ARE THE CAPITAL STRUCTURES OF JSE LISTED COMPANIES INFLUENCED BY EQUITY MARKET TIMING?

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I hereby declare that I have read and understood the regulations governing the submission of Master of Commerce dissertations, including those relating to length and plagiarism, as contained in the rules of the University, and that this dissertation conforms to those regulations.

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PLAGIARISM DECLARATION

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3. This work has not been previously submitted in whole, or in part, for the award of any degree in this or any other university. It is my own work. Each significant contribution to, and quotation in, this dissertation from the work, or works of other people has been attributed, and has been cited and referenced.

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ABSTRACT

Purpose

Empirical research on capital structure in the South African context has primarily been focused on testing the speed of adjustment theory, pecking order theory and the trade-off theory. This dissertation sets out to test whether evidence of the market timing theory exists in JSE listed firms by applying the method used by De Bie and De Haan (2007) for evidence of market timing in Dutch firms; the regression model used to test market timing was developed by Baker and Wurgler (2002).

Baker and Wurgler (2002) hypothesized that a firm's current capital structure is the cumulative result of past attempts to issue equity when share prices are high and repurchase equity when share prices are low; this is the market timing theory of capital structure.

Design/methodology

The method is applied to non-financial firms for the ten-year period including financial periods from 2012 to 2022. Specifically addressing the following question, is the current capital structure of JSE firms the cumulative result of past equity timing attempts?

To test this hypothesis, the regression model which includes the external-finance-weighted average market-to-book ratio (EFWAMB) variable will be used alongside the four common variables for capital structure, namely: firm size, tangibility, profitability, and market-to-book ratio (Allini et al., 2018; Baker & Wurgler, 2002; De Bie & De Haan, 2007; Hovakimian, 2006).

The study applies a two-step system generalised method of moments (GMM). For robustness, a Generalized Least Square regression (GLS) was also conducted for robustness as well as descriptive statistics and the discussion of the results thereof.

Findings

The results show evidence for both the pecking order theory and trade-off theory. More importantly, the findings of this dissertation show evidence supporting the market timing theory of capital structure.

Originality/value

The market timing theory has become popular and has been tested in other markets (Hovakimian et al., 2004), however it has not been explicitly tested in South African firms. Adding the South African context further contributes to the capital structure literature and further tests the robustness of the theory or can help in identifying the circumstances in which the results of the study may differ.

1. INTRODUCTION

Capital structure can be defined as the combination of debt and equity that a firm's management adopts to fund its statement of financial position (Myers, 2001). Firms may decide to raise funds from external sources or utilise retained earnings (rather than distributing to shareholders) for capital investments, these funding decisions can result in the capital structure being a complicated mix from different sources (Cekrezi, 2013). Management needs to decide on the proportion of debt (whether short-term or long-term) versus equity that is most cost-effective and is most likely to result in the desired return on investment for investors. The capital structure of a firm is useful to both management and external parties: management can use it calculate the WACC which is important for the valuation of capital projects and determining the company's economic value added or economic profit; external parties can use WACC for the valuation of the company for investment decisions (Correia et al, 2013). The relevancy of capital structure has been an ongoing debate for over 65 years conflicting conclusions.

The concept of the optimal capital structure was initially introduced in 1954 by Ferry B. Allen analysing whether increasing debt reduced the cost of capital. The assumption in that paper was the increase of debt in the capital structure increased the risk to the equity holder thus increasing the cost of equity. Allen (1954) debated the premise that there was a benefit of low cost that came with debt and this benefit was greater than the increase in the cost of equity, in other words, a higher equity percentage increased the cost of capital because the cost of equity is higher than the cost of debt. Allen (1954) then concluded that the increase in the cost of equity as result of increased debt completely offset the tax deductibility of debt, thus there was no real possibility of reducing the cost of capital by increasing debt (Allen, 1954).

Miller and Modigliani (1958) came to the same conclusion when developing a theory for the valuation of firms. The cost of capital would be unaffected by the type of capital used to finance the investments (Modigliani & Miller, 1958).

Miller and Modigliani (1963) subsequently corrected the 1958 theory and concluded that a capital structure which includes more debt than equity is more lucrative because

of the deductibility of interest expenses for taxation purposes. Both papers did not arrive at a conclusion on any optimal capital structure that firms should seek. In fact, the paper warned firms against having the highest level of debt in their capital structure without taking into consideration other qualitative factors (Modigliani & Miller, 1963).

Following the start of the debate by Miller and Modigliani, the main themes explored in literature have been determining the existence of an optimal capital structure; the cost effectiveness of debt versus equity; the utilization of retained earnings as the first source of funds for capital expenditure; and the cost of utilizing equity.

An expansion of this debate raised questions of why American firms were not taking advantage of the tax shield by utilizing as much debt as possible or why some firms utilize more debt than others or why they borrow at different maturities (Myers, 1977). Many attempts have been made to solve some of these questions, and some of those attempts have resulted in even more questions. It would appear that there is not one capital structure that is suitable for all kinds of firms in all kinds of industries and economies, this is why this capital structure debate has been called a puzzle (Myers, 1984).

In attempting to solve this puzzle, several theories have been developed and tested (and continue to be tested) without a clear conclusion. The main theories that have been accepted are the: pecking order theory, trade-off theory, agency theory, and market timing theory which is the most recently developed theory. A fully integrated theory of capital structure has not yet been developed (Taggart, 1997). Most of the early literature on capital structure has been focused the trade-off and pecking order theories (Baker & Wurgler, 2002). And in recent years, the testing of the market timing theory has increased (Allini et al., 2018; De Bie & De Haan, 2007; Hovakimian, 2006; Hovakimian et al., 2004; Simatupang et al., 2005).

Capital structure of a firm impacts a number of factors that ultimately drive the performance of a firm thereby affecting its market value; for example the relationship between capital structure and profitability can inform the amount of debt that needs to be utilized to maximize on the tax deductibility of interest payments without putting the firm at risk for financial distress (Muhammad Sajid Amin et al., 2020). Capital structure research is important as it can assist management in developing and implementing

policies that can guide the decisions which reduce the cost of capital and maximize the market value of firms (Çelİk & Akarim, 2013).

Within the South African equity market context, while the speed of adjustment, pecking order theory and the trade-off theory have been tested extensively, market timing has not been explicitly tested. This dissertation sets out to test whether evidence of market timing exists on the JSE by applying the method used by De Bie (2007) for evidence of market timing in Dutch firms; they used the model developed by Baker and Wurgler to measure market timing. Baker and Wurgler (2002) hypothesized that a firm's current capital structure is the cumulative result of past equity timing attempts. The method will be applied to non-financial firms for the ten-year period including financial periods from 2012 to 2022. Specifically addressing the following question:

Is the current capital structure of JSE firms the cumulative result of past equity market timing attempts?

It is important to note that while market timing has become popular and has been tested in other markets (Hovakimian et al., 2004), adding a new context further contributes to this literature and further tests the robustness of the theory or can help in identifying what circumstances the results of the study may differ. In answering the question, this dissertation will apply the generalized method of moments (GMM) regression analysis.

The results of the testing show evidence of market timing, this is contrary to the results for Egypt in Allini et al. (2018) which is the closest study to the South African context. The results for the other capital structure variables are consistent with other capital structure studies of the JSE which show a conservative use of debt (de Wet & Gossel, 2016; Erasmus, 2010; Gwatidzo & Ojah, 2009; Mouton & Smith, 2016; Ramjee & Gwatidzo, 2012).

The remainder of this dissertation continues with a review of literature of capital structure theories, followed by a description of the data sample and discussion of the method used to conduct the market timing study on JSE listed firms. Finally, the dissertation ends with a discussion of the results from the GMM regression model and the conclusion which includes recommendations for future research.

2. LITERATURE REVIEW

Several theories have been developed in attempting to solve the capital structure puzzle, as discussed the main theories that have been accepted are the: pecking order theory; trade-off theory; agency theory; and market timing theory which is the most recently developed theory. Speed of adjustment (SOA) is another area extensively researched which tests whether firms move towards an optimal capital structure.

The pecking order theory states that the utilization of financial resources should follow a logical order where internal funds are first in the financial hierarchy, low-risk borrowing is ranked second and equity issuances are at the lowest rank (Seifert & Gonenc, 2010). This is based on conveniance and driven by information asymmtary (Fosu et al., 2016).

The trade-off theory states that the value of the firm is at its highest when the weighted average cost of capital (WACC) is at its lowest; the theory implies an optimal capital structure (de Wet, 2006). WACC is minimised by using the trade-off theory to balance the taxation advantage of debt and against the cost of financial distress caused by debt (Kraus & Litzenberger, 1973).

The speed of adjustment testing stems from the trade-off theory hypothesis of a target debt ratio and it states that firms will set a target debt ratio and will always adjust back towards it (Belkhir et al., 2016). This area of research explores whether firms move towards a target and the speed at which firms adjust their capital structure toward this target (Moyo, Wolmarans, & Brummer, 2013).

The agency theory suggests management are motivated to accept risky projects, shifting profits between bondholders and shareholders, which represents a conflict of interest between sharehodlers and bondholdes (Myers, 1977). This means that managers would give up investment opportunities for growth due to gains accruing to bondholders rather than shareholders, resulting in the rejection of profitable projects (Myers, 1977).

The market timing theory, which is the most recently developed theory, states that firms can form different capital structures as a result of following economic and capital market conditions (Kayhan & Titman, 2007). As a result the current capital structure of

a firm can be traced back to past attempts to time the market for equity and debt issuances (De Bie & De Haan, 2007).

The remaining sections of this literature review discuss the development of capital strutcure theories, particularly the trade-off theory, the pecking order theory and the market timing theory. Further it reviews the literature relating to emerging markets and the South African context so to determine gaps in the literature which can potentially form part of future research.

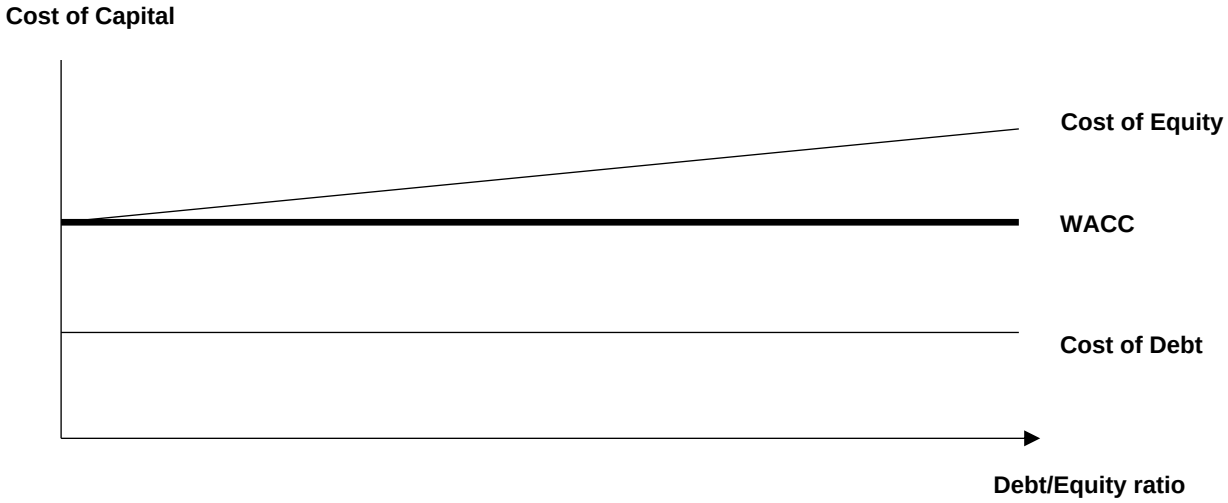
2.1. CAPITAL STRUCTURE THEORIES

Modigliani and Miller (1958) made very specific assumptions which implied that the market was perfect for all participants. The assumptions included that there were no taxes, no brokerage or financial distress costs and that both investors and management equally had all the information about the company's future investment opportunities (Modigliani & Miller, 1958).

Subsequently, Modigliani and Miller adjusted their model in a follow up paper in 1963. In this paper, they incorporated and relaxed some of their original assumptions about the market; they concluded that the tax deductibility of debt financing costs reduces the cost of capital thus making a capital structure which includes more debt than equity more lucrative (Modigliani & Miller, 1963).

The results from their 1958, capital structure irrelevance theory (with the above assumptions), show that the WACC remains the same regardless of the capital structure because the increase in WACC driven by an increase in the cost of equity is equally offset by the decrease in WACC driven by the greater weight given to the cost of debt. In other words, capital structure is irrelevant concerning the cost of capital, this concept is now known as the irrelevancy theory (ÇelİK & Akarim, 2013). The figure 1 below depicts this (de Wet, 2006).

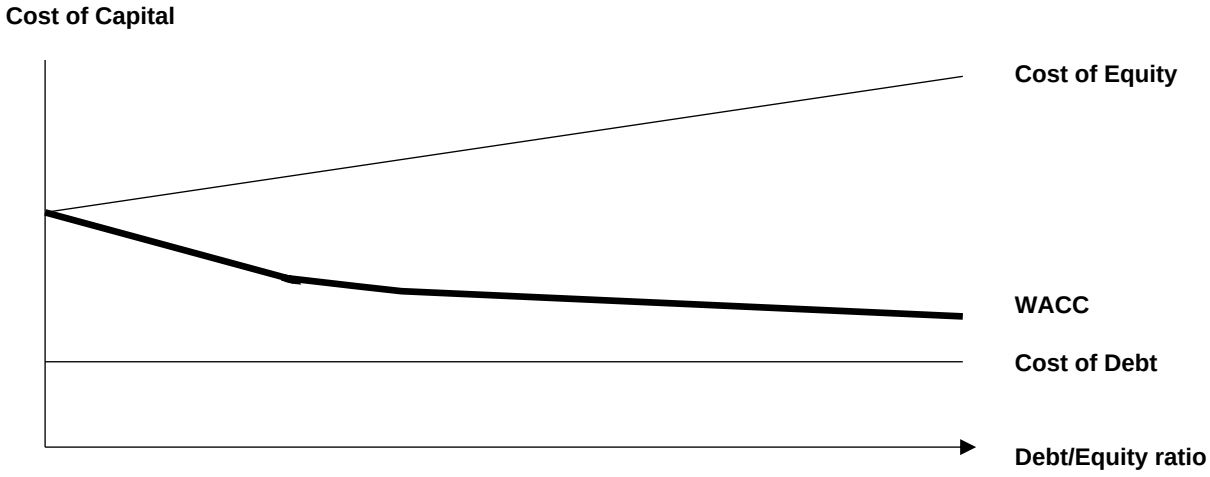
Figure 1 – the weighted average cost of capital at different capital structures assuming there are no taxes.



Source: Hawawini and Vialett (1999)

The assumptions for the initial theory are unrealistic in many economies and the results thereof do not give a complete picture that can be used to make investment decisions. This led to the revision to include the tax benefits associated with debt financing. In this dissertation, Modigliani & Miller (1963) show us that the cost of debt decreases because of the tax deductibility of interest expense. With the inclusion of the tax deduction, a higher debt-equity ratio will result in a decrease in WACC and an increase in the valuation of the company. Figure 2 below depicts this.

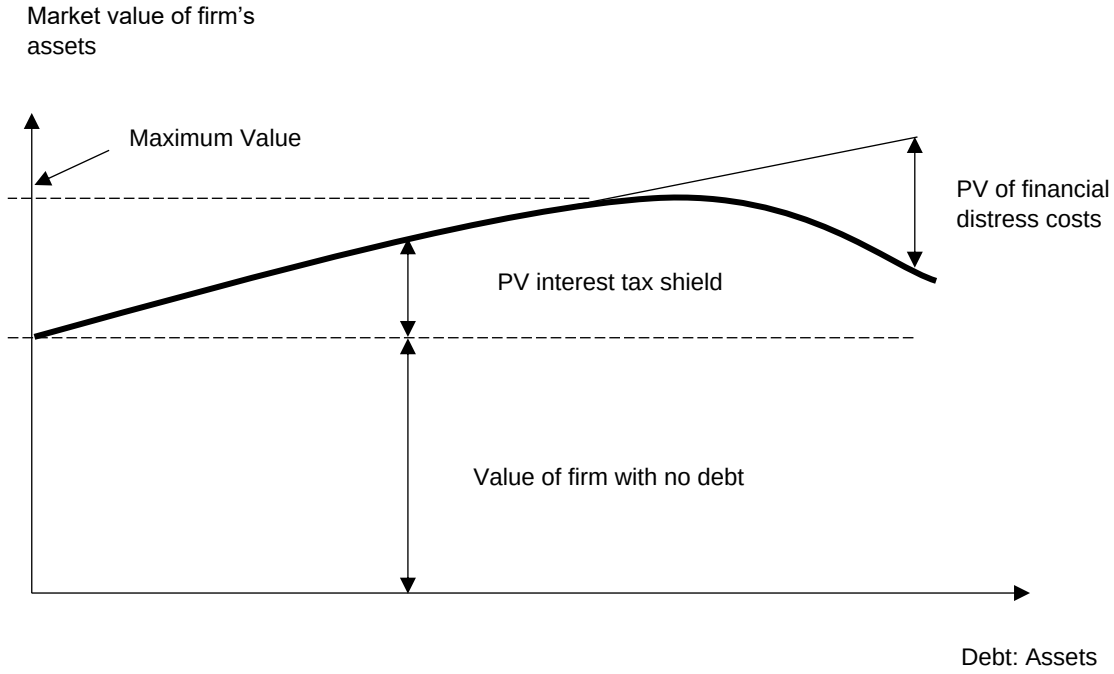
Figure 2 – the weighted average cost of capital at different capital structures considering the tax benefit for debt financing costs.



Source: Hawawini and Vialett (1999)

However, this theory excludes the increased likelihood of financial distress driven by increased debt levels. The costs associated with financial distress decreases the value of the company. Figure 3 below depicts that higher levels of debt reduce WACC up to a certain point where the cost of financial distress kicks in to offset the reduction (Modigliani & Miller, 1963).

Figure 3 – the weighted average cost of capital at different capital structures considering the tax benefit for debt financing costs and the present value of financial distress costs.



Source: Hawawini and Vialett (1999)

The models for testing this theory have evolved and been developed in many studies since Miller and Modigliani's conclusion that there's positive effect of tax shields on the market values of firms.

From the seminal literature on capital structure, several variables have been found to be the main determinants of capital structure and these vary between the different theories of capital structure. The most popular dependant variables of capital structure used in literature are the debt ratio, short-term debt ratio and long-term debt ratio and the independent variables are the tax shield, assets structure, profitability, growth opportunities, liquidity, firm size and dividend payment policy. A few studies have also used research and development expenditures, which are used as a proxy for intangible

assets as an independent variable and evidence show that debt ratios have a negative relationship with this variable (Smith & Watts, 1992).

For the pecking order theory, the independent variables are liquidity and firm size which are expected to have a negative relationship with leverage, and profitability and asset tangibility which have a positive effect on the debt-equity ratio. For the trade-off theory the independent variables are non-debt tax shield which is expected to have a negative relationship with the debt-equity ratio; and profitability, firm size, and asset tangibility which are expected to have a positive relationship with the debt-equity ratio. For the agency theory, growth has negative relationship with the debt-equity ratio (Ali et al., 2011). For testing the market timing theory, the additional independent variable added to the variables used in testing the pecking order theory is the external-finance-weighted average market-to-book ratio (EFWAMB) which is expected to have a negative effect on leverage for evidence of market timing theory to be present (Allini et al., 2018).

2.1.1. Trade-off theory

The trade-off theory of capital structure states that the value of the firm is at its highest when the WACC is at its lowest (Belkhir et al., 2016; Chirinko & Singha, 2000). As such, the model predicts that firms will adjust toward an optional debt ratio (Chirinko & Singha, 2000). Following Miller and Modigliani (1958 and 1963) capital structure irrelevance paper and subsequent tax correction paper, the concept of this theory was formally introduced by Kraus and Litzenberger (1973) in a paper introducing corporate taxes and financial distress costs into a valuation model in a complete market. They concluded that the value of the firm increases due to taxation deductions relating to the interest on the debt, and the optimal level of capital structure is when the present value of the costs associated with issuing more debt is completely offset by the marginal benefit associated with issuing more debt (Kraus & Litzenberger, 1973). This segment of the trade-off theory was subsequently named the static trade-off theory.

The static trade-off theory assumes that firms will attain an optimal capital structure by balancing the present value of interest tax deductions against the costs of financial distress (Shyam-Sunder & C. Myers, 1999). It assumes that there are no transaction costs associated with issuing or repurchasing debt securities such as bonds (Dudley, 2007). It also suggests that as a result of striving for higher tax shields, high performing

firms will have a higher target debt ratio than low profit earning firms (Cekrezi, 2013). To correct some of the flaws in the assumptions of this theory such as the absence of transaction costs associated with debt financing, the dynamic trade-off theory was introduced.

Contrary to the static trade-off theory, the dynamic trade-off theory introduces the costs associated with the issuing and repurchasing of debt instruments and suggests that firms will adjust their capital structure provided the benefit of doing so exceeds the costs (Dudley, 2007). The dynamic trade-off theory proposes that firms may deviate from their target debt-equity ratio but they will display a behaviour that continuously adjusts back to their target (Abdeljawad et al., 2013).This theory suggest that firms have a target range, rather than a static target, of capital structure within which they will allow their debt-equity ratio to vary (Cekrezi, 2013; Dudley, 2007). Evidence has also been found that firms appear to adjust toward debt-equity ratio targets (Hovakimian et al., 2001). Estimating the speed of adjustment (SOA) back towards the optimal capital structure is the study used for the joint hypotheses that the target capital structure actually exists and that firms adjust toward that target (Abdeljawad et al., 2013).

Shyam-Sunder and Myers (1999) developed a simple model for testing the trade-off theory based on the model of mean reversion. The model is shown below:

$$\Delta D_{it} = \mathrm{a} + b_{TA}(D_{it} \mp D_{it-1}) + e_{it} \qquad (1)$$

Where:

- D_{it} is the debt level at time t of the firm I;
- D^* is the target debt level; and
- b_{TA} is the adjustment coefficient.

For the average adjusting behaviour, the b_{TA} coefficient should be positive and between zero and one.

2.1.2. Evidence for the static trade-off theory – international context

The static trade-off and pecking order models were tested on a sample data of 1325 non-financial Japanese firms for periods from 2002 to 2006 by Zhang and Kanazaki (2007) and the statistical results proved that both models could explain some part of the capital structure. The static trade-off model showed a firm's capital structure is influenced by several variables namely: profitability, tangibility, firm size, non-debt tax shields, and the pecking order model displayed similar movements between the change of long-term debt and financial deficit. However, both models showed some shortcomings in that the static trade-off model did not explain the negative relationship between profitability and firm leverage, and the pecking order model failed to explain the low deficit coefficient (Zhang & Kanazaki, 2007).

Adesola (2009) developed tested models for the static trade-off theory and pecking order theory to find the best explanation for the capital structure choices of Nigerian firms. The study was limited to a cross section of 27 listed firms with data for the periods 1996 to 2006 using ordinary least squares regression methods and concluded that both the static trade-off theory and pecking order theory serve as an explanation for the financing decisions of Nigerian firms for the period under review (Adesola, 2009).

When leverage was measured as total debt, Genç et al. (2018) found growth as well as size were positively related to leverage. Profitability, asset tangibility as well as leverage were found to be have a negative relationship with leverage, compared to profitability, liquidity, and asset tangibility which had a negative relationship with leverage. Additionally, non-debt tax shields are insignificant for total debt leverage. The study concluded that total debt leverage of French listed companies is best explained by the static trade-off theory and the pecking order theory. (Genç et al., 2018)

Butt (2019) examined the static trade-off theory in conjunction with governance mechanisms of firms; it is expected that governance structures will vary from firm to firm and this will have an impact on financing decisions. The study hypothesised that good governance structures incentivise those charged with governance to act in the best interest of shareholders, and they would raise debt financing only when the firm is profitable, evidently, the study finds that firms with good governance structures have higher debt-equity ratios than firms with poor governance structures. In addition, in

good governance firms, the debt-equity ratios adjust with changes in profit which is not the case for poor governance firms, and asset tangibility and firm size are strong determinants of capital structure; large firms in size and tangibility tend to have higher debt-equity ratios than smaller firms. The conclusion of the study is that firms with good governance structures exhibit the predictions of the static trade-off theory and a positive relationship between profitability and debt-equity ratios. Firms with poor governance have a negative relationship between profitability and debt (Butt, 2019).

Izhakian (2002) use the static trade-off theory to examine the impact of ambiguity, or Knightian uncertainty, on the capital structure decisions of firms. Knightian uncertainty (or ambiguity) represents a situation where it is no longer possible to predict and form expectations about future events, this is uncertainty about probabilities (Dibiasi & Iselin, 2021). Ambiguity is different from risk, which is uncertainty about outcomes, which usually leads firms to reduce debt as part of good governance (Izhakian et al., 2022). The results of the static trade-off model showed that ambiguity has an impact on capital structure (Izhakian et al., 2022).

2.1.2.1. Evidence for the dynamic trade-off theory – international context

Kayhan & Titman (2007) examine how the histories of firms affect their capital structures. Particularly focusing on investigating how historical cash flows, capital expenditures, and share prices influence capital structure. These variables have a strong influence on changes in capital structure, particularly share price changes and the amount of external financing raised. However, in the long run, the effects of share price changes and the amount of external financing raised on capital structure are partially reversed. Although these historical variables have an effect on capital structure, over time, firms tend to adjust back to their target levels for capital structure which is consistent with the dynamic trade-off theory of capital structure (Kayhan & Titman, 2007).

Abdeljawad et al. (2013) use a system GMM approach and find evidence of the dynamic trade-off theory when looking at Malaysian firms. They propose that using a single speed of adjustment that fits all types of firms may be misleading if the real dynamic behaviour is mostly heterogeneous and the results thereof cannot be used as evidence for or against dynamic trade-off theory. As expected and consistent with the

dynamic trade-off theory, the study found that firms that are overleveraged and far from their target adjust back to the target faster than firms that are underleveraged and closer the target. Other capital structure theories cannot be rejected as explanations for the capital structure decisions of Malaysian firms as the speed of adjustment for some firms is very slow and therefore the speed of adjustment cannot be deemed a strong determinant of capital structure for Malaysian firms (Abdeljawad et al., 2013).

Ghazouani (2013) test both the static and dynamic trade-off models for Tunisian firms. The dynamic model incorporated a variable for transaction costs associated with adjusting capital structure to demonstrate the speed of adjustment toward a target debt-equity ratio. The results for the dynamic trade-off model revealed that high costs of adjustment slowed down the pace at which firms adjust to an optimal debt-equity ratio (Ghazouani, 2013).

Dierker et al. (2019) analyse the external financing decisions of firms following changes in risk by examining the dynamic trade-off theory. To measure risk, the study uses a variety of measures such as stock return volatility, default probability, implied asset volatility, and adjusted Ohlson (1980) scores and find that firms issue equity following increases in risk and issue debt following decreases in risk, this is true even for financially unconstrained firms. These results are consistent with the predictions of the dynamic trade-off theory but not consistent with the pecking order theory. Furthermore, the dynamic trade-off theory results did not hold for forms with high market-to-book ratios which could indicate that for such firms, other explanations can be used for capital structure such as the market timing theory (Dierker et al., 2019).

Esghaier (2023) look at a panel of US listed industrial firms to test the dynamic trade-off theory of capital structure in its symmetric and asymmetric versions for the period 2013 to 2019 to examine the existence of adjustment behaviour towards a target debt-equity ratio and what influences the speed of adjustment towards that level. The study showed evidence of the dynamic trade-off theory as the result exhibit debt-equity targeting behaviour. Consistent with Dierker et al. (2019), the speed of adjustment toward the target leverage is determined by the level of debt; meaning that overleveraged firms will adjust faster toward the target leverage than underleveraged firms (Esghaier, 2023).

Evidence of the trade-off theory (both static and dynamic) for capital structure has been supported by literature across countries and across firms in various industries over time, for example (Bruinshoofd & de Haan, 2012; de Wet & Gossel, 2016; Kannadhasan et al., 2018; Matemilola et al., 2012; Mukaddam & Sibindi, 2020; Ramjee & Gwatidzo, 2012; Sogorb-Mira, 2005). However, studies over the years have resulted in conflicting conclusions about the evidence of the determinants of capital structure across different industries and different economies. In 1984, a different theory was developed to attempt to solve this conflict. The concept of a firms' financing policies following a hierarchy, with a preference for internal funds, debt and, as a last resort, issuance of equity (Myers & Majluf, 1984). This hierarchy is known as the pecking-order theory and is further discussed in the next section.

2.1.3. Pecking-order theory

Myers & Majlufs (1984) determined that there is no ultimate capital structure that firms can work towards, but instead, because of the information asymmetry between lenders and borrowers, borrowers follow a hierarchy approach for their policy. This hierarchy is known as the pecking order theory which states that when firms need funds for investment, they will utilize internal funds first, borrowings second (as this is easier to raise than equity) and, as a last resort, issue equity. The issuing of equity as a last resort results from management's unwillingness to dilute the ownership of existing shareholders and also the avoidance of the cost and lengthy administration processes associated with the raising of equity (Myers & Majluf, 1984). In its simplest definition, the pecking order theory of capital structure states that when a firm's internal cash flows are insufficient for its current investment and dividend payout commitments, the firm will issue debt. The issuing of equity is always a last resort, except possibly when the firm can only issue junk debt and costs of financial distress are high (Shyam-Sunder & Myers, 1999).

Shyam-Sunder & Myers (1994) tested the static trade-off theory against the pecking order theory for 157 companies (excluding financial and regulated companies) over a period of 19 years and found the pecking order is a much better explanation of capital structure; companies plan to finance new projects with debt rather than equity. The hypothesis that an optimal capital structure does not exist was reinforced by this study (Shyam-Sunder & Myers, 1994).

Fama & French (2002) tested the dividend and debt prediction of the trade-off and pecking order theories, examining how long-term debt and the dividend pay-out ratio vary across different firms if they are driven by the variables of both theories, namely profitability and investment opportunities. The conclusion was that the tests for these theories are flawed as the results cannot be attributed to a particular theory, the results support both the trade-off theory and the pecking order theory (Fama & French, 2002).

Watson and Wilson (2002) tested the pecking order theory on a sample of SMEs in the United Kingdom and found strong evidence of the pecking order preference. The results also suggested there may be pecking order in the types of debt the SMEs issue (Watson & Wilson, 2002).

Naranjo et al. (2002) use the international financial reporting standards (IFRS) to study whether the financing decisions of firms worldwide support the pecking order theory; the introduction of IFRS may have been a shock to the information asymmetry of firms as the reporting standards require transparency and enhanced comparability of financial information. Results revealed that, for firms in countries that adopted IFRS, there was an increase in the probability of raising external financing relative to firms that did not adopt IFRS. Additionally, firms that adopted IFRS make different capital structure decisions. Overall, their results support the pecking order theory in explaining financing and investment policies (Naranjo et al., 2022).

The debt-equity ratio of companies that follow this model is likely to be high thus increasing the cost of financial distress (Myers, 1984). Decisions relating to financing are influence by the costs associated with information asymmetry between mangers and investors; these costs are incurred when firms issue securities and are particularly higher for equity issues hence firms will issue equity as a last resort (De Bie & De Haan, 2007). Another contributor to the cost of issuing equity is the liquidity of the firms shares, firms that have more liquid shares incur less investment management fees for equity issues than firms with less liquid shares (Butler et al., 2005).

Frank & Goyal (2003) tested the pecking order theory for American public companies over a period of 27 years. Over time evidence of the pecking order declined as more small companies were listed on the stock exchange in the latter years; small companies have been found to not follow the pecking order theory (Frank & Goyal, 2003, 2007).

Ali et al. (2011) also added to the literature investigating the determinants of capital structure based on the static trade-off theory, pecking order theory information asymmetry and agency theory. The study found that the pecking order theory is the prevailing theory for explaining capital structure, but also found low to moderate support of the other theories examined in the study (Ali et al., 2011).

Shyam-Sunder and Myers (1999) developed a simple model for the pecking order theory, this is shown below:

$$\Delta D_{it} = \alpha + \beta_{it} DEF_{it} + \varepsilon_{it} \quad (2)$$

Where:

- D_{it} is the debt level at time t of the firm i
- $DEF_{it} = DIV_t + I_t + \Delta W_t + R_t - C_t$ (3)
- DEF_t is the financing deficit in the year t,
- DIV_t is the cash dividends in the year t,
- I_t is the net capital investment in the year t,
- ΔW_t is the change in working capital in the year t,
- R_t is the current portion of the long-term debt,
- C_t is the cash flows from operations.

A significant coefficient of DEF_{it} will indicate the presence of pecking order for a sample of firms.

2.1.4. Market timing theory

The equity market timing theory of capital structure was formalised by Baker and Wurgler (2002). The theory states that the current capital structure is the accumulation of past attempts to time the market (Baker & Wurgler, 2002). Market timing is the hypothesis that firms issue equity when they consider to be overvalued that is when the share prices are high and will repurchase equity when the share prices are low (De Bie & De Haan, 2007). Firms will want to exploit the temporary fluctuations in the cost of equity relative to the cost of other forms of capital, meaning that at the point when share prices are high, firms will raise larger capital at not much additional cost (De Bie & De Haan, 2007). This benefits ongoing shareholders at the expense of exiting or entering shareholders, provided that market timing is successful (Baker & Wurgler, 2002).

The concept of market timing had already been empirically established by others when Baker and Wurgler developed their theory. For example, Fama and French (1995) found that the market-to-book ratio is a measure for growth opportunity and firms will fund these growth opportunities by issuing equity rather than debt in order to avoid high debt-equity ratios; high market-to-book is perceived as a proxy for growth opportunities or, and firms issue equity when the market-to-book ratio is high (Fama & French, 1995). Baker and Wurgler (2000), examined capital structure in light of share price changes and found that lower debt-equity ratios precede declining share prices; suggesting that firms would have issued equity when share prices were high and these issuances would have then had the consequence of diluting the share price.

2.1.4.1. Empirical evidence for market timing in capital structure

The evidence of market timing in capital structure has been tested several ways, including examining first the performance of initial public offerings, second the behaviour of management, and third the relationship between market-to-book ratios and capital structures (Çelİk & Akarim, 2013). This dissertation employs the third approach. The statistical results of several studies support the market timing theory of capital structure (Welch, 2004; Mahajan & Tartaroglu, 2008; Yang et al., 2010; Dong et al.,2012; Lee et al., 2012).

On the analyses of actual financing decisions by firms, evidence has shown several factors supporting the validity of market timing. Equity issuances by seasoned companies occur when the company valuations are high, that is, when the company share price is performing well (Asquith & Mullins, 1986; Taggart, 1997; Hovakimian et al., 2001). Initial public offerings also occur when company valuations are high, this is consistent with the pecking order theory as there will be information asymmetry in the case of initial public offerings (Loughran et al., 1994). Equity repurchases occur when companies seems to be undervalued, that is when the share price is underperforming (Ikenberry et al., 1995).

When analysing earnings forecasts and returns resulting from equity issues, the results suggest that firms issue equity when investors are optimistic about the firm's future earnings (Loughran & Ritter, 1997). This follows periods of high performance by the

firms which can signal to the market high profitability in the future (Loughran & Ritter, 1997).

Two thirds of CFOs confirmed the valuation of their shares to be an important consideration prior to raising additional external funding which confirms market timing (Graham & Harvey, 2001). The survey of CFOs is the most convincing evidence of market timing (Baker & Wurgler, 2002).

Baker and Wurgler (2002), continuing from the 2000 paper, are the first who investigate the persistent effects of market timing on capital structure thus developing the market timing theory of capital structure (Çelİk & Akarim, 2013). The 2002 paper examined US firms over ten years and found that the current capital structure is strongly related to past market-to-book ratios suggesting past attempts to time the market have a persistent effect on capital structure (Baker & Wurgler, 2002). In developing the theory, Baker & Wurgler (2002) looked at four different kinds of empirical studies which displayed evidence of market timing. First, the analyses of actual financing decisions by firms. Second, the analyses of long-term stock returns, including the performance of the share price, following corporate financing decisions. Third, the analyses of earnings forecasts. Forth, management surveys (Baker & Wurgler, 2002).

On the analyses of long-term returns on shares following corporate financing decisions, either equity or debt issuances, evidence has shown that equity timing is successful on average (Baker & Wurgler, 2002). This success is evidenced by the share price of equity issuers subsequently reducing, thus earning shareholders low returns and firms that have issued equity when the market-to-book to book ratios were high have returned even lower earnings to their shareholders (Stigler, 1964; Ritter, 1991; Loughran et al., 1994; Spiess & Affeck-Graves, 1994). The share price of firms that have repurchased their shares has subsequently increased, thus earning shareholders high returns (Ikenberry et al., 1995). The subsequent performance of the share price is driven by market sentiment responding to the firms' signal of overvaluation or undervaluation (Baker & Wurgler, 2002).

Baker and Wurgler (2002) also hypothesized that a firm's current capital structure is the cumulative result of past equity raise timing attempts. Meaning that the effect of equity raises are long-lasting and persistent. This hypothesis would suggest that, if a

firm has been timing the market, other forms of capital would have had no impact on the capital structure over time (Baker & Wurgler, 2002).

Further studies of Baker and Wugler's market timing theory have resulted in some agreeing and some conflicting evidence. Firms with high market-to-book ratios have good growth opportunities and, therefore low target debt ratios and the probability of equity issuances increases while the probability of debt issuances declines (Hovakimian et al., 2004). The probability of debt issuances is not affected by the performance of the share price, the importance of the share price in corporate financing choices is not related to the trade-off theory, and is likely to be related to the pecking-order theory or the market timing theory (Hovakimian et al., 2004).

Contrary to Baker and Wugler, Hovakimian (2006) found that historical market-to-book ratio is not due to past attempts of market timing, meaning that market timing does not have a persistent effect on the capital structure of a firm (Hovakimian, 2006). But historical average market-to-book ratios have a significant influence on financing and investment decisions which implies they capture information about future growth opportunities that may not be evident in current market-to-book ratios (Hovakimian, 2006). The study concluded that debt issues have a significant long lasting effect on capital structure, but their timing is not related to the performance of the share price (Hovakimian et al., 2001; Hovakimian et al., 2004; Hovakimian, 2006).

To examine the historical effect of cash flows, capital expenditures and share prices on market capital structure, Kayhan and Titman (2007) use a model for market timing, pecking order and trade-off theory and separate the market timing measure into two components, one short-term and one long-term timing measure. The study found that capital structure changes are driven by market timing in the short-term but not in the long-term, suggesting that the market timing effect on capital structure is not persistent. Additionally, a firm's history strongly impacts current capital structure and, over time, firms tend to move toward a target capital structure that is consistent with the trade-off theory of capital structure (Kayhan & Titman, 2007).

In the study of Dutch firms, De Bie and De Haan (2007) find evidence of market timing not just for the issuance of equity, but also of debt. Temporary sudden increases in share prices increase the probability of a dual issue (equity and debt) which is consistent with both the market timing and pecking order theories. Die Bie and Die

Haan (2007) examined the effects of market timing on the capital structures of Dutch firms using the methodology used by Kayhan and Titman's (2007) for the period 1983-1997 and find evidence for market timing effects on capital structures of Dutch companies (De Bie & De Haan, 2007).

Elliott et al. (2008) used an earnings-based valuation to test the market timing theory of capital structure, this model allowed equity mispricing to be separated from growth opportunities thus avoiding the multiple interpretations of the market-to-book ratio. Market-to-book ratios can be used as a measure for multiple factors such as growth opportunities, asymmetric information, and irrational equity over or under valuation; the conclusion was that that equity market mispricing is significant contributor to security choice decision and firms whose equity is overvalued are significantly more likely to issue equity (Elliott et al., 2008).

Mahajan and Tartaroglu (2008) did no find evidence of market timing when looking at the equity market timing theory of capital structure in major industrialized 'G-7' countries, instead, the leverage of firms is negatively related to the historical market-to-book ratio in all G-7 countries however, not attributable to equity market timing. The impact of equity market timing is short lived and not persistent for all the countries except for Japan; Japan does not time the market for any equity issuances. The study concludes that the capital structure behaviour of the G-7 countries is more consistent with the dynamic trade-off theory than the market timing theory (Mahajan & Tartaroglu, 2008).

When investigating the persistent effect of market timing on capital structure for Tunisian and French firms, Bougatef and Chichti (2010) found evidence of market timing. When market-to-book ratios are high, French and Tunisian firms issue equity (Bougatef & Chichti, 2010).

Dong et al. (2010) found that Canadian firms that are not financially constrained issue or repurchase equity and debt when their share prices are overvalued or undervalued. They investigated the market timing theory using a sample of debt and equity issues and repurchases of Canadian firms during the periods from 1998 to 2007. The behaviour of Canadian firms concerning issuances and repurchases appears to be conditional on the current financial performance of the firms, Dong et al. (2010) imply

that firms that are financially constrained would rather not incur the costs associated with equity and debt issuances and repurchases (Dong et al., 2010).

Bruinshoofd and de Haan (2012) conducted an international comparative study for US, UK and continental European firms investigating the evidence of market timing in capital structure. There is a negative correlation between capital structure and historical market-to-book ratios in the US samples. The findings on UK and continental European samples were contrary to the US, firms in these countries tend to issue debt rather than equity when share prices are high, this is consistent with the pecking order theory in which debt is preferred over equity (Bruinshoofd & de Haan, 2012).

In addition to evidence of market timing behaviour for US firms, Alti and Suleiman (2012) found evidence to support that such market timing behaviour coincide with strong institutional investor demand. Meaning that high share prices on their own have little impact on the likelihood of equity issuances; the results of the study highlight the importance of market reception for the timing of equity issuances (Alti & Sulaeman, 2012).

Çelİk & Akarim (2013) investigated Turkish firms for the priods between 1999-2008. Firstly testing the impact of equity market timing on the amount of equity issued in IPOs and secondly, testing how market timing affects capital structure from. The conclusion was that market timing does not apply to firms in Turkey, managers do not take the advantage of overvaluation by issuing equity (Çelİk & Akarim, 2013).

Arosa et al. (2014) use Hofstede's (2001) cultural dimensions to investigate the impact of market timing on capital structure. The cultural dimensions considered in the study were uncertainty avoidance and power distance. They use an international sample of 15 910 firms from 36 countries to test the correlation between cultural dimensions and share price returns (a proxy they use for market timing). Based on market-based leverage, the results showed evidence of market timing as firms reduced their debt-equity ratios when share prices increased. The results of the book-based leverage were consistent but less conclusive. The study concludes that cultural dimensions have an impact on the extent to which firms can adjust their capital structure based on market timing and overall, the findings support the market timing theory for capital structure (Arosa et al., 2014).

When looking at Egyptian companies, Allini et al. (2018) investigated whether capital structure is influenced by the pecking order or market timing theory. The study finds that profitable firms are less likely to obtain external funding, this is evidence of the pecking-order theory and equity issuances were more of a result of financial deficit than equity market timing (Allini et al., 2018).

2.2. CAPITAL STRUCTURE IN SOUTH AFRICA AND OTHER EMERGING MARKETS

A number of studies in the area of capital structure have been done in developed and emerging markets resulting in different conclusions and leaving a gap of unanswered questions (Demirgüç-Kunt & Maksimovic, 1996). Studies on emerging markets showed that capital structure is not influenced by growth, risk and investment opportunity as in developed markets (Pandey & Chotigeat, 2004). However, Conradie et al. (2014) assert that the planning of capital investments is of prime importance for the economic growth and business development of a country.

The capital structure of a firm is not only determined by its own actions, but also the environment, economy and regulations of where it operates (Antoniou et al., 2016). The determinants of capital structure are country specific and depend on the regulations around corporate governance and taxes. Regulations differ from country to country and therefore the trade-off theory (and any other capital structure theory) may not be evident in every market. For example, the capital structure of banks is largely governed by regulations because of deposit funding, hence most studies on corporate financing decisions exclude financial information of banks. The capital structure study on emerging markets has not been as robust as that of developed markets, however it has increased over the years to encompass more of the African countries as well (Gwatidzo et al., 2017).

2.2.1. Capital structure evidence in South Africa

De Wet (2006) analysed three companies listed on the JSE (Mr Price, Mittal and Tongaat) to determine the optimal capital structure. The results showed that the value of the companies was maximized at the financial structure that yielded the lowest WACC. This indicates the three companies follow the trade-off theory (de Wet, 2006).

South African firms experience the effects of economic changes on capital structure indirectly and only after a period. In addition, the trade-off and pecking-order capital

structure models are not mutually exclusive and over time, management can the selected capital structure model to incorporate the benefits of a different model (Mans & Erasmus, 2011).

Matemilola et al. (2012) analyse the trade-off and pecking order theories jointly in a nested model using the Generalised Method of Moments technique. The study used a sample of 100 JSE-listed firms for the period 2004 to 2009 and found that the cash flow variable is significant and negatively corelated to long-term and total debt thus supporting the pecking order theory. In addition, the study found fixed assets and profitability are strong determinants of capital structure. Overall the results implies that the nested model used in the study supports both the trade-off theory and pecking order theory (Matemilola et al., 2012).

Ramjee and Gwatidzo (2012) examined the cost of adjustment towards a target capital structure as well as the determinants of target capital structure for South African companies for the 10 years 1998 - 2008. The findings showed evidence of a target capital structure for South African firms, supporting the trade-off theory. The results also showed that companies with larger tangible assets also have larger debt-equity ratios and profitable companies have lower debt-equity ratios. The same study also showed that companies prefer internal sources of finance over external sources, concluding that South African companies follow both the trade-off and pecking order theories for capital structure (Ramjee & Gwatidzo, 2012).

Moyo et al. (2013) investigated the relationship between debt and the key varibles for financial performance such as cash flow, capital expenditure, asset tangibility,liquidity, share price and econimc value added using a smaple from the JSE of manufacturing, mining and retail insdustry firms for the period 2005 to 2010. The findings regarding cash flow and profitability are consistent with the trade-off theory. The findings regarding capital expenditure and asset tangibility are consistent with the pecking order theory. The findings regarding the share price show evidence for the market timing theory. And lastly, the findings regarding economic value added reject the trade-off theory; the economic value added is positively correlated to leverage (Moyo et al., 2013).

Fosu (2013) investigates the relationship between capital structure and firm performance, particularly focusing on to the extent of industry competition. To measure

competition, the ‘Boone indicator’ is applied. The Boone indicator implies that competition drives efficiency and performance, therefore, in a more competitive market, there is a stronger relationship between efficiency differences and performance differences (Schiersch & Schmidt-Ehmcke, 2012). A panel of 257 South African listed firms for the period 1998 to 2009 was used. The results suggest that debt has a positive effect on performance and competition enhances this effect (Fosu, 2013).

Conradie et al. (2014) conducted a survey of opinion to obtain the perceptions of the business leaders in South Africa regarding the importance of the determinants of capital structure such as economic and firm-specific factors for the financing of planned capital investments. The survey also gains the perception regarding the associated problem areas as perceived by the firms, as well as the frequency of planning various types of capital investment projects. The conclusion was that the most important factor that firms will consider when making financing decisions for planned capital investments is the profitability of such planned capital investments. The two second most important factors are the improvement in cash inflows as well as the utilisation the expected growth opportunities (Conradie et al., 2014).

Moyo (2016) sampled of 29 JSE listed financial services for the period 2003 to 2012 to test which theory of capital structure is valid for explaining the financing decisions of regulated entities. The findings supported the dynamic trade-off theory but rejected the market timing and pecking order theories; leverage was positively related to profitability, firm size and asset tangibility. The study concludes that JSE listed financial services firms have a target capital structure which they actively adjust towards consistent with the dynamic trade-odd theory (Moyo, 2016).

A study of the JSE top 40 companies post the 2008 financial crisis showed that South African companies do not follow the trade-off theory and do not work toward an optimal capital structure. The results showed the companies considered that profitability, risk, and tangibility to be the most significant factors when determining an ideal capital structure to maximize company value. The debt-equity ratio decreased as profitability increased, indication that the top 40 companies follow the pecking order theory rather than the trade-off theory (Mouton & Smith, 2016).

De Wet & Gossel (2016) conducted a survey of 33 CFOs from JSE listed firms to understand the drivers of capital structure. According to the survey, South African CFOs are likely to apply the pecking order and static trade-off theories equally. This was not the case for small firms, they are more likely to follow the pecking order theory. In addition, when compared to companies in other emerging markets, South African companies are more likely to follow the Static Trade-Off theory (de Wet & Gossel, 2016).

Using panel data of 239 listed South African firms for the period from 1996 to 2010, Gwatidzo et al. (2017) apply a quantile regression approach to investigate the effect of capital structure determinants on debt. The main objective of their study was to assess the effect of the determinants across the distribution of debt to determine whether the effect varies at different levels of debt. Apart from asset tangibility and age, whose effect increased with leverage, their results suggest that the importance of capital structure determinants does not vary with levels of debt (Gwatidzo et al., 2017).

Like Moyo (2013), Mukaddam & Sibindi (2020) zoom into a specific sector by employing a sample of 18 retial sector firms listed on the JSE to determine the relationship between capital structure and financial performance in an attempt to brigde the gap left by the inconclusive nature of some previous capital structure literature on South Africa. The retail sector accounts for a large portion of the Gross Domestic Product in South Africa. The study used panel data techniques for the ten year period 2010 to 2019 and concluded that the results support the pecking order theory as opposed to the trade-off theory of capital structure, a negative relatioship between fiancial perfomance and capital structure for retail firms was evident (Mukaddam & Sibindi, 2020).

2.2.2. Capital structure evidence in the rest of Africa and other emerging markets

When looking at Indian companies, Singh & Kumar (2012) concluded that Indian companies follow the trade-off theory for capital structure on average (Singh & Kumar, 2012). The results contrasted the conclusion by Farhat, et al (2006) that Indian companies follow the pecking order theory (Farhat et al., 2006).

The capital structure of Ghanaian SMEs is affected by the firm's age, size, asset structure, profitability and growth. SMEs also utilize more short-term debt than long-

term debt. However, evidence of the maturity matching principle is evident in Ghanaian SMEs. They finance their fixed assets with long-term debt and their current assets with short-term debt. The financing decisions of Ghanaian SMEs suggest and support the pecking-order theory (Abor & Biekpe, 2009).

Seifert & Gonenc (2010) examine the pecking order theory in 23 emerging market countries assuming that emerging market countries would to be ideal for the pecking order theory to apply as a result of information asymmetry and high agency costs. The study did not find sufficient evidence minimal for the pecking order theory as the primary capital structure theory for all emerging market firms. Firms in these countries mainly issue equity to finance any deficit, which is not consistent with the patterns of the pecking order theory. However, evidence of the pecking order theory was present in emerging markets with the most information asymmetry or high agency costs. These findings suggest that the environment in which the firms operate can influence the financial decisions the firms make (Seifert & Gonenc, 2010).

Seifert & Gonenc (2010) were the first to analyse the effects of information asymmetry on financing deficits and surpluses on the pecking order theory in sub-Saharan Africa. Overall, the analysis on individual countries revealed equity is better at tracking financing deficits than debt. However, when analysing by category, the results show that firms operating in the weakest legal environments appear to follow the pecking order theory for financing decisions. This evidence of the pecking order was less present for firms operating under strong legal environments. In addition, the results showed different capital structure behaviours depending on the development of markets and banking environments (Chipeta & Deressa, 2016).

Olumuyiwa et al. (2017) examine the speed and cost of adjustment towards the target optimal capital structure of Nigerian firms by using a two-step system Generalized method of moment. The empirical results show negative correlations between speed and costs of adjustment of firms in Nigeria and concludes that firms in an emerging market, like Nigeria, adjust relatively faster towards their target capital structure (Olumuyiwa et al., 2017).

Kannadhasan et al. (2018) examined the capital structure theories of some of the BRICS countries namely: China, India, and South Africa for the periods 1999 to 2016. The conclusion of the study was that firms have a target capital structure to which they

quickly adjust towards indicative of stronger evidence for the trade-off theory than the pecking order theory (Kannadhasan et al., 2018).

Khémiri & Noubbigh (2018) examined the capital structure determinants for firms in five sub-Saharan African countries namely South Africa, Ghana, Kenya, Nigeria and Zimbabwe. Using a System GMM estimation and quadratic methods, the results were consistent with both the trade-off theory and the pecking order theory. The results also display a significant negative relationship between the firm's performance and its debt. In addition, the study found historical debt levels and macroeconomic factors are robust determinants of the current capital structure (Khémiri & Noubbigh, 2018).

3. RESEARCH METHODOLOGY AND DATA SAMPLE

3.1. SAMPLE AND DATA

The JSE was founded in 1887 and has been used for this paper because of its size and efficiency; it is the largest stock exchange in Africa and the 16th largest in the world by market capitalization (JSE, 2023). As seen from the literature review chapter, many studies on capital structure have been based on the JSE but the gap in literature that still need to be covered is wide (de Wet & Gossel, 2016; Mouton & Smith, 2016; Ramjee & Gwatidzo, 2012). Using the JSE for testing the market timing theory adds to the capital structure work done on South Africa and other African countries by various authors and to the market timing work done on Egypt by Allini et al. (2018).

It is worth nothing that the equities market on the JSE is the most active on the exchange, and like most emerging markets, the debt market is not as active (Allini et al., 2018). It is therefore expected that the results of this market timing study will reveal evidence mostly relating to the state of the equity market. Exploring the impact of a relatively inactive debt market on capital structure decisions is an area for further research and has not be considered further in this study.

The data for JSE listed companies was obtained from the Refinitiv Datastream database for the financial periods 2012 to 2022. The data includes the same firms for the same time-series; as result this is panel data (de Jager, 2008). During the period of this study, the JSE has seen a decline in the number of listed firms of 94 firms which is 23 percent; this is resulting from more firms delisting than firms listing. However, the market capitalization has increased during the same period, indicating an increase in

stock market activity, either through the issuance of more shares by existing companies or a general increase in equity trading (Nikani & Holland, 2022).

The data extracted from the Refinitiv Datastream database consisted of 382 entities for the preceding ten annual financial periods in all the JSE industry classification benchmarks (ICB) as shown in Table 1, namely; basic materials, consumer discretionary, consumer staples, energy, exchange-traded funds (ETFs), financial services, healthcare, industrials, real estate (REITs), technology and telecommunications. The sample used in the study consists of an unbalanced panel of 192 companies, which is 50,3 percent of the sample extracted, and total panel observations of 1 277 for the generalised method of moments model and 1 516 for the panel least squares model being included. The panel is unbalanced as not all companies contain all the variables for the entire ten-year period, as a result a generalised method of moments regression model was preferred.

Financial services, ETFs and REITs have regulated capital structures and, in the case of banks, are customer deposit funded (Abor & Biekpe, 2009). As such, for the purposes of this study, companies in these sectors have been removed from the sample. Removing these sectors from the study is consistent with most capital structure studies (Adair & Adaskou, 2015; Allini et al., 2018; Butler et al., 2005; Frank & Goyal, 2007). Therefore, from the total sample of companies extracted, 190 have been removed resulting in 192 companies being included in the study.

The data extracted from Refinitiv for the 382 companies consisted of the following variables which are used as explained in table 2 to construct the regression formulae 4 and 5:

1. Market-to-book ratio
2. Revenue
3. Total assets
4. Property, plant and equipment (PPE)
5. Total debt
6. Total equity
7. Retained earnings
8. Income before taxation

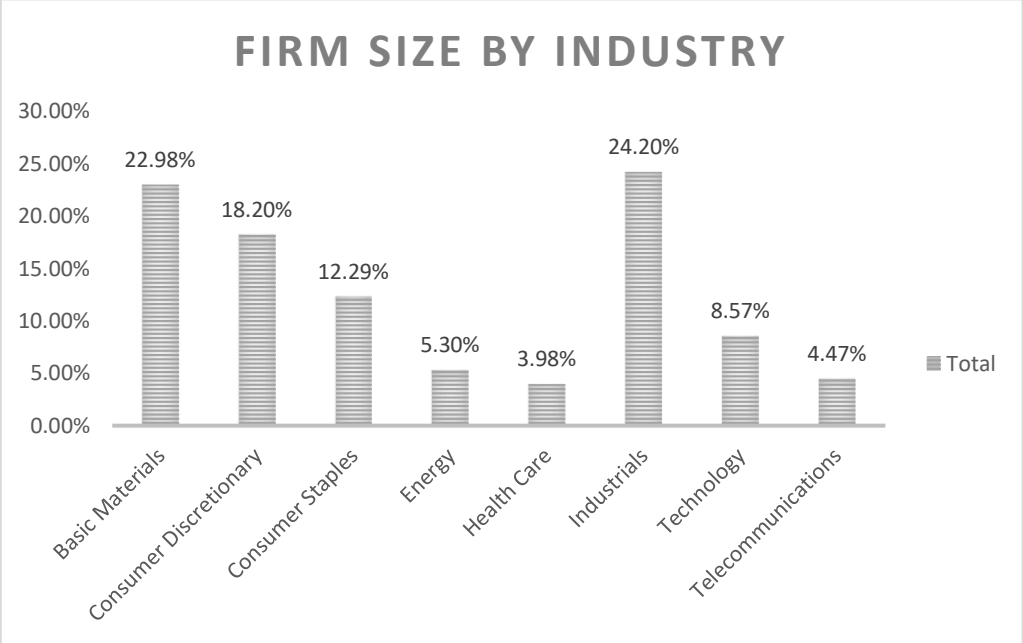
Table 1 – Summary of the number of companies in each ICB

Industry Name	Number of companies
Basic Materials	43
Consumer Discretionary	36
Consumer Staples	23
Energy	10
Financials	56
Health Care	9
Industrials	47
Real Estate	47
Technology	16
Telecommunications	8
Exchange-traded funds (ETFs)	87
Grand Total	**382**

Of which dual listed	**24**

Note: the table above shows the entire sample retrieved before any adjustments. It shows the number of firms in each industry.

Figure 4 – Total firm size by Industry Classification benchmark ("ICB"), excluding financial services and RIETs



NOTE: The chart above clearly depicts the percentage each industry contributes to the total firm size of the sample for the year 2022. Firm size is the logarithm of the book value of assets.

Figure 4 shows that the Industrials (24 percent) and basic materials (23 percent) industries to be the largest industries and health care (four percent) and energy (five percent) to be the smallest by book value of assets. The sample firm size by industry for the financial period ended in 2022. For this dissertation, the logarithm of the book value of assets is used as a proxy for firm size following Allini et al, 2018 and Ramjee & Gwatidzo, 2012. Other studies however use revenue or turnover as a proxy for firm size (Hovakimian, 2006).

3.2. RESEARCH METHODOLOGY

To analyse the evidence of market timing in JSE listed firms, the study follows the approach of De Bie (2007) for evidence of market timing in Dutch firms; they used the model developed by Baker and Wurgler to measure market timing. Baker and Wurgler (2002) hypothesized that a firm's current capital structure is the cumulative result of past equity timing attempts. To test this hypothesis, the regression model which includes the external-finance-weighted average market-to-book ratio (EFWAMB) variable will be used alongside the four common variables for capital structure, namely: firm size, tangibility, profitability, and market-to-book ratio (Allini et al., 2018; Baker & Wurgler, 2002; De Bie & De Haan, 2007; Hovakimian, 2006).

This framework establishes whether the current capital structure is the cumulative result of past attempts to time the market. The regression formula for the model as depicted by Allini et al. (2018) is shown in formula 4 below. The formula will be estimated using a two-step system generalised method of moments (GMM). For robustness, descriptive statistics and the discussion of the results thereof are also included. A Generalized Least Square regression (GLS) was also conducted for robustness and the results thereof have been included in the appendix. Allini et al. (2018) found the GLS with fixed effects method more appropriate for testing market timing for Egyptian firms. De Bie et al. (2007) found the GLS with random effects to be a more effective model for testing market timing for Dutch firms. Both studies followed the methodology established by Baker & Wurgler (2002).

To use panel data regression techniques, the data and model must not suffer from heteroskedasticity, and it must not exhibit autocorrelation. Heteroskedasticity is present in cross-sectional data when units have different sizes and as a result exhibit different variations; this will be the case for data extracted for JSE listed firms where

the book value of assets ranges between two hundred million and three trillion Rand. The issue with heteroskedasticity is that ordinary least squares regressions assume the residuals are drawn from a population with a constant variance, and this is not the case for the data used in this dissertation. General methods of moments is therefore suitable for the panel data set in this dissertation as it controls for autocorrelation and omitted variables bias (de Jager, 2008).

$$DE_{(i,t)} = C + LSA_{(i,t)} + MTB_{(i,t)} + PFR_{(i,t)} + TAN_{(i,t)} + EFWAMB_{(i,t)} \quad (4)$$

The variables in the formula and the relationship with capital structure is explained below. Furthermore

1. DE is the firm's capital structure which is the debt-equity ratio. This is the ratio of total book value of debt to the value of total equity.
2. LSA is firm size. This is the logarithm of book value of assets. Some capital structure studies use revenue as a proxy for firm size (Hovakimian, 2006).
3. TAN is tangibility. This is the ratio of net property, plant and equipment to the total book value of assets.
4. PRF is profitability. This is the ratio of revenue to the book value of assets.
5. MTB is the market-to-book ratio. This is the ratio of the market value of assets to the book value of assets.
6. EFWAMB is external-finance-weighted average market-to-book ratio. The formula is depicted in the table below.

The book value instead of the market value for assets, total debt and equity is used. The market value can inflate the values, particularly equity if shares are overvalued. Market value is also not reflective of the decisions of management, whereas book value would be reflective of current and historical management decisions (Mans & Erasmus, 2011). There is also consistency in calculation of book value as all firms on the JSE are required by the Companies Act to use IFRS.

Table 2 – This table presents the formulae for the model variables.

Variable	Formula	Formula number
DE – dependant variable	$\left(\frac{Debt}{Total\ Equity}\right)t$	(4.1)
LSA – independent variable	*Log(Total Assets)*	(4.2)
TAN - independent variable	$\left(\frac{PPE}{Total\ Assets}\right)t$	(4.3)
PFR - independent variable	$\left(\frac{Revenue}{Total\ Assets}\right)t$	(4.4)
MTB - independent variable	$\left(\frac{Market\ value\ of\ assets}{Total\ Assets}\right)t$	(4.5)
EFWAMB - independent variable	$\sum_{s=1}^{t-1} \frac{e_s + d_s}{\sum_{r=1}^{t-1} e_r + d_r}$ X MTB_S	(4.6)
Note: the table above represents all the formulas for the variables used in the regression model. The definitions of assets, liabilities, equity and revenue are consistent with IFRS.		

In the formula for EFWAMB *e* and *d* denote net equity and net debt issued, respectively. Equity and debt used in the compilation of this variable are based on book values. Net equity issued is defined as the change in equity less retained earnings. Net debt issued is defined as the change in total debt. *MTB* is the market-to-book ratio. And the suffixes *s* and *r* denote time. For a firm observed at a point in time (*t),* the EFWAMB is the weighted average of a time series of market-to-book ratios. The weighting for each year is the ratio of external financing compared to the total financing raised by the firm. In other words, the EFWAMB measures the increase in external financing compared to the market-to-book ratios over a time series (Allini et al., 2018; De Bie & De Haan, 2007).

4. RESULTS AND DISCUSSION

4.1. DESCRIPTIVE STATISTICS

Table 3 presents a summary of the statistics and the correlation analysis for the variables in formula 4. The high standard deviation and skewness indicate the data are more spread out from the mean; this is not unexpected given the firms included in the sample are not homogenous.

Table 3 - Descriptive Statistics and correlation analysis of the variables in the regression model depicted in formula (1)

	DE	EFWAMTB	LSA	MTB	PFR	TAN
Mean	0,5990	9,1370	9,3823	2,2381	-0,1773	0,3132
Median	0,3317	0,0037	9,7449	1,0413	0,0588	0,2765
Maximum	88,3163	14288,25	12,5588	418,7393	5,9015	0,9837
Minimum	-90,7943	-21,1916	0,0000	0,0000	-136,567	0,0000
Std. Dev	3,6977	349,4627	2,1378	11,1462	4,0967	0,2531
Skewness	-1,5598	40,7901	-3,1530	32,1246	-26,9590	0,5907
Correlation						
DE	1,0000					
EFWAMTB	-0,0037	1,0000				
LSA	0,0647	-0,0273	1,0000			
MTB	0,0543	0,9238	-0,0141	1,0000		
PFR	0,0100	-0,0108	0,1038	-0,0089	1,0000	
TAN	0,0424	-0,0313	0,3136	-0,0414	0,0577	1,0000
Note: represents the results of the descriptive statistics and correlation test. DE is the dependent variable.						

Table 3 represents the results of the descriptive statistics and correlation test. The debt-equity (DE) ratio shows that, on average, JSE listed companies are funded by 60 percent of debt compared to equity. Compared to the period 1998 to 2008 examined by Ramjee and Gwatidzo (2012), this percentage has remained constant. This is constant regardless of fundamental changes driven by firms maturing; growth, reduced profitability, or loss of growth opportunities, all of these changes would increase the firms requirement for debt (Mitton, 2008). It is worth noting that the high maximum debt-equity ratio relates to EOH Holding Ltd; this firm incurred significant losses during the 2019 financial period resulting in a significant reduction in equity. The minimum debt-equity ratio relates to Ayo Technology Solutions Ltd; this firm incurred losses during the initial years of listing on the JSE resulting in negative equity. The average firm size as approximated by the logarithm of total assets is 9.74. Market-to-book value has a mean of 2.23. Profitability has a mean of 17 percent. Asset tangibility has a mean of 31 percent. All of this is consistent with Ramjee and Gwatidzo (2012).

The correlation analysis shows that there is a negative relationship between external-finance-weighted average market-to-book (EFWAMB) ratio and capital structure;

historical market-to-book ratios are expected to have a long-lasting effect on a firm's capital structure if firms issue equity when market values are high and buy back equity when market values are low (Allini et al., 2018). The hypothesis is that if firms time the market, EFWAMB should have a significantly negative effect on leverage, and this would mean that the current capital structure is a result of past attempts to time the market. If firms do not time the market, EFWAMB would be not significant (Baker & Wurgler, 2002; De Bie & De Haan, 2007). The results of the regression model are discussed in section 5, however, the correlation analysis already suggests possible evidence of market timing.

The correlation analysis shows that there is a positive relationship between firm size and capital structure; size can serve as a proxy for reputation (Frank & Goyal, 2007). Larger companies may have better access to external funds than smaller companies as lenders are more willing to lend to larger companies than smaller companies, lenders are usually exposed to less risk by lending to larger companies (Acharya et al., 2015; Allini et al., 2018; Baker & Wurgler, 2002; Hovakimian, 2006). In South Africa, this is also indicative of the capitalization requirements imposed by the South African Reserve Bank on lenders which govern how much risk lenders are able and willing to take; banks and mutual banks by required to hold appropriate capital resources taking into consideration the level of risk to which they are exposed (South African Reserve Bank, 2021). Firm size is one of the risk factors considered by banks for capitalization requirements.

There is a positive relationship between the market-to-book (MTB) ratio and capital structure; market-to-book ratio is a proxy for market sentiment about a firm and a proxy for future growth. It can also mean that firms will accumulate external funds for investment purposes to meet the future growth (Frank & Goyal, 2007).

There is a positive relationship between tangibility and capital structure; tangible assets can be used as collateral for borrowings showing that tangible assets are important for South African firms; the capital that banks are required to hold reduces when collateral is used and even more depending on the quality of the collateral, this incentivises lenders to reduce the cost of debt (Ramjee & Gwatidzo, 2012). Companies with larger values of tangible assets can thus be expected to have more access to external funds (Allini et al., 2018).

Relationship between profitability and capital structure; it is expected that highly profitable firms will use internal funds first rather than external funds for investment purposes, this is consistent with the pecking order theory (de Wet, 2006; de Wet & Gossel, 2016; Fosu et al., 2016; Graham & Harvey, 2001; Kumar et al., 2017; Pandey & Chotigeat, 2004). However, the correlation analysis shows, in the case of JSE listed firms for the period between 2013 and 2022, profitability seems to have a positive relationship with leverage, albeit not a strong positive correlation. This correlation aligns with Butt (2009) hypothesis that good governance firms show a positive relationship between profitability and leverage and display the predictions of the trade-off theory. Firms with accumulated tax losses are less likely to issue debt, as the tax shield benefit cannot only be utilized in the future when the firm begins to make tax profits again (MacKie-Mason, 1990).

A comprehensive analysis is presented below in the results discussion of the regression analysis outcome.

4.2. TWO-STEP SYSTEM GMM MODEL COMPARED TO THE ONE-STEP GMM MODEL.

To arrive at the conclusion to use the two-step system GMM, the following checks were conducted:

a. The Breusch-Pagan-Godfrey test for Heteroskedasticity showed that the data suffers from Heteroskedasticity.
b. The panel least squares regression model, however due the presence of Heteroskedasticity, the results cannot be analysed.
c. Arellano-Bond Serial Correlation Test. The p-values show that there is no first-order or second-order serial autocorrelation of the residual in the two-step GMM model.
d. Descriptive statistics and correlation tests. The results from both these tests showed consistency with other South African studies for example (Ramjee & Gwatidzo, 2012) particularly the mean of the dependant variable.

Although the focus of the discussion is on the two-step GMM, the results from both the GMM and two-step GMM have been included below. Table 4 presents the results from a one-step GMM; the probability of the Hansen J statistic is 0.000865 which is below 0.05, the null hypothesis that overidentifying restriction on the instruments are valid

can be rejected. The results from the two-step GMM model in table 7 show the probability of the Hansen J statistic is 0.31; as this is above 0.05, the null hypothesis that overidentifying restriction on the instruments are valid cannot be rejected. This means that by using the two-step GMM, it can be concluded that the instruments in the model are valid and correctly specified.

Table 4 – Results from the one-step Generalised method of moments

Variable	Coefficient	Std.Error	t-Statistic	Prob.
LAGDE	0,0009	0,0540	0,0174	0,9861
EFWAMTB	-0,0168	0,0105	-1,6032	0,1106
LSA	1,6232	1,3233	1,2266	0,2215
MTB	0,5686	0,3572	1,5917	0,1131
PFR	0,0457	0,0726	-0,6297	0,5296
TAN	-18,6421	12,3634	-1,5078	0,1333
Mean dependent var	0,0817		**S.D. dependent var**	4,2950
S.E. of regression	5,2807		**Sum squared residual**	41327,11
J-statistic	67,1632		**Instrument rank**	41
Prob(J-statistic)	0,00087			
Note: the table above represent results for 10 years of data for the periods 2012 to 2022. The dependant variable is				

Table 5 – results from the Arellano-Bond Serial Correlation Test

Arellano-Bond Serial Correlation Test				
Test order	**m-statistic**	**rho**	**SE(rho)**	**Prob.**
AR(1)	1,4812	-11743,845	7928,597	0,1386
AR(2)	0,6697	-754,3205	1126,4391	0,5031
Note: The p-values of the AR(1) and AR(2) are 0.14 and 0.50 respectively, both above 0.05. The P-values need to be above 0.05 to rule out autocorrelation.				

To address the possibility of serial autocorrelation of the residual, the Arellano-Bond Serial Correlation Test was conducted, the results from this test are presented in table 5. The p-values of the AR(1) and AR(2) are 0.14 and 0.50 respectively, both above 0.05. The result of AR(1) is considered to be uninformative (Roodman, 2009). The p-values show that there is no first-order or second-order serial autocorrelation of the residual in the two-step GMM model.

4.3. RESULTS DISCUSSION OF THE TWO-STEP SYSTEM GMM MODEL

This paper applies the two-step system GMM to avoid any correlation between unobservable firm variables and variables that are explained in formula 4. Using a two-step system GMM to control for the correlation issue is recommended by Arellano and Bond (1991). In addition, to control for endogeneity of the variables which may be present in the formula because of economic factors that can affect capital structure, a lagged variable of the of the dependant variable was included in the formula. Including a lagged variable for the dependant variable in the formula is suggested by Drobetz et al. (2006). As a result, formula 4 including the lagged dependant variable is follows:

$$DE_{(i,t)} = C + LAGDE_{(i,t)} + LSA_{(i,t)} + MTB_{(i,t)} + PFR_{(i,t)} + TAN_{(i,t)} + EFWAMB_{(i,t)} \quad (5)$$

Table 6 – Results from the two-step Generalised method of moments

Variable	Coefficient	Std.Error	t-Statistic	Prob.
LAGDE	0,0001	0,0045	0,0237	0,9811
EFWAMTB	-0,0154**	0,0014	-10,9318	0,0000*
LSA	1,7297	0,2467	7,0149	0,0000*
MTB	0,5161	0,0495	10,4165	0,0000*
PFR	-0,0594***	0,0202	-2,9437	0,0037*
TAN	-16,7981	1,4857	-11,3062	0,0000*
Mean dependent var	0,0817		**S.D. dependent var**	4,2950
S.E. of regression	5,2140		**Sum squared residual**	40288,76
J-statistic	38,7214		**Instrument rank**	41
Prob(J-statistic)	0,3054			

NOTE: LAGDE is the dependant variable lagged by one year, EFWAMTB is the external-finance-weighted average market-to-book ratio, LSA is firm size presented by the logarithm of book value of assets, MTB is the market-to-book ratio, PFR is profitability presented by the ratio of revenue to the book value of assets, TAN is tangibility presented by the ratio of net property, plant and equipment to the total book value of assets.

*statistical significance at 1% level
**statistical significance at 5% level
***statistical significance at 10% level

The results of the two-step GMM are presented in table 6 above; from these results we can see that the variables that have a significant impact on the dependant variable

(debt-equity) at one percent statistical significance are external-finance-weighted average market-to-book, firm size, market-to-book, profitability, and tangibility. This includes all the variables in the model except the lagged dependant variable. The significance of firm size, market-to-book, profitability and tangibility is consistent with other capital structure research (Allini et al., 2018; Gwatidzo & Ojah, 2009; Ramjee & Gwatidzo, 2012).

From the significant variables, external-finance-weighted average market-to-book, profitability and tangibility have negative coefficients indicative of a negative relationship with capital structure. Firm size and market-to-book have positive coefficients indicative of a positive relationship with capital structure.

Profitability exhibits a negative correlation with leverage. This result for profitability are consistent with the pecking order, this result is contrary to the correlation analysis conducted under the descriptive statistics analysis earlier in this paper; it is expected that highly profitable firms will use internal funds first rather than external funds for investment purposes, this results in the debt-equity ratio decreasing as profits are either deployed to repay debt or for capital investments (de Wet, 2006; de Wet & Gossel, 2016; Fosu et al., 2016; Graham & Harvey, 2001; Kumar et al., 2017; Pandey & Chotigeat, 2004). This result is consistent with Ali et al. (2011) and Allini et al. (2018) for the pecking order theory.

Tangibility is expected to have a positive relationship with capital structure according to both the trade-off and pecking order theories as the tangibility of assets is supposed to be used as collateral for debt financing. This prediction is consisted with other capital structure literature for South Africa for example (Matemilola et al., 2012; Ramjee & Gwatidzo, 2012). However, the results of this dissertation are inconsistent with this expectation; the debt-equity ratio for JSE listed firms decreases as tangible assets increase for the period 2012 to 2022. This result is however consistent with a study on Indonesian firms published in 2019 (Simatupang et al., 2019).

A positive relationship between firm size, market-to-book and capital structure is evident from the results of this dissertation. Both firm size and market-to-book can serve as a proxy for market sentiment and the reputation of the firm as well as future growth (Frank & Goyal, 2007). Larger companies may have better access to external funds than smaller companies as lenders are more willing to lend to larger companies

than smaller companies (Acharya et al., 2015; Allini et al., 2018; Baker & Wurgler, 2002; Hovakimian, 2006). It can also mean that firms will accumulate external funds for investment purposes to meet the future growth (Frank & Goyal, 2007). Moyo (2016) also found firm size to have a positive correlation with capital structure.

The study shows a significant negative relationship between external-finance-weighted average market-to-book and capital structure; this means historical market-to-book ratios have a long-lasting effect on capital structure for JSE listed firms; this is because of the significant negative coefficient. This result is consistent with the findings of Baker and Wurgler (2002) for American firms and De Bie & De Haan (2007) for Dutch firms; they found that firms time the market when issuing equity and debt for periods of high market performance and this behaviour has a persistent effect on capital structure. Contrary to Allini et al. (2018) for Egyptian firms, the study found the external-finance-weighted average market-to-book to have an insignificant positive relationship with capital structure and concluded that Egyptian firm capital structure is not impacted by market timing (De Bie & De Haan, 2007). Moyo (2015) tested a modified external-finance-weighted average market-to-book and found an insignificant negative relationship between the book-to-debt ratio and capital structure for the period 2003 to 2012. The period covered by Moyo (2015) is different to this study and the contrary findings could result from several factors affecting leverage and market-to-book ratios; those factors can be explored in future studies. Such factors may include the global financial crisis of 2008 affecting interest rates and share prices and limiting the opportunity for any market timing activity; interest rates were higher on average during 2003 to 2012 compared to 2012 to 2022 significantly increasing the cost of debt and affecting leverage, and share prices decreased and many companies could not access funds for share repurchases.

5. CONCLUSION

The relevancy of capital structure has been an ongoing debate for over 65 years with limited and conflicting conclusions. Fama & French (2002) even concluded that the tests for the trade-off and pecking order theories flawed as the results can be ambiguous and cannot be attributed to a particular theory and sometimes the results from studies support both the trade-off theory and the pecking order theory.

To attempt to bridge some of the gaps found in prior literature and contribute to the South African literature, this dissertation set out to test the following question. Are the capital structures of JSE listed companies influenced by equity market timing?

The answer to this question is important as the capital structure of a firm impacts a number of factors that ultimately drive the performance of a firm thereby affecting its market value; for example the relationship between capital structure and profitability can inform the amount of debt that needs to be utilized to maximize on the tax deductibility of interest payments without putting the firm at risk for financial distress (Muhammad Sajid Amin et al., 2020). Capital structure research is important as it adds to the body of literature for academic uses and can assist management in corporate finance in developing and implementing policies that can guide the decisions which reduce the cost of capital and maximize market value of firms (Çelİk & Akarim, 2013).

Using the two-step system GMM this dissertation employed the regression model as depicted by Allini et al. (2018) to test the evidence of the market timing theory in the capital structure choices of JSE listed firms. The period covered in the study is financial periods between 2012 and 2022. Even though the pecking order and trade-off theories are not the focus, it is almost impossible to conduct a capital structure study without noting evidence of either of these theories in the results.

The results of the test showed that external-finance-weighted average market-to-book, profitability, and tangibility have negative coefficients indicative of a negative relationship with capital structure. Firm size and market-to-book have positive coefficients indicative of a positive relationship with capital structure.

The main variable for the market timing theory EFWAMTB shows that historical market-to-book ratios have a long-lasting effect on capital structure for JSE listed firms which is clear evidence of the market timing theory. This consistent with De Bie & De Haan (2007) for Dutch firms but contrary to Allini et al. (2018) for Egyptian firms.

The other common variables for capital structure revealed evidence for the pecking order theory and some evidence of the trade-off theory. The positive relationship between firm size, market-to-book and capital structure is evidence for both the trade-off theory and pecking order theory, both of these variables can serve as a proxy for market sentiment and the reputation of the firm as well as future growth which increases the need to external funding (Frank & Goyal, 2007).

Profitability exhibits a negative correlation with leverage. This result for profitability are consistent with the pecking order, this result is contrary to the correlation analysis conducted under the descriptive statistics analysis earlier in this paper; it is expected that highly profitable firms will use internal funds first rather than external funds for investment purposes, this results in the debt-equity ratio decreasing as profits are either deployed to repay debt or for capital investments (de Wet, 2006; de Wet & Gossel, 2016; Fosu et al., 2016; Graham & Harvey, 2001; Kumar et al., 2017; Pandey & Chotigeat, 2004). This result is consistent with Ali et al. (2011) and Allini et al. (2018) for the pecking order theory.

The results of this study, particularly the market timing variable EFWAMTB, are relevant for the South African context mainly to investors. Investors can make better investment decisions by using market timing literature to predict a firm's future actions regarding the issuance or repurchase of equity.

5.1. LIMITATIONS AND AREAS OF CAPITAL STRUCTURE RESEARCH THAT STILL REQUIRE FOCUS

The main limitation for this study is that data used is for a specific period and therefore the conclusion of the results apply only to the specified period and cannot talk to the capital structure decisions of JSE firms for all time. The possible impact of the COVID-19 pandemic has also not been considered. The results might also differ when the test is conducted for different sectors instead of the entire JSE population.

Capital structure research on South African firms has been focused on testing for evidence of the pecking order and trade-off theories with conflicting results (as discussed above). It is important that we continue to probe the determinants of corporate financing decisions by firms in South Africa as this can contribute to the development of theories that apply to the South African context which can used for general African context as well (Gwatidzo & Ojah, 2009; Ramjee & Gwatidzo, 2012).

To add to the continuing research on South African firms, other elements of the market timing theory on JSE listed firms need to be researched. This dissertation can be replicated for specific industries and different periods. Another consideration would be the impact of financial distress caused by the COVID-19 pandemic on capital structure; this would be a future study for the periods post the pandemic period.

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7. APPENDIX

Panel least squares
Dependent variable: DE
method: Panel least squares
Cross-sections included: 189
Total unbalanced panel observations: 1516

Variable	Coefficient	Std.Error	t-Statistic	Prob.
EFWAMTB	-0,003357	0,000647	-5,189903	0,0000
LAGDE	0,308834	0,027895	11,07129	0,0000
LSA	0,068282	0,042717	1,598470	0,1101
MTB	0,113674	0,020289	5,602784	0,0000
PFR	0,00077	0,021165	0,03639	0,9710
TAN	0,314432	0,359509	0,874616	0,3819
C	-0,535200	0,391873	-1,36575	0,1722
R-squared	0,093976		**Mean dependent variable**	0,598952
Adjusted R-squared	0,090715		**S.D dependent variable**	3,697731
S.E. of regression	3,526024		**Akaike info criterion**	5,362392
Sum of squared residual	20725,55		**Schwartz criterion**	5,385068
Log likelihood	-4481,322		**Hannan-Quinn criteria**	5,370793
F-statistic	28,8179		**Durbin-Watston Stat**	1,943192
Prob(F-statistic)	0,000000			