the pecking-order, debt and equity is more likely to be issued only when internal funds are insufficient, and signalling effects play some role. But in contrast to the theory, which would predict that equity would be issued only once debt capacity has been exhausted, the survey indicates that the equity issuance decision is somewhat unaffected by the ability to obtain funds from debt, convertibles, or other sources.

iii. Support is found for the market-timing theory: the responses indicate that the decision to issue equity is to a large extent driven by recent stock price changes (being more likely to be issued following recent stock price increases, and being less likely to be issued if it is perceived by the firm to be undervalued). The level of interest rates is an important consideration for debt issuances.

iv. Other factors found to be important in the decision to issue debt include controlling the firm's credit rating, maintaining financial flexibility, and matching the maturities of

assets and liabilities (i.e. immunising the balance sheet by striking a balance between short- and long-term debt). For the equity issuance decision, EPS dilution is very important.

Bancel and Mittoo (2004) conduct a survey based on Graham and Harvey's (2001) methodology but in the European context (using firms from a total of sixteen European countries), with a broad focus on corporate finance practices. In the context of capital structure, much like Graham and Harvey (2001) they find that two of the more important factors affecting the capital structure decision are maintaining financial flexibility and EPS dilution. But overall, they find mixed levels support for the trade-off and pecking-order theories among European managers, as is the case for their US counterparts. Windows of opportunity in the market, in terms of the relative level of interest rates and equity valuations, are an important factor, again suggesting the relevance of the market-timing theory.

d. Evidence from Africa

A growing body of research on capital structure practices in South Africa (and the rest of Africa) has come to fruition in recent years. A summary of some of the salient findings is presented here.

Ojah and Gwatidzo (2009) examine corporate capital structure in the broader African context. Using a panel of listed firms in Ghana, Kenya, Nigeria, South Africa and Zimbabwe, they find that companies in these countries appear to be about as leveraged as companies from other emerging economies, such as Mexico, Thailand, Brazil, South Korea, Malaysia and Turkey. They find that African firms tend to rely heavily on internal finance, and when external finance is needed, they choose mostly short-term debt to fund their production activity, which would indicate some support for the pecking-order theory. It is suggested that remedies for inadequate institutional infrastructures are important determinants of corporate capital structure in Africa.

Mkhawane (2010) analyses leveraged buyout activity (LBO) in South Africa over 1998-2010 and finds that the composition of the LBO financing package (in terms of the amount of leverage used in the transaction, implicitly a capital structure decision). In line with the trade-off theory, LBO sponsors seek to balance potential leverage-related benefits with leverage-related costs. The LBO financing package appears to be methodically designed to respond to

differences across firms in their size and maturity, growth prospects, variability of earnings, and to a lesser extent the tangibility of assets. Market-related factors are also important.

Ramjee and Gwatidzo (2012) estimate a target-adjustment model on 178 publicly-listed South African firms over 1998-2008, and find that South African firms adjust relatively quickly towards a target leverage level. It is also found that asset tangibility, growth, size and risk are positively related to leverage, while profitability and tax are negatively related to leverage. Thus mixed support is found for both the pecking order and trade-off theories of capital structure.

Jooma and Gwatidzo (2013) estimate speeds of adjustment for a panel of industrial companies from four African countries. Firms in Nigeria and South Africa adjust relatively faster to their target capital structures, whereas firms in Ghana and Kenya have slower speeds of adjustment, pointing to the existence of higher adjustment costs and less-developed capital markets in these countries.

Finally, Moyo, Wolmarans and Brümmer (2013) examine the capital structure practices of a panel of manufacturing, mining and retail firms listed on the JSE over 2000-2010. Interestingly, they find that leverage is positively correlated to profitability, while asset tangibility is inversely related to leverage. Their results show that South African manufacturing, mining and retail firms do have target leverage ratios and the true speed of adjustment towards target leverage is 40-60%.

9. Integrating the theory: a unified view

Upon examination of the empirical evidence presented in Section 8, it is clear that none of the 'classic' theories of capital structure, taken in isolation, can definitively conclude exactly how it is that firm managers make the capital structure decision. In fact, an examination of the available evidence can be quite bewildering in its lack of conclusiveness. What is clear is that factors such as profitability, flexibility, taxes, costs of bankruptcy/financial distress, information costs and market-timing considerations all play some role in the capital structure decision, but tests appear unable to reject any one theory in favour of another. Capital structure remains a 'puzzle' indeed, as Myers (1984) famously suggests.

There are a number of possible reasons for the continued existence of this puzzle. Barclay and Smith (1999) suggest that:

i. Models of capital structure are far less precise than asset pricing models, for example, and at best only provide qualitative or directional predictions.
ii. The competing theories are not entirely mutually exclusive. Evidence in favour of one theory does not necessarily render the others invalid.
iii. Many of the variables hypothesised to affect capital structure are difficult to measure (often, at best, only a proxy can be used).

There are also a number of econometric and methodological concerns that render accurate and bias-free testing in the capital structure context somewhat difficult. This is an important area of investigation in this study and is discussed further under Section 10.

But all considered, perhaps a comprehensive unified theory of the capital structure decision incorporates aspects of all of the theoretical ideas, along the lines of an 'integration of stocks and flows' idea proposed by Barclay and Smith (1999): firm managers begin by obtaining a firm-specific, context-dependent D/E target that managers perceive will maximise firm value by balancing the marginal benefits and costs of debt (along the lines of trade-off theory) – taking into consideration factors such as the company's projected investment requirements; the level and stability of its operating cash flows; its tax status; the expected loss in value from being forced to defer investment because of financial distress; the firm's ability to raise capital on short notice (without excessive dilution); and the overall outlook for macroeconomic and industry conditions.

Following any shock to its capital structure that moves the firm away from its target, management should look at moving back towards the target by issuing/retiring the particular class of financing as needed. The nature and speed of the capital structure adjustment should take into account the costs of adjustment: not only the explicit out-of-pocket transaction costs, but also any signalling implications (being the information costs of adjustment, along the lines of pecking order theory) and any considerations about market conditions (i.e. market-timing factors). Adjustment requires constantly assessing firm, industry and market conditions and their impact on the financing decision. In general, the firm should look to move back towards its target whenever the broad costs of doing so are less than the cost of deviating from the target. Overall, this line of thinking clearly incorporates elements from the whole range of capital structure paradigms.

Indeed, Titman (2001, pg. 23) suggests that the 'stock and flow' concept may be highly relevant, with the focus lying on the dynamic 'flow' of financing:

> *"Corporate treasurers do occasionally think about the kind of trade-offs between tax savings and financial distress costs that we teach in our corporate finance classes. However, since this trade-off does not change much over time, the balancing of the costs and benefits of debt financing that we emphasize so much in our textbooks may not be their major concern. They likely spend much more thinking about changes in market conditions and the implications of these changes on how firms should be financed".*

Thus, having taken into consideration the range of capital structure theories and empirical evidence, it is posited that a lack of complete mutual exclusivity among competing theories of capital structure provides the basis for an integrated theory encompassing aspects of all hypotheses – that is, each of the trade-off, pecking order and market-timing hypotheses may carry some practical relevance in their own right, along the lines of the 'integration of stocks and flows' conjecture. In other words, in a dynamic sense, these theories are not applied with mutually exclusivity – and the relevance, importance and applicability of each theory is likely to be context-specific and time-varying. Correspondingly, one should not be surprised at the inability of existing empirical work to conclusively reject one theory in favour of another.

In this context, it is argued that a broad and dynamic capital structure decision-making process (as described in this section) is likely to be most descriptive of reality; and it is likely that such a financing framework is applicable to the South African context. Although this study will look at the relevance of the trade-off and pecking order theories in what might be argued is a 'mutually exclusive lens', the goal and expectation is not necessarily reject in any one theory in favour of any other(s). Rather, the aim is to see what fundamental factors (and combinations thereof) drive the use and degree of leverage among JSE-listed firms (and by implication, show which aspects of the trade-off and pecking order theories appear to be applicable in this country) – thereby investigating the need for a dynamic, context dependent view of the capital structure decision in South Africa.

10. Research methodology and sample construction

The four objectives of this study are i) to investigate trends in industry leverage and gearing; ii) to investigate the role of classic firm-specific factors in determining leverage outcomes; iii) to test Frank and Goyal's (2003) pecking order model (specifically, the role of the financing deficit in determining changes in leverage); and iv) to measure the dynamic speed of adjustment (as per trade-off theory). Together, the outcomes of these investigations will shed substantial light on the capital structure practices of non-financial firms listed on the JSE, and provide insight into the relevance of the trade-off and pecking order theories in South Africa. The methodology selected to achieve these objectives (as well as the underlying rationale) is described in this section.

a. A comment on econometric methodology in capital structure research

Elsas and Florysiak (2008), Hovakimian and Li (2011) and others discuss at length the various econometric and methodological difficulties faced by research into capital structure. For the purposes of this study, there are three main factors to consider in the construction of the research methodology.

i. Panel data

First is the issue of panel data analysis. The data used in capital structure research generally has both cross-sectional and time-series components (that is, firms are observed across multiple dimensions and across time), so it is important to recognise and account for the longitudinal/panel character of the data. Failure to do so may render the results highly spurious.

The analysis of panel data can follow one of three broad approaches (Gujarati and Porter, 2009):

i. *Pooled (OLS) estimation*: all observations are pooled together, neglecting the cross-section and time series nature of the data

ii. *Fixed effects estimation*: allows for heterogeneity among subjects by allowing each entity to have its own intercept value; assumes that entity-specific effects are correlated with the selected independent variables

iii. *Random effects estimation*: entity-specific effects are uncorrelated with the independent variables

In the capital structure context, which is the best approach? The pooled (OLS) model would essentially ignore any differences across companies and changes across time – clearly this would not suit the objectives or dataset used in this study. The use of a random effects model does incorporate cross-sectional and time series analysis, but comes with the assumption that individual effects do not exist. However, since the model to be employed in this study relates firm-specific fundamentals (such as profitability and size) to leverage, it would be better to use an estimation technique that does incorporate individual effects. The fixed effects model does just that, by allowing for correlation between individual-specific effects and the explanatory variables. As such, in the context of examining the role of classic determinants in the capital structure decision (see Equations 7 and 8), it is considered *a priori* to be the most accurate estimation technique and will be considered the baseline model. This is consistent with the relevant literature, where fixed effects models are most commonly used. Results will be nonetheless be reported for all three approaches.

ii. Endogeneity

Second is the issue of endogeneity, which is characterised by an explanatory variable being correlated with the error terms of the regression. In general, it may arise from omitted explanatory variables, measurement error of explanatory variables, or reverse causality between the dependent and explanatory variables. The consequences of endogeneity are inaccurate coefficient estimates and thus invalid inferences. In the capital structure context, endogeneity may arise from important explanatory variables being omitted (because of data availability or underlying theory being ignored) or imprecisely measured/proxied (for example, using Tobin's Q as a proxy for growth opportunities). If the omitted variables are time-invariant, the use of fixed effects panel estimators should correct for endogeneity.

iii. Dynamic adjustment

A third issue relates to the measurement of the speed of adjustment under trade-off theory, an important objective of this study. Adjustment costs may keep a firm away from its desired leverage ratio in the short-run, so dynamic capital structure adjustment (through a partial-adjustment process) should be incorporated into the empirical model. This could be done by simply including the lagged dependent variable as an explanatory variable in the fixed effects model (where the speed of adjustment is one minus the estimated coefficient thereon), but in the panel data context, endogeneity may arise. The use of dynamic panel estimators in the generalised method of moments (GMM) framework may mitigate this problem to some extent.

It must be noted that there is a lack of consensus in the literature as to what is the best approach to measuring the dynamic speed of adjustment. This is a relatively serious issue. For instance, Illiev and Welch (2010) suggest that a number of studies of capital structure estimate the speed of adjustment of firms' leverage ratios with estimators not designed for applications in which the dependent variable is a ratio. Thus what is in fact mean reversion is mistakenly considered as readjustment. The authors propose a non-parametric process to model underlying true leverage ratios. In this process, debt changes and equity changes are joint processes.

In simulation experiments, Hovakimian and Li (2011) show that both partial-adjustment and debt-equity choice models can generate spuriously significant estimates that are consistent with the hypothesis that firms have target debt ratios to which they periodically adjust. Regressions relying on full-sample fixed effects models of target leverage produce results severely biased in favour of the target-adjustment hypothesis. Their findings imply that traditional methods utilized in most of the existing literature on capital structure overestimate the importance of target debt ratios for corporate financing policies.

All considered, it is acknowledged that it is somewhat difficult to measure a true speed of adjustment to a leverage target under existing econometric methodologies. Nonetheless, in the hope of at least providing a reasonably narrow and confident range in which the true value lies, this study will use three established econometric techniques to attempt to estimate the speed of adjustment:

i. A fixed effects regression with instrumental variables; lagged market leverage is instrumented with lagged book leverage
ii. Arellano-Bond dynamic panel data estimation
iii. Arellano-Bover/Blundell-Bond system dynamic panel data estimation

The latter two approaches employ a GMM framework; in particular, Hovakimian and Li (2011) suggest that the Arellano-Bover/Blundell-Bond method is designed to mitigate the bias present in a dynamic panel model with fixed effects.

b. Model construction and hypotheses

i. Determinants of leverage: the role of classic factors

To investigate the role played by specifically identified company fundamentals (i.e. 'classic' determinants) in the capital structure decision, a regression-based methodology (in the spirit of Rajan and Zingales (1995), Elsas and Florysiak (2008) and others) will be used. The regressions will use market leverage as the dependent variable. The explanatory variables consist of the following:

i. Profitability (using return on assets [ROA] as a proxy, measured as Net Income/Total Assets)
ii. Firm size (measured by ln[Sales])
iii. Growth opportunities, measured by Market-to-Book value of equity (M/B)
iv. Tangibility of assets (measured by Fixed Assets/Total Assets)
v. Industry median debt ratio (IMDR) as a control variable, which should capture the influence of a number of unobserved industry-specific factors

Each of these explanatory variables will be lagged by one year. The standard format (in fixed effects form) for this regression is as follows:

$$LEV_{i,t} = \alpha_i + \beta_1(ROA)_{i,t-1} + \beta_2 \ln(Sales)_{i,t-1} + \beta_3(\frac{M}{B})_{i,t-1} + \beta_4(\frac{Fixed\ assets}{Total\ assets})_{i,t-1} + \\ + \beta_5(IMDR)_{i,t-1} + \varepsilon_{i,t} \qquad \ldots\ldots\ldots \qquad (7)$$

where α is the intercept term and $\varepsilon_{i,t}$ is the error term. The hypothesised coefficients on these factors – under each of the trade-off and pecking order theories – are outlined in Section 6.

As was discussed previously, the fixed effects model is considered the baseline regression, but results will be presented for pooled (OLS) and random effects models as well.

ii. Changes in leverage and the role of the financing deficit

A key area in which this research aims to contribute is an explicit test of the pecking order theory using Frank and Goyal's (2003) model, which relates annual changes (i.e. first differences) in the classic factors to annual changes in leverage. In fixed effects form, the model is as follows:

$$\Delta LEV_{i,t} = \alpha_i + \beta_1 \Delta(ROA)_{i,t} + \beta_2 \Delta \ln(Sales)_{i,t} + \beta_3 \Delta(\frac{M}{B})_{i,t} + \beta_4 \Delta(\frac{Fixed\ assets}{Total\ assets})_{i,t} + \beta_5 DEF_{i,t} + \varepsilon_{i,t} \quad \ldots\ldots \quad (8)$$

where the variables numbered one to four are the classic factors defined as before, α is the intercept term, $\varepsilon_{i,t}$ is the error term and Δ refers to the change in the variable between years t-1 and t.

The key fifth variable here is the financing deficit, defined as $DEF_{i,t} = C_{i,t} - (DIV_{i,t} + I_{i,t} + \Delta W_{i,t})$ where:

- $C_{i,t}$ is cash flow generated by operations (after interest and taxes) in year t;
- $DIV_{i,t}$ is the amount of cash dividends paid in year t;
- $I_{i,t}$ is the level of net investment in year t; and
- $\Delta W_{i,t}$ is the change in net working capital between years t-1 and t

This variable is scaled to total assets. When $DEF_{i,t} < 0$, the implication is that internally generated cash flow is insufficient to meet the total net cash flow required for cash dividends, fixed capital investment and working capital investment. The pecking order theory predicts that after an acceptable rundown of retained earnings (which itself would increase leverage), such a deficit will need ultimately to be financed from external sources, with debt as the first choice. Conversely, for $DEF_{i,t} > 0$, a financing 'surplus' exists, with no need to access external funds. Such surplus funds would show up as an increase in retained earnings (i.e. equity) or could be used to pay down debt, both of which decrease leverage. The overall message here is that a shortfall (surplus) in internal financing shows up as an equivalent increase (decrease) in leverage.

At the extreme, the pecking order theory would predict that $\beta_5 = -1$: all else constant, the change in leverage between years t-1 and t perfectly tracks the deficit or surplus, with a deficit showing up as an equivalent increase in leverage (and a surplus as an equivalent decrease). At the very least, however, a negative coefficient on the financing deficit would show that leverage

increases in the presence of a cash flow shortfall, indicating a preference for debt financing when external funds are required – in line with the pecking order.

Frank and Goyal (2003) suggest that the specification of the estimation technique – fixed effects or random effects – should not materially impact the estimated coefficients. Results will be presented for each specification. Nonetheless, for the reasons previously outlined in this study, there is a preference for the fixed effects approach.

iii. Measuring the speed of adjustment

In testing the relevance of a capital structure target in the style of the trade-off theory, an important research objective is to test the speed of adjustment towards an underlying leverage target. As has been discussed, there is something of a lack of any clear consensus on the appropriate econometric methodology. The dynamic speed of adjustment will be estimated using three approaches: a fixed effects regression with lagged market leverage instrumented with lagged book leverage; the Arellano-Bond dynamic panel data estimation (GMM) technique; and the Arellano-Bover/Blundell-Bond system dynamic panel data estimation (GMM) technique.

Essentially what is estimated is a regression of the following form:

$$LEV_{i,t} = \alpha_i + \beta_n X^n_{i,t-1} + \lambda LEV_{i,t-1} + \varepsilon_{i,t} \qquad \ldots\ldots \qquad (9)$$

where α is the intercept term, $\varepsilon_{i,t}$ is the error term and *X* refers to the set of the usual *n* classic variables from Equation 7. The speed of adjustment is measured as one minus the coefficient on lagged leverage (λ).

Under the trade-off model, any deviations from the target leverage ratio should be eliminated as a matter of first-order concern under the capital structure decision; the speed of which will depend on a comparison of the costs of deviating from the target against the costs of adjustment. A high speed of adjustment indicates that deviations are eliminated quickly, which supports the predictions of the trade-off theory.

c. Sample construction and data collection

The sample in this study is built from the universe of companies that were continually listed on the main board of the JSE from 1999-2011. Firms listed on the AltX have been excluded.

As per the existing literature, companies in involved in the financials space, viz. banks and insurance companies, are also excluded. This is due to the unique role that regulation plays in the capital structure practices of such companies – banks being subject to regulations under the Basel accords, with Basel III prescribing capital adequacy regulations, minimum liquidity requirements and leverage constraints; and insurance companies being subject to Solvency Assessment and Management regulatory guidelines (and its predecessors), in line with Solvency II standards in the EU. Pure investment holding companies, where it can be difficult to disentangle the true fundamentals of the underlying assets, are also excluded. A small number of firms that otherwise met the requisite criteria were excluded because of missing data.

By focussing only on continually listed firms, the issue of a potential survivorship bias manifests. But for reasons discussed in Section 13, this should not be a major concern, as the explicit focus of this study is on the capital structure practices of 'going concerns' with long-term financial track-records available for analysis.

All considered, the final sample consists of 104 JSE-listed companies observed over the period 1999-2011. The full list of firms contained in the sample can be found in the appendix.

The McGregor BFA Research Database was used as the primary source of financial information utilised in this study. The database provides balance sheet, income statement and cash flow statement data in a standardised format; the requisite information for the empirical models used in this study was extracted from these statements. Return on assets (ROA) and market-to-book ratios were obtained from the Financial Ratios product module. A few firms in the sample report their financial statements in USD and GBP; these figures were converted to Rand values by applying the relevant average annual R/$ or R/£ exchange rate to the appropriate values. Industry classifications were performed using McGregor BFA classification codes. Finally, descriptive economic data was obtained from Statistics South Africa.

11. Results and discussion

a. Summary statistics and industry leverage

The 1999-2011 period encompasses an interesting period in South Africa's economic history – most notably the Rand collapse of 2000/2001, the commodities boom prevailing through much of the 2000s, the impact of the global financial crisis of 2007/2008 and the subsequent muted recovery). According to StatsSA, annual GDP growth averaged approximately 3% during this time – reaching a high of 7.1% (annualised) around the peak of the commodities boom in December 2006 and a low of -2.7% (annualised) in June 2009, a result of the post-financial crisis economic fallout. Thus the sample period can be seen to encompass a wide range of economic states and arguably the full business cycle.

Figure 4 shows the industry breakdown of the firms represented in the sample. Overall, the sample shows a good spread across industries. Industrial goods and services is the most highly represented sector (at 27% of the sample), but other major industries (notably basic resources and consumer goods and retail) are also well represented.

Table 1 summarises the descriptive statistics of the full sample. The mean market leverage ratio of firms in the sample lies just below 0.50, suggesting a roughly even split between debt and equity financing. The mean level of gearing (book leverage net of cash and cash equivalents) comes in at 0.4086. Return on assets averages 11.96%. In nominal Rand terms, mean annual turnover is R1.98bn, with the largest firm in the sample (BHP Billiton) generating an average annual turnover of R193.8bn.

It may be instructive to look at trends in the degree of leverage across industries and across time. Figures 5 and 6 respectively show the progression in industry median leverage and industry median gearing for 1999-2011. Looking at Figure 5, there appears to be substantial differences in leverage across industry. Construction and materials is consistently the most highly levered industry, while basic resources consistently carries the least leverage. It is apparent that despite some year-on-year variation, industry median debt ratios have tended to stay around their long-term medians. Only the ICT sector appears to show an upward trend in leverage, while real estate shows a steady downward trend.

Figure 4: Breakdown of sample by industry

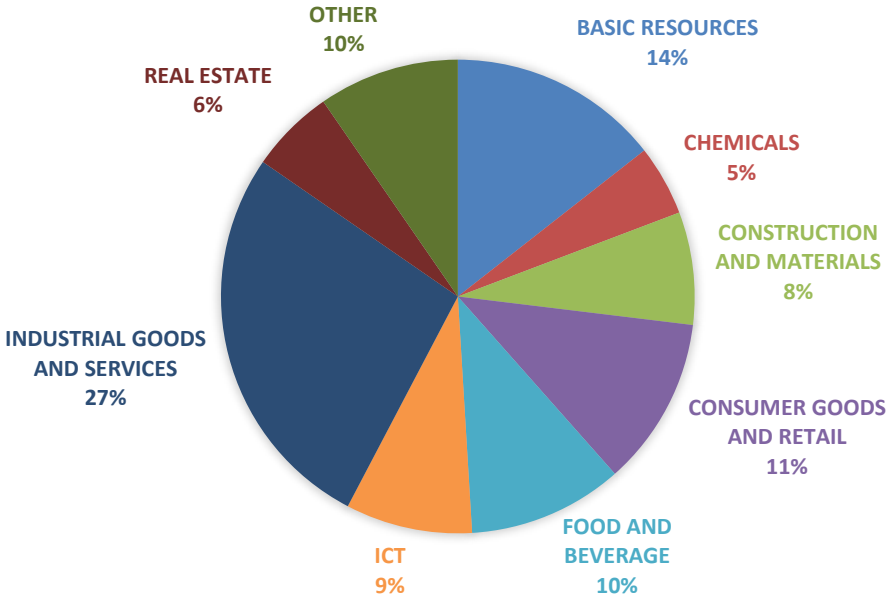


Table 1: Summary statistics

Variable	Mean	Std. dev.	Min	Max
Leverage	0.4991	0.2469	0.05	2.11
Gearing	0.4086	0.2559	-0.4487	2.1126
CCE/Assets	0.1267	0.1150	0	0.6489
Profitability	0.1196	0.2828	-6.9141	0.8263
Size	21.4134	2.2221	13.8757	26.8882
M/B	3.2389	1.4729	-10.56	296.98
Tangibility	0.3602	0.2486	0.0012	0.9929
Deficit	-0.0063	0.1333	-1.0880	0.6840

Based on the full sample with annual observations on 104 JSE-listed firms from 1999-2011.

Leverage is measured as Total Debt/Total Assets (using market values); Gearing measured as Net Debt/Total Assets (using book values); CCE/Assets is measured as Cash and Cash Equivalents/Total Assets; Profitability is measured as return on assets (ROA); Size measured as ln(sales); Market-to-Book (M/B) value of equity used as a proxy for growth opportunities; Tangibility measured as fixed assets-to-total assets; Deficit is measured as CFO + ΔNWC - Dividends - Net Investment (scaled by total assets)

As Figure 6 shows, there appears to be a slight degree of clustering when looking at industry gearing. On the one hand, the ICT sector has progressively increased its degree of net leverage (from a low base), but this variable has steadily declined in the real estate sector (off a high base). Otherwise, however, gearing by industry over the 1999-2011 period remains in the range of 0.3 – 0.5, forming a fairly narrow band around the overall sample mean of 0.4086.

Interestingly, the overall sample appears to have experienced substantial de-gearing from 2008-2010, the height of the fallout following the recent financial crisis. This would be expected under conditions of tight capital markets and 'cash hoarding' by risk averse corporates.

Table 2 formalises some of these findings. A random effects regression employing dummy variables was performed using industry classification as the indicator and the overall sample mean leverage (or gearing) as the base category. Thus this table shows how the average degree of leverage or gearing in a particular industry compares with that of the full sample. The construction and materials, ICT, real estate and industrial goods and services sectors are significantly more levered than the full sample average. On the other hand, the basic resources and food and beverage sectors appear significantly less levered than the full sample average. For any given firm (or industry) with a positive cash balance, gearing should come in below leverage; but some discrepancies have arisen here since leverage has been measured using market values, while gearing was measured using book values. Looking at gearing, the construction and materials, industrial goods and services and real estate sectors carry the highest gearing (being significantly higher than the full sample average); while the basic resources and ICT sectors carry the lowest gearing. The fact that ICT ranks high on leverage but low on gearing may reflect a tendency for firms in this industry to hold high cash balances (relative to total assets). Cursory analysis suggests this is the case.

Figure 5: Trends in industry median debt ratios (1999-2011)

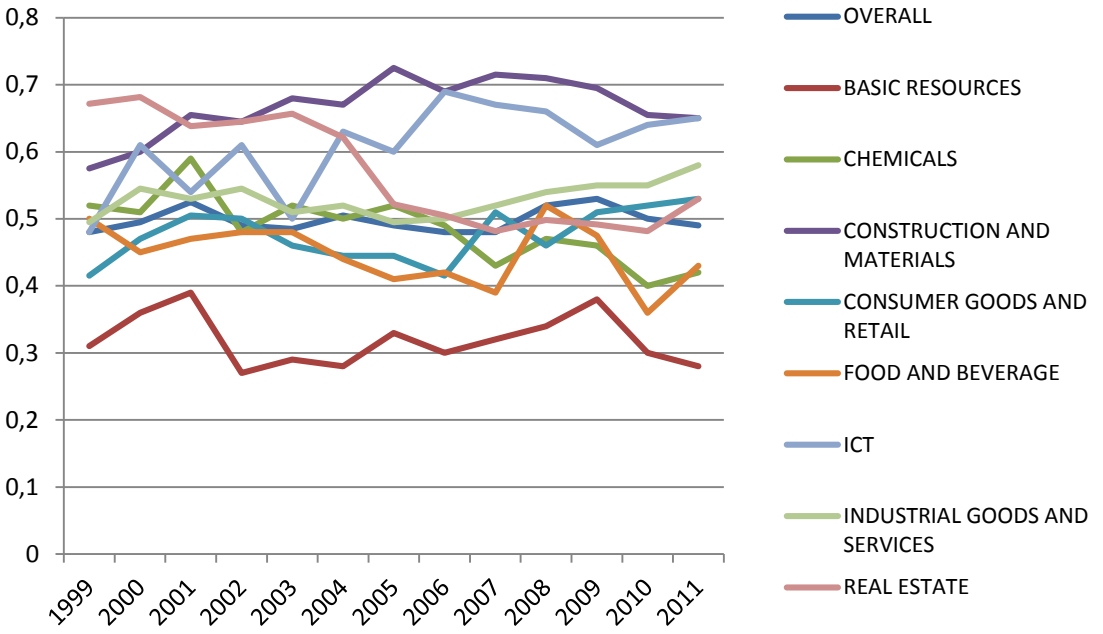


Figure 6: Trends in industry median gearing [Net Debt/Assets] (1999-2011)

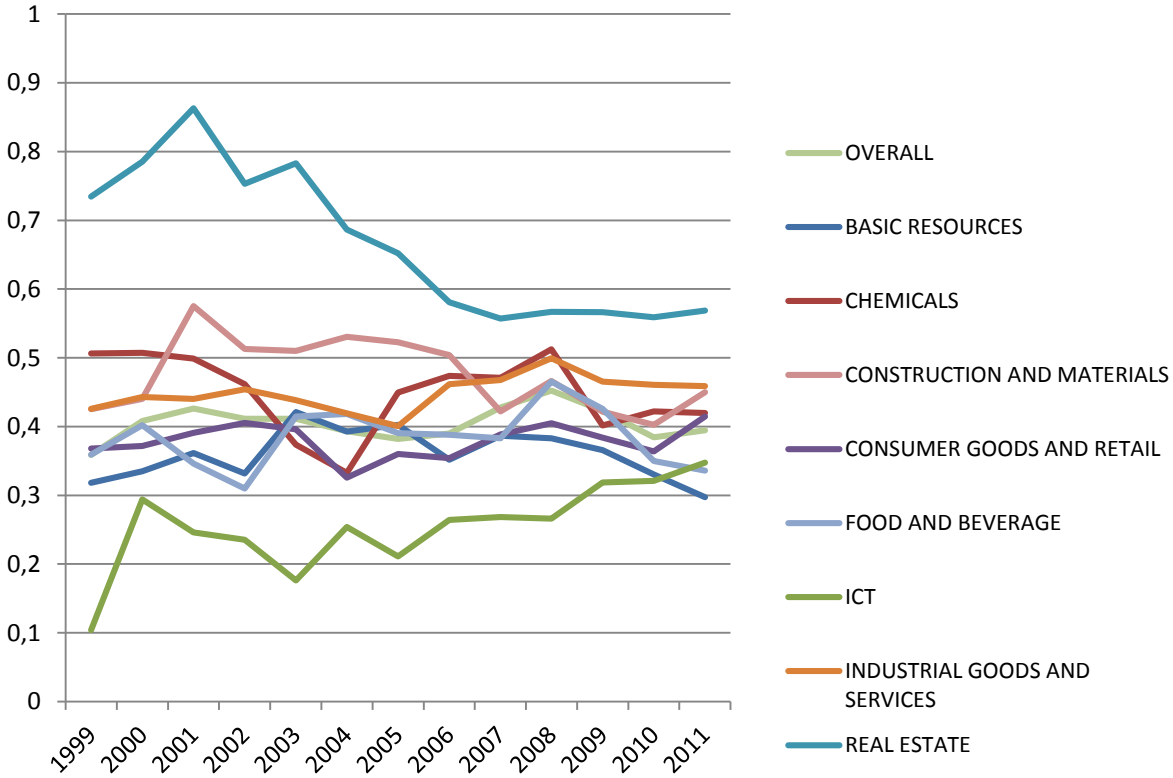


Table 2: Analysis of industry leverage and gearing

			Industry leverage relative to full sample		Industry gearing relative to full sample	
Sector	**Mean leverage**	**Mean gearing**	**Coefficient**	**p-value**	**Coefficient**	**p-value**
Basic resources	0.3199	0.3632	-0.1792	0.000***	-0.0454	0.036**
Chemicals	0.3324	0.4436	-0.1667	0.372	0.0350	0.107
Construction and materials	0.6741	0.4797	0.1750	0.000***	0.0711	0.001***
Consumer goods and retail	0.4808	0.3800	-0.0183	0.326	-0.0286	0.187
Food and beverage	0.4437	0.3858	-0.0554	0.003***	-0.0228	0.293
ICT	0.6174	0.2668	0.1183	0.000***	-0.1418	0.000***
Industrial goods and services	0.5320	0.4507	0.0329	0.078*	0.0421	0.053*
Real estate	0.5627	0.6600	0.0636	0.001***	0.2514	0.000***
Overall (constant)	0.4991	0.4086	0.4991	0.000***	0.4086	0.000***

Based on the full sample with annual observations on 104 JSE-listed firms from 1999-2011.

Mean leverage is the mean IMDR for 1999-2011; Mean gearing calculated as the mean of the industry median gearing ratio (LT Debt + ST Debt – CCE) / Total Assets for 1999-2011.

Coefficients are measured using random-effects estimation with leverage (or gearing) as the regressor and industry dummies as the independent variables. The full sample (i.e. 'Overall') is used as the base category.

**** Statistically significant at the 1% level*
*** Statistically significant at the 5% level*
** Statistically significant at the 10% level*

The conclusion here is that there do appear to be significant differences in leverage and gearing across industry classifications. Firms in the construction and materials, industrial goods and services and real estate sectors tend to be the most highly levered; while firms in the basic resources and food and beverage sectors tend to be the least levered. The consumer goods and retail sector lies in the middle. This heterogeneity in industry leverage implies that there may be industry-wide conditions (beyond the roles of firm-specific factors) playing a role in a

specific firm's capital structure decision. This justifies the inclusion of the industry median debt ratio (IMDR) as an explanatory variable in the regressions to follow.

b. Leverage and the role of classic factors

An objective of this study is to investigate the role played by classic firm-specific factors in the South African capital structure decision. Table 3 provides the results of the regressions of market leverage on profitability, size, growth opportunities, asset tangibility and the industry median debt ratio (IMDR). Results are presented for the fixed effects, random effects and pooled (OLS) estimation specifications. Recall the discussion from Section 10, where it was determined that given the panel data context with individual (firm)-specific effects likely to be significantly correlated with the independent variables**,** the use of a model employing fixed effects estimators is best. Indeed, an F-test reveals the presence of fixed effects (significant at the 1% level). Thus the results of the fixed effects model (number one in the table) are likely to be the most accurate and should be considered the baseline.

Nonetheless, it is important to briefly digress and investigate how the specification of the estimation process affects the results when compared to the fixed effects baseline. In the pooled (OLS) model, the coefficient on M/B becomes positive and significant (at the 1% level), and the coefficient on tangibility changes sign (while retaining its significance). But in such a model, firms are pooled together with no provision for cross-section or time-series differences – clearly an unjustifiable assumption in the context of this study, rendering these particular results highly spurious.

Contrary to the fixed effects approach, the random effects model assumes that individual-specific effects are uncorrelated with the independent variables. In this case, the use of random effects estimators would not materially affect the outcome of the analysis – the coefficients maintain the same signs and similar levels of significance as in the fixed effects regression, although the p-values do change. But in unreported analysis, a Hausman test leads to a clear rejection of the null hypothesis that the fixed effects and random effects coefficient estimates are equal to one another. Correspondingly, the random effects estimators are inconsistent and unlikely to reflect the true parameter values. This once again justifies the preference for the results of the fixed effects regression.

Thus returning to the core fixed effects model, the results suggest a positive and significant relationship (at the 1% level of significance) between leverage and each of the factors size, tangibility and the IMDR; and a negative and significant relationship (at the 1% level of significance) between leverage and profitability. Although there is a positive relationship between leverage and growth opportunities (proxied by M/B), it is not significant at any conventional level. Note that some of these results directly contradict Moyo, Wolmarans and Brümmer (2013), who find that among South African mining, manufacturing and retail firms, profitability relates positively with leverage while asset tangibility relates negatively with leverage.

The results presented here thus suggest that among JSE-listed companies, larger firms and firms with a higher degree of asset tangibility tend to be more highly levered. This is consistent with the trade-off model, where size reduces default risk and potential costs of financial distress; and asset tangibility improves the profile of the company's collateral on debt financing. At the same time, these coefficients are somewhat supportive of the pecking order theory: although it predicts an ambiguous relationship between size and leverage, it does predict that greater levels of tangible assets will reduce the effects and costs of information asymmetries – thereby increasing leverage capacity. The positive coefficient on asset tangibility is consistent with this hypothesis.

Additionally, higher profitability is associated with lower leverage. This is consistent with the pecking-order framework, where higher profitability leads to a greater level of earnings generation and retention (holding constant other factors, like the payout and investment decision), thus reducing the need for external funds and thereby implying a lower degree of leverage. Note that the negative coefficient on profitability is inconsistent with the trade-off theory, where higher profitability would increase the value and desirability of the interest tax-shield that debt financing (i.e. leverage) would bring.

Table 3: Determinants of leverage

	Fixed effects model (1)		Random effects model (2)		Pooled (OLS) model (3)	
Regressors	**Coefficient**	**p-value**	**Coefficient**	**p-value**	**Coefficient**	**p-value**
Profitability	-0.1184	0.000***	-0.1213	0.000***	-0.2023	0.000***
Size	0.0179	0.008***	0.0130	0.016**	0.0099	0.002***
Market-to-Book	0.0003	0.453	0.0005	0.175	0.0027	0.000***
Tangibility	0.2135	0.000***	0.1060	0.012**	-0.1083	0.000***
IMDR	0.3419	0.000***	0.3923	0.000***	0.5724	0.000***
Constant	-0.1179	0.448	-0.0005	0.997	0.0545	0.533
N	1248		1248		1248	
R-squared	0.0889		0.0838		0.1669	
F-test	20.19***		-		45.58***	
F-test fixed effects	24.98***		-		-	
rho	0.7421		0.6710		-	

Estimation of Equation 7

Dependent variable is market leverage. Profitability is measured as return on assets (ROA); Size measured as ln(sales); Growth Opportunities measured using market-to-book (M/B) value of equity as a proxy; Tangibility measured as fixed assets-to-total assets; and IMDR is the industry median debt ratio. All independent variables are lagged by one year.

Based on the full sample with annual observations on 104 JSE-listed firms from 1999-2011.

**** Statistically significant at the 1% level*
*** Statistically significant at the 5% level*
** Statistically significant at the 10% level*

The lack of significance in the role of growth opportunities is interesting. Recall that measuring a company's level of growth opportunities is generally a fairly crude process: here the market-to-book ratio (M/B) was used, but it is a proxy only, and as such may be an imprecise representation of growth opportunities. Other measures, such as Tobin's Q or R&D expenditure, could also be used; and Hovakimian (2004) suggests that historical average (rather than current) M/B might better capture information about growth opportunities. Nonetheless, M/B is a very widely used measure and it is instructive to interpret the results, despite the imprecision.

In the context of the trade-off theory, the level of growth opportunities is predicted to be negatively related to leverage, since firms that derive more of their value from future opportunities for growth (as opposed to assets-in-place) are considered to be more susceptible

to costs of financial distress. But under the pecking order theory, growth will ultimately need to be funded externally and with debt (as the first choice), suggesting a positive relationship between growth opportunities and leverage. Here, the lack of significance of the coefficient on M/B may simply imply that growth opportunities plays no role in the capital structure decision – but it could be that the predictions of both the trade-off and pecking order models each hold some mutual truth in determining the leverage outcome of the firms in the sample, making the exact role of growth opportunities ambiguous and difficult to clarify.

The significant and positive coefficient on IMDR suggests that industry-specific conditions are a relevant factor in the capital structure decision. This ties in with the discussion presented previously where it was shown that substantial differences in leverage occur across industry. It may be that the impact of omitted industry-specific factors (such as business cycle risk, the nature of competition and product market interactions) on the leverage decision are captured by the IMDR; or alternatively, the degree of industry leverage provides a target towards which companies adjust.

c. The role of the financing deficit – a test of the pecking order

The next objective of this study is to test a version of Frank and Goyal's (2003) pecking order model – more specifically, to investigate the role played by the financing deficit in changes in leverage (in addition to the role played by changes in the classic factors). Table 4 displays the results of this analysis (based on the estimation of Equation 8). Results are presented for both the fixed effects and random effects estimations. Aside from the size of the coefficients, there is little material difference between the models on the basis of coefficient signs and significance. But as has been justified previously, an *a priori* preference is reserved for the fixed effects model, and the interpretation is accordingly based thereon. Encouragingly, an F-test reveals the presence of fixed effects (significant at the 1% level).

Consistent with Table 3, one observes a negative relationship (significant at the 1% level) between changes in profitability and changes in leverage. In other words, when a company experiences an increase in profitability (measured by ROA), there is a tendency for leverage to decrease (and vice-versa). This is consistent with the pecking order framework, in which an increase in profitability leads to an increase in earnings available for retention, thereby increasing available internal funds and reducing leverage *(ceteris paribus).* Likewise, when profitability declines, the level of internally available funds would otherwise decline, leading

to greater demand for external funding (with debt as the first choice) and thus an increase in leverage. Once again, the negative relationship observed here is inconsistent with the trade-off model, in which increased profitability should come with increased leverage, due to the desirability of the interest tax-shield arising from the use of debt.

Table 4: Analysis of changes in leverage

	Fixed effects model (1)		Random effects model (2)	
Regressors	**Coefficient**	**p-value**	**Coefficient**	**p-value**
Δ Profitability	-0.0315	0.009***	-0.0280	0.017**
Δ Size	-0.0291	0.012**	-0.0302	0.004***
Δ Market-to-book	0.0004	0.127	0.0004	0.101
Δ Tangibility	0.0662	0.185	0.0462	0.332
Deficit	-0.3082	0.000***	-0.2769	0.000***
Constant	0.0023	0.487	0.0026	0.411
N	1248		1248	
R-squared	0.108		0.107	
F-test	27.49***		-	
F-test fixed effects	21.70***		-	
rho	0.0434		0.0327	

Estimation of Equation 8

Dependent variable is the annual change in market leverage (i.e. first difference). Profitability is measured as return on assets (ROA); size measured as ln(sales); growth opportunities measured using market-to-book (M/B) value of equity as a proxy; tangibility measured as fixed assets-to-total assets; and Deficit is measured as CFO + ΔNWC - Dividends - Net Investment (scaled by total assets). All independent variables (except Deficit) are measured as annual first differences).

Based on the full sample with annual observations from 1999-2011.

**** Statistically significant at the 1% level*
*** Statistically significant at the 5% level*
** Statistically significant at the 10% level*

The negative coefficient on ΔSize (significant at the 5% level) is interesting. Recall that in Table 2 it was observed that larger firms tend to carry significantly higher leverage; but the negative coefficient in this model would seem to imply that when firms grow in size, there is an association with a decrease in leverage. Although this would seem inconsistent, there may be a logical reconciliation with a pecking order framework. In this study, size is proxied by sales. Assuming consistent margins, an increase in sales should to a large extent filter down to

an increase in earnings available for retention, thereby increasing internal funds and decreasing leverage *(ceteris paribus).* The opposite would apply for a company that experiences a decline in sales. Essentially, this logic links back to the posited profitability/leverage argument.

It is acknowledged that there are a host of factors at play when linking changes in sales to changes to the bottom line of the income statement (net income) and then to changes on the balance sheet – and the posited logic presented here may be tenuous. But whatever the underlying reason, this study proposes that there appears to be a decline in leverage associated with an increase in sales; while at the same time, on a cross sectional basis, it is the larger companies, generating greater turnover, that experience higher levels of leverage.

The coefficient on ΔMarket-to-Book is positive but not significant – similar to the results from Table 3. But here, it only narrowly misses significance at the 10% level. The interpretation may thus be that firms tend to experience an increase in leverage in response to an increase in implicit growth opportunities, though the effect is not particularly powerful. Once again, this is consistent with the pecking order theory, where growth opportunities will ultimately be financed by debt as the predominant external source. By contrast, the trade-off theory would predict a negative relationship here – since the costs of financial distress become potentially more severe for high-growth firms, thereby reducing their leverage capacity.

The coefficient on changes in asset tangibility is positive (as would be expected under both the trade-off and pecking order models) but not significant. This contrasts with Table 3, where a higher degree of asset tangibility is associated with significantly higher leverage. Thus the picture being constructed here is that firms with a greater level of asset tangibility will tend to carry a higher degree of leverage; but leverage does not significantly respond to short-term changes in asset tangibility.

The most important explanatory variable in this regression is the financing deficit, which essentially measures the difference between cash flow generated from operations and the sum of cash flows arising from net investment in fixed assets, net investment in working capital, and payout of cash dividends. This deficit is arguably the definitive and most pragmatic determinant of borrowing in the pecking order model, as it is a strong estimate of the demand for external funds (with debt proposed to be the first choice). Recall the discussion in Section 10, where the hypothesis was put forward that at the extreme, the pecking order theory predicts a coefficient of -1 on the deficit (implying that changes in leverage perfectly tracks the deficit

or surplus); but at the very least, a negative coefficient implies that the deficit is predominantly funded through debt, as the pecking order would predict.

The fixed effects model estimates a coefficient on the deficit of -0.3082, statistically significantly different from zero at the 1% level. Consistent with a core prediction of the pecking order theory, this suggests that a financing deficit will tend to show up an increase in leverage; and a surplus will tend to show up as a decrease in leverage. However, since the coefficient is less than one (in absolute terms), changes in leverage are not fully explained by the financing deficit. To explain this, it is posited that the deficit/leverage relationship may not be linear. In the pecking order model, debt is the preferred choice of external funds, but for a sufficiently large deficit, a firm's debt capacity may become exhausted before covering the funding gap. This would necessitate the issue of new capital in the form of securities progressively down the pecking order – convertible bonds, pseudo-equity and common equity as the last resort – which would manifest in an eventual deleveraging of the capital structure. If this is the case, then one would expect the coefficient on leverage to be negative but less than one (in absolute terms). Thus, obtaining a coefficient of -0.3082 is consistent with the pecking order framework.

Taken together, the implication seems to be that if the financing deficit is taken as a strong proxy for the demand for external funds, debt tends to be the preferred (but not exclusive) choice of funding over equity when internal funds are insufficient. Support is thus found for the pecking order theory.

d. Speed of adjustment

In the theoretical background presented in Section 3, it was shown that a key prediction of the trade-off model is that once an optimal capital structure target has been identified, the dynamic value-maximising policy should be to ensure any deviations are eliminated through appropriate adjustments. But in the short-run, transaction and other adjustment costs may outweigh the benefits of being at or near the target, making it desirable to keep the firm away from its target. Looking at it from another angle, when being at the target is a highly desirable goal in the capital structure decision, the benefits of adjustment should generally outweigh the costs, thereby hastening capital structure adjustment. Consequently a measurement of the speed at which companies tend to dynamically adjust towards a capital structure target will provide

evidence as to how important this target actually is, and thereby test a central tenet of the trade-off theory.

Results for this estimation are presented in Table 5 and are derived using three econometric techniques – a fixed effects model with lagged market leverage instrumented with lagged book leverage; Arellano-Bond GMM estimation; and Arellano-Bover/Blundell-Bond GMM estimation. The null hypothesis here is that the speed of adjustment is zero – in other words, there is zero adjustment towards a leverage target. For all three techniques, the speed of adjustment is statistically significantly different from zero (at the 1% level) and ranges from 28.58% on the low side using the Arellano-Bover/Blundell-Bond technique to a high of 52.79% using the Arellano-Bond technique. At 37.13%, the fixed effects estimation lies in the middle. This indicates that the speed of adjustment for JSE-listed firms lies in the 30-50% range.

Table 5: Estimation of the speed of adjustment

	Instrumental variables with fixed effects		Arellano-Bond estimation		Arellano-Bover/Blundell-Bond estimation	
	Estimate	**p-value**	**Estimate**	**p-value**	**Estimate**	**p-value**
Speed of adjustment	37.13%	0.000***	52.79%	0.000***	28.58%	0.000***
Half life of shock	1.49 years		0.92 years		2.06 years	

Estimation of Equation 9

Dependent variable is market leverage. Independent variables are lagged by one year and include profitability, size, growth opportunities, asset tangibility and IMDR. Lagged leverage is introduced as an additional independent variable; speed of adjustment measured as one minus the estimated coefficient of lagged leverage.

Based on the full sample with annual observations from 1999-2011.

**** Statistically significant at 1% level*
*** Statistically significant at 5% level*
** Statistically significant at 10% level*

The speed of adjustment is more easily interpreted using the following formula:

$$t_{1/2} = \frac{\ln(0.5)}{\ln(1-\lambda)}$$

where $t_{1/2}$ is the half-life of the shock (i.e. the length of time it takes for half of the deviation from the target to be eliminated); and λ is the speed of adjustment. These estimated half-lives range from 0.92 years using the Arellano-Bond estimation to 2.06 years using the Arellano-

Bover/Blundell-Bond estimation. The conclusion to be drawn here is that it appears to take JSE-listed firms between 1 – 2 years on average to eliminate half of the deviation from a leverage target following a capital structure shock.

Prominent published estimates of the speed of adjustment in the US literature range from 34% (half-life of 1.7 years) in Flannery and Rangan (2006) to 23% (half-life of 2.7 years) in Huang and Ritter (2009). Thus the estimates in this study suggest that the speed of adjustment for JSE-listed firms is similar to, but slightly higher, than that estimated in US-based studies. This is fairly consistent with the findings of Ramjee and Gwatidzo (2012), who suggest that South African companies adjust relatively quickly to a capital structure target; and Moyo, Wolmarans and Brümmer (2013), who estimate a speed of adjustment among JSE-listed companies of 40-60%.

The evidence presented here thus supports the relevance and importance of a leverage target towards which firms will adjust following shocks to their capital structure (as per trade-off theory). But once again, this comes with the caveat that due to methodological constraints, it is difficult to disentangle mean reversion from actual adjustment and thus measure a true speed of adjustment.

12. Conclusion

This study examined the capital structure practices of a sample of 104 non-financial JSE-listed companies observed over the period 1999-2011, in an attempt to test the relevance of the trade-off and pecking order theories of capital structure.

More specifically, the objectives of this study were fourfold:

i. To investigate patterns in sector leverage and gearing over the 1999-2011 period
ii. To investigate the role played by classic firm-specific determinants of leverage (namely size, profitability, growth opportunities and asset tangibility) in capital structure outcomes
iii. To investigate the role played by changes in fundamentals and the financing deficit in leverage changes, using Frank and Goyal's (2003) model
iv. To estimate the average speed of adjustment towards an underlying leverage target

In examining trends in industry leverage, it was found that there do indeed appear to be significant differences in leverage and gearing across industry classifications. Firms in the construction and materials, industrial goods and services and real estate sectors tend to be the most highly levered; while firms in the basic resources and food and beverage sectors tend to be the least levered. Firms operating in the consumer goods and retail sector lie in the middle. Despite evidence of de-gearing in the post-financial crisis period of 2008-2010 and some year-on-year variation, industry median leverage ratios (as well as that for the full sample) have largely tended to remain in relatively narrow bands around their long-term averages. Overall, these findings suggest heterogeneity in capital structure practices across industries; a relative persistence in capital structure practices within industries; and that industry-specific factors may be an important influence on a given company's capital structure decision.

In examining the relationship between leverage and firm-specific factors, it was found that there is a negative relationship between profitability and leverage; a positive relationship between size and leverage; a positive relationship between asset tangibility and leverage; a positive relationship between the industry median debt ratio and leverage; and a positive but insignificant relationship between perceived growth opportunities and leverage. This suggests that larger firms and firms with a higher degree of asset tangibility tend to carry greater levels of debt in their capital structures, which is consistent with aspects of both the trade-off and pecking order theories; but in direct support of the pecking order model, firms experiencing greater profitability tend to carry less leverage. The positive coefficient on industry median leverage again suggests a significant role played by industry-specific factors, such as business cycle risk, the nature of competition and product market interactions.

A test of Frank and Goyal's (2003) model showed that decreases in both sales/turnover and profitability are associated with increases in leverage; and a financing deficit (surplus) is associated with an increase (decrease) in leverage. This is notably consistent with the pecking order model, in which declining sales and profitability puts pressure on the ability of the company to generate sufficient internal funds to meet investment and payout demands (thus creating a possible financing deficit), which shows up as an increased demand for external funds (with debt as the first choice) and consequently higher leverage.

Finally, the speed of adjustment for JSE-listed firms is estimated to lie in the 30-50% range (i.e. a half-life for capital structure shocks of between 1 – 2 years), slightly higher than US-based estimates, and suggesting that achieving and maintaining an optimal leverage outcome

may be an important aspect of the capital structure decision (as per the trade-off model). It is nonetheless noted that it is difficult to disentangle mean reversion from true and purposeful adjustment in the spirit of the trade-off hypothesis.

Overall, it appears that capital structure practices in South Africa are consistent with aspects of the pecking order framework, but some of the predictions of the trade-off theory hold too. This is not surprising, given a lack of complete mutual exclusivity between the theories, with the hypothesis being that aspects of both offer important practical factors in the capital structure decision in a dynamic sense. It is thus argued that improved view of the capital structure decision in South Africa should view financing through a dynamic and context-dependent lens, incorporating aspects of each theory.

Further studies in this area should augment the results of this study by looking into the role played by capital market, macroeconomic and industry conditions in the capital structure decision of JSE-listed companies.

13. Delimitations and directions for future research

There a few delimitations applicable to the findings of this study.

First, the results are strictly applicable only in the context of publicly-listed, non-financial corporations listed on the JSE. Privately-held companies were excluded due to data unavailability, and financial institutions were excluded due to the unique role that regulation plays in the capital structure decision of these companies.

Second, the focus on continually-listed companies arguably creates a survivorship bias. But it is not believed to a major issue as the sample was purposefully constructed in such a way, for several reasons. Essentially, this study focuses on attempting to characterise corporate finance practices among firms that are long-term ‘going concerns’ with a substantial financial track record available for analysis. By excluding firms that have subsequently delisted, the sample avoids being disproportionately made up of distressed or failed companies. In such cases, conditions of operational or strategic distress may have disrupted normal corporate finance practices, leading to the capital structure decision becoming somewhat distorted and difficult to reconcile with standard models. Obviously a number of delistings are not due to business failure – healthy companies will often be delisted due to being acquired, taken private in LBO-

type transactions, and so on – and it would arguably be ideal to include such companies in the sample. But here again, the desire to examine the fundamentals of companies over the long term would necessitate the pushing of such 'short-term' listings out of the sample. In any case, the existing literature predominantly looks at samples of continually listed firms; by following suit, the results of this study would be readily comparable.

Third, acknowledgement must be made of the fact that capital structure research is subject to a number of methodological and econometric constraints (most notably the difficulty of measuring the true speed of adjustment and effectively disentangling mean reversion from true adjustment). The results presented here are therefore reflective of an informed best effort, but improvements and refinements are possible.

Finally, it must be remembered that the capital structure decision is subject to a veritable host of complex factors. This study focused largely on the role of firm-specific fundamentals in the leverage outcome. But other notable factors and considerations, not least the tenets of market-timing hypothesis, were not included in the empirical model developed in this study. Thus this study should be seen as laying a foundational, if incomplete, view of capital structure practices in South Africa. Further research encompassing legal, institutional, macroeconomic, industry and capital market factors is required to complete the puzzle.

On that note, some proposed lines of inquiry into South African capital structure practices are as follows: a formal investigation into the role played by debt and equity capital market conditions in the debt/equity issuance decision, in the style of Baker and Wurgler (2002) and DeAngelo, DeAngelo and Stulz (2010); a deeper investigation into the role played by industry factors and conditions in explaining between-industry capital structure heterogeneity, as per MacKay and Phillips (2005) and Leary and Roberts (2010a); an investigation into the impact of macroeconomic factors on the capital structure decision, in the spirit of Cook and Tang (2010); and a look at the role played by South Africa's particular legal and institutional frameworks in the financing decision. It is also imperative to continue to extend this analysis into the context of sub-Saharan Africa, as attempted by Ojah and Gwatidzo (2009) and Jooma and Gwatidzo (2013), as and when African capital markets have become adequately developed and sufficient, clean data becomes available.

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Appendix

List of companies contained in the sample. Ticker symbol in brackets followed by industry classification:

AECI (AFE) – Chemicals

African Media Entertainment (AME) – Media

African Oxygen (AFX) – Chemicals

Allied Electronics (ATN) – Industrial Goods and Services

Allied Technologies (ALT) – ICT

Anglo American (AGL) – Basic Resources

Anglo American Platinum (AMS) – Basic Resources

AngloGold Ashanti (ANG) – Basic Resources

Argent Industrial (ART) – Industrial Goods and Services

Aspen Pharmacare (APN) – Pharmaceuticals

Assore (ASR) – Basic Resources

Astrapak (APK) – Industrial Goods and Services

Aveng (AEG) – Construction and Materials

AVI (AVI) – Food and Beverage

Awethu Breweries (AWT) – Food and Beverage

Barloworld (BAW) – Industrial Goods and Services

Basil Read Holdings (BSR) – Construction and Materials

Beige Holdings (BEG) – Consumer Goods and Retail

Bell Equipment (BEL) – Industrial Goods and Services

BHP Billiton (BIL) – Basic Resources

Bidvest Group (BVT) – Industrial Goods and Services

Bowler Metcalf (BCF) – Industrial Goods and Services

Buildmax (BDM) – Basic Resources

Capital Property Fund (CPL) – Real Estate

Cargo Carriers (CRG) – Industrial Goods and Services

Ceramic Industries (CRM) – Industrial Goods and Services

City Lodge Hotels (CLH) – Travel and Leisure

Comair (COM) – Travel and Leisure

Combined Motor Holdings (CMH) – Consumer Goods and Retail

Compu-Clearing Outsourcing (CCL) – ICT

Control Instruments Group (CNL) – Industrial Goods and Services

Crookes Brothers (CKS) – Food and Beverage

Cullinan Holdings (CAL) – Travel and Leisure

Datacentrix Holdings (DCT) – ICT

Datatec (DTC) – ICT

Delta EMD (DTA) – Chemicals

Digicore Holdings (DGC) – Industrial Goods and Services

Distell Group (DST) – Food and Beverage

Distribution and Warehousing Network (DAW) – Construction and Materials

Don Group (DON) – Travel and Leisure

Dorbyl (DLV) – Industrial Goods and Services

EOH Holdings (EOH) – ICT

Grindrod (GND) – Industrial Goods and Services

Group Five (GRF) – Construction and Materials

Growthpoint Properties (GRT) – Real Estate

Harmony Gold Mining Company (HAR) – Basic Resources

Howden Africa Holdings (HWN) – Industrial Goods and Services

Hudaco Industries (HDC) – Industrial Goods and Services

Hyprop Investments (HYP) – Real Estate

Iliad Africa (ILA) – Industrial Goods and Services

Illovo Sugar (ILV) – Food and Beverage

Impala Platinum Holdings (IMP) – Basic Resources

Imperial Holdings (IPL) – Industrial Goods and Services

Invicta Holdings (IVT) – Industrial Goods and Services

Italtile (ITE) – Consumer Goods and Retail

Jasco Electronics Holdings (JSE) – Industrial Goods and Services

JD Group (JDG) – Consumer Goods and Retail

Kagiso Media (KGM) – Media

Kairos Industrial Holdings (KIR) – Industrial Goods and Services

Labat Africa (LAB) – Industrial Goods and Services

Lonmin (LON) – Basic Resources

Masonite Africa (MAS) – Construction and Materials

Mediclinic International (MDC) – Healthcare

Metair Investments (MTA) – Industrial Goods and Services

Murray and Roberts Holdings (MUR) – Construction and Materials

Mustek (MST) – ICT

Nampak (NPK) – Industrial Goods and Services

Naspers (NPN) – Media

Netcare (NTC) – Healthcare

Northam Platinum (NHM) – Basic Resources

Nu-World Holdings (NWL) – Consumer Goods and Retail

Oceana Group (OCE) – Food and Beverage

Octodec Investments (OCT) – Real Estate

Omnia Holdings (OMN) – Chemicals

Palaborwa Mining Company (PAM) – Basic Resources

Pick n Pay Stores (PIK) – Consumer Goods and Retail

Pinnacle Technology Holdings (PNC) – ICT

PPC (PPC) – Construction and Materials

Premium Properties (PPM) – Real Estate

Rainbow Chicken (RBW) – Food and Beverage

Reunert (RLO) – Industrial Goods and Services

Rex Trueform Clothing Company (RTO) – Consumer Goods and Retail

Sable Holdings (SBL) – Real Estate

SAB-Miller (SAB) – Food and Beverage

Sappi (SAP) – Basic Resources

Sasol (SOL) – Basic Resources

Seardel Investment Corporation (SER) – Consumer Goods and Retail

Shoprite Holdings (SHP) – Consumer Goods and Retail

Sovereign Food Investments (SOV) – Food and Beverage

Spanjaard (SPA) – Chemicals

Steinhoff International Holdings (SHF) – Consumer Goods and Retail

Stella Vista Technologies (SLL) – ICT

Super Group (SPG) – Industrial Goods and Services

Tiger Brands (TBL) – Food and Beverage

Tongaat Hulett (TON) – Food and Beverage

Trans Hex Group (TSX) – Basic Resources

Transpaco (TPC) – Industrial Goods and Services

Trencor (TRE) – Industrial Goods and Services

Truworths International (TRU) – Consumer Goods and Retail

Wilson Bailey Holmes-Ovcom (WBO) – Construction and Materials

Winhold (WNH) – Industrial Goods and Services

Woolworths Holdings (WHL) – Consumer Goods and Retail

York Timber Holdings (YRK) – Basic Resources

Zaptronix (ZPT) – ICT