THE LINKAGE BETWEEN CAPITAL STRUCTURE AND FINANCIAL PERFORMANCE: A CASE OF SELECTED TECHNOLOGICAL FIRMS LISTED IN JOHANNESBURG STOCK EXCHANGE

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ABSTRACT

The main objective of this study is to analyse the effect of capital structure on the financial performance of technological firms listed on the Johannesburg Stock Exchange in South Africa. Cross-sectional time-series data was collected from a sample of 14 technological firms over 9 years, yielding a total of 126 observations. The Levin, Lin & Chu test was used to conduct unit root tests on financial performance, capital structure, firm size, firm growth, and macroeconomic control variables. Results indicate that some series were stationary at a level and some at first difference. While return on assets was used as a dependent variable or proxy of financial performance, and debt/equity ratio as a proxy of capital structure, the random effects model was selected in preference to the Fixed Effects model using the Hausman test. Estimates of the random effects model show that the debt/equity ratio had negative and statistically insignificant effects on firms' financial performance positions. Conversely, the size of the organization and its growth had statistically positive and significant effects on financial performance, with firm size having a more pronounced effect relative to firm growth. The adjusted Rsquared shows that nearly 97 percent of the variation in technological firms' financial performances is explained by capital structure, firm size, firm growth, and liquidity. Robust checks from stepwise regression results are consistent with the estimates of the random effects model. This study recommends that the management of technological firms should maintain levels of debt that are optimal to avoid the negative effects of high debt burdens on a firm's financial performance positions.

Key Words: *Capital structure, Financial performance, Return on Asset, Debt-to-equity ratio, Liquidity, Firm size, Firm growth*

CHAPTER 1: INTRODUCTION AND BACKGROUND

1.1 Background

The structure of capital of a firm is made up of a selected combination of debt or debt equivalent instruments and equity as sources of finance. As a result, the performance of a firm is greatly impacted by the decisions on the capital structure (Gordon & Gordon, 1987). In this study, the researcher seeks to establish the measurable linkages that exist between financial leverage (capital structure) and financial performance, and this can be measured through analysing ratios such as Return on Asset, Return on Equity, Debt-to-equity ratio, Liquidity, Return on Investment and Price Earnings ratio.

In determining the value of a firm, one of the key role's modern financial managers play is making financing decisions. They attempt to attain and maintain a capital structure that results in shareholder's wealth maximising effect, simultaneously, minimising the firm's business risk and reducing financial risks. Traditionally, it is viewed that firms strive to maintain an optimal capital structure that balanced the value and cost associated with varying equilibria (Modigliani & Miller, 1958). In response to the changing equilibrium, it is argued that companies rebalanced their optimal level.

Many attempts have been made to define capital structure. In this study, capital structure has been defined as the combination of permanent financing sources, the shareholders' equity, and long-term debt, such as preferred stock (Myers, 1984). A capital structure may not be the same as a financial structure. The latter, on the contrary, in addition to other capital structure components includes short-term sources of finance. Capital structure, therefore, is determined by the choice between equity financing and long-term debt/debt equivalent source of the finance. Since the initial studies by Modigliani and Miller (1958), there has been a vehement which ignited the interest in the subject of capital structure (Gachoka2015).

Studies and research by Modigliani and Miller on capital structures attempted to determine if the optimal capital structures existed in reality. The optimal capital structure is defined to be the capital framework that minimises the cost of capital of a firm and maximises its firm value (Modigliani & Miller, 1958). As a result, capital structure decisions are argued to

impact the firms' performance. Choosing the optimal combination of equity and debt for the capital structures of firms has remained a cryptic puzzle for managers. The idea that capital structure influenced a firm's performance has been considered to be irrelevant in the classical theory, (Modigliani and Miller, 1958). The school of thought suggests that the performance of a firm in a perfectly competitive market is influenced by real factors and not by capital structure. On the contrary, recent studies argue that capital structure plays a critical role in the determination of the firm's performance (Kakani, Biswatosh, & Reddy, 2016). Other researchers concurred that entities making huge profits were tempted to remain moderately leveraged since they were able to finance their operations (Loof, 2013).

This viewpoint is grounded on the perception that highly leveraged firms had increased chances of bankruptcy. Leveraging the firm also resulted in the interest payments, which had the benefits of tax deductibility, especially in developing countries like South Africa (Gachoka, 2015). The advocators of the use of debt finance argued that payment of interest had advantages and that tax is deductible. While this is true, it has however been noted that firms that use all debt finance lost their control over their firm to creditors, who would attempt to have control over their stake (Cheronoh, 2017). Other critiques of debt finance have indicated that it increased agency costs between debt holders and shareholders (Njagi, 2013). No conclusion has been reached over which capital structure was most appropriate. This has inspired this study, to examine whether there a link between financial performance and capital structure technology-based organizations that are on the JSE. The technological firms have been selected for this study since the form the backbone of the country in economic growth

1.2 The relationship between capital structure and financial performance

Deciding on the most appropriate capital structure decision has been cited as the most daunting task in developing and emerging economies such as Kenya and South Africa. Increased difficulties were faced when making capital structure decisions for firms that operated in economically highly unstable environments. In such circumstances, firms attempted to identify their combinations of debt and equity they assumed would maximise their market values. How critical the decisions made by management on the structure of capital were similar to financial structure decisions. The two structures were crucial and

essential because they influenced the returns of different organisational elements, and similarly, they impacted the firm's ability to survive in a competitive environment. A lot of research had been carried out on capital structure for many years, but, surprisingly, there has been no shared view about how capital structure influenced the firm's performance (Kakani, Biswatosh & Reddy, 2016).

A capital structure is described as optimal when it minimises the cost of capital of a firm and enhanced the maximisation of shareholders' wealth (Bancel & Mittoo, 2002). It, therefore, pointed to the fact that the decisions on capital structure have an impact on how the firm performed financially. A lot of uncertainty still surrounds how firms choose the combinations of equity to debt (Myers, 1984). Questions have been raised as to whether these combinations were determined by the firms' reasoning, or they were made following the traditional approaches to capital structures, which were based on the nature of the industry (Loof, 2013). Answers were sought for these questions so that the actions of managers would be informed to influence the performance of firms and the perception of investors about the firm.

Making investors happy through maximising investor's wealth is a key to making capital structure decisions (Zeitun & Tian, 2017). It is therefore very important that the performance of the firm is constantly measured. The most used measures of financial performance are financial ratios. These ratios have demonstrated their importance by making their way through to most financial reports which were produced for investors and other stakeholders. Ratios are also used by investment analysts in creating a clear impression about a firms' securities to investors who are assessing whether they could purchase the firm's shares (Titman & Wessels., 1988).

Many of the recent research studies were sparked by the work of Modigliani and Miller (1958) on the irrelevance theory. The theory held that the structure of capital is irrelevant to the firm's performance since, in a competitive perfect market, the firm's value is not linked to the mix of its financing. Contemporary research studies have emphasised that the proportion of debt in the capital structure chosen by a firm had an actual impact on the firm's performance (Jensen, 1986). It is from this backdrop that this study seeks to examine the relationship that exists between financial performance and capital structure of technological firms listed on the Johannesburg Stock Exchange (JSE) in South Africa.

1.3 Listed Technological firms on Johannesburg stock exchange

The Johannesburg Stock Exchange, based in South Africa, is one of the stock exchanges that are leading in Africa. The JSE has a listing for debt and equity securities, and it provides a world-class market for local and international investors to trade in these security and equity instruments. The JSE has enlisted the 10 largest technological firms (JSE, 2019). It has been observed that most technological companies preferred sourcing finances from commercial banks instead of the stock exchange. Some of these firms did not prefer bank borrowings for fear of losing their businesses to lenders. It has, however, been argued that the key source of financing for technological firms is debt (Demirguc-Kunt, Klapper, Singer, & Van Oudheusden, 2015). Explanations have not been given from firms' perspective for use of debt financing, however, financial analysts argued that debt finance is valuable if it is acquired at an appropriate rate and used effectively by managers (Zeitun & Tian, 2017). Hundreds of billions are raised every year by firms listed on the JSE through rights issues (Findex, 2019). This resulted in the increased use of debt financing in the capital structure of the technological firms, as they sought to implement their various projects and expand business operations.

1.4 Problem statement

Most profit-making companies would find it ideal to operate without debt. The key reason for this is that they would want to avoid paying debt on finance interest. However, firms have found out that, when they mix debt with equity, they would enjoy the benefits of borrowed finance. However, if taken to an extreme, and borrowing is excessive, their survival begins to be threatened by increased bankruptcy costs, which would arise from declining returns on excessive debt. It has therefore been noted that profit maximising firms, which moved away from appropriate capital structure risked incurring higher financing or bankruptcy costs, as the tax benefits arising from debt financing were outweighed. Capital structure influences the financial performance of a firm. Zeitun and Tian (2017) believed that there is an optimal mix of debt and equity which maximises financial performance. Each firm should therefore attempt to strike the balance of the mix to maximise shareholder wealth. In an attempt to prove this, some studies have indicated that capital structure decisions have a positive influence on financial performance, whereas some studies indicated a negative association between the two. These mixed findings have

left this debate unresolved. This study opines that the impacts of capital structure on financial performance may vary from country to country and from one sector to another. It is from this opinion that this study seeks to find out whether there is a link between a firm's capital and financial performance, focusing in the technological sector in South Africa. If the relationship is positive, then the capital structure decisions can influence the financial performance of technological firms to be the engine driving the economic growth especially at the time we are bracing up for the Fourth Industrial Revolution (4IR).

This study selects technological firms in South Africa since their performance is key to the achievement of the country's growth and the achievement of the country's vision 2030. Technological firms account for 33 percent of real GDP, 47 percent of the total earnings, and 40 percent of government revenue. Approximately 45 percent of employment in South Africa is generated by the technological sector (Statistics South Africa, 2018).

1.5 Research objective

This study seeks to examine whether there is a relationship between capital structure and financial performance for technological firms that are listed on the JSE.

1.6 Significance of the study

The research intends to contribute to the existing body of knowledge and research by applying the various capital structure theories in a South African JSE listed technological sector context. The findings will benefit firm management in making decisions on equity and debt capital mix, to maximise shareholder wealth, and highlight the linkage that capital structure has on firm performance. The findings will also benefit managers in new and existing technological companies in aiding with the capital structure that they adopt to try and maximize shareholders' wealth. The shareholder wealth maximization in this sector can lead to increased local and foreign investment.

1.7 Organization of the study

This research report has been presented in five chapters. Chapter one gives the introduction and background of the study, as well as the problem statement and objectives

of the study. Chapter two focuses on the theoretical framework for capital structure and reviews the literature on the relationship between a firm's capital structure and financial performance. Chapter three gives details of the research methodology and design, setting the logical steps that were followed in conducting this study.

Chapter four gives detail of the analysis data and presentation of research results in various forms which include tables, charts, and graphs. These representations are discussed concerning the literature reviewed. Chapter five presents conclusions and policy recommendations according to the findings from the research.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

In this chapter, a review is presented for the theoretical and empirical literature to establish whether a link between financial performance and capital structure for technological firms that are on the South African Johannesburg Stock Exchange (JSE) exists. The section discusses theories on capital structure, followed by reviews of empirical studies, determinants of capital structure, and financial performance.

2.2 Theoretical review

This section discusses the theoretical literature which was identified to be relevant to this study.

2.2.1 Capital structure irrelevance theory

Modigliani and Miller (1963) propounded that capital structure did not have any influence on the firm's value. They asserted that a firm could fully finance its capital using debt to enjoy tax benefits. They also pointed that the greater debt ratio is desirable, but it might lead to increased costs of financial distress as more interest would be paid. Marsh (1982) argued that, though the theory is true, it is worthwhile noting that with increased debt-bankruptcy costs also rose. The demands made by creditors for the payment of their interest on borrowed money when they fell due caused financial distress and ultimately bankruptcy.

In their argument for using debt finance, Modigliani and Miller (1998) stated that payment of interest attracts tax deduction, leading to the reduction of finance costs and enhanced firm's value. From this point of view, increased debt leads to enhanced value of the firm and improved performance. Yet, Modigliani and Miller (1998) emphasised that debt financing leverage in a perfect market did not influence the value of the firm. Based on this argument, this study will interrogate whether leveraging by technological firms in South Africa has any influence on firms' value and performance, considering that the country is an emerging economy that is relatively less liquid than developed financial markets.

2.2.2 Static trade-off theory of capital structure

The static trade-off theory was propounded by Myers (1984) to seek the balance between equity and debt which would result in an optimal cost of capital. The author explained that, though there are benefits of tax shield from using debt finance, there is a need to enforce strict discipline in management that they would not overstep. It was from this observation that Myers (1984) advocated the use of equity finance. Oolderink (2013) concurred that value of a firm is equivalent to the value of the unleveraged firm with tax shield benefits and costs of financial distress. The author also indicated that in trade-off theory, the financial performance of the company was influenced by the capital structure and firm's liquidity, firm's size, and firm's growth.

When creditors perceive that the firm, they have given the debt to has a high likelihood of bankruptcy which is caused by excessive use of debt, they demand a risk premium on their funds (Okoye, 2018). The author suggested that debt finance should be used only when the cost of debt is outweighed by tax benefits. Myers (1984) indicated that a point at which the marginal tax shield benefits meet with the marginal bankruptcy related costs signifies the optimal mix of equity and debt. At that point, the value of the firm is maximised.

2.2.3 Pecking order theory

This theory was hypothesized that firms first use internally generated funds as a source of capital before seeking debt finance Myers (1984). The author explained that it was from the investment opportunities that were available to the firm on which the dividend policy was inclined. The theory states that a sudden change in a firm's profitability and investment opportunities make the internally generated funds to be expensive. It is worthwhile for firms with a positive profitability outlook and cash flows to use less debt financing. In the tests which were conducted on whether there is any relationship between internal funds deficit and debt, the findings reported that no relationship exists (Gachoka, 2015). From these findings, a conclusion was reached that capital structure inhibited both the past and present net cash flows of a firm.

The Pecking order theory suggests that firms chose the financing structure that minimises the associated costs. The firms that chose external funding use debt rather than equity or

retained earnings, so they experienced less effect of information asymmetries (Gachoka, 2015). Thus, firms use internally generated funds for financing new projects at the initial stages and then consider the combination of equity and debt at later stages.

2.2.4 Agency theory

The agency theory was proposed by Berle and Means (1932) who observed the conflicts that arose between shareholders (principals) and managers (agents) (Cheronoh, 2017). Agents are ideally positioned to create wealth and cash flows for the principals. However, managers (agents) sometimes fail to meet this obligation by pursuing the self-interest of non-profit-making objectives which would not benefit shareholders. Managers were oftentimes tempted to use free cash flows to satisfy personal interests instead of generating wealth. Atkin and Glen (1992) suggest that this conflict could be mitigated by leveraging the firm without significantly increasing agency costs. From this perspective, managers would be prevented from investing in non-profitable activities, since; by doing so they would be unable to pay back interest on the debt. Xiaoyan (2018) suggests that debt should be used to monitor managers. More so according to Titman and Wessels (1988) highly leveraging the company lowers agency costs, improves efficiency and the firm's performance.

2.3 Determinants of financial performance

The financial performance of a firm could be measured by the equity's market value, which is obtained by multiplying the share price by outstanding shares. Alternatively, the book value of equity could be used (Gordon & Gordon, 1987). The performance of a firm is determined by the variables which have been discussed below:

2.3.1 Capital structure

Capital structure is the firms' funding profile determined by the mix of debt and equity (Abor & Biekpe, 2005). A company could choose from different sources of capital, to give a firm the desired mix. The most popular method of determining the mix is the pie model, which

shows the relationship between the company value and the different sources of finances, defining the desired amount of debt relative to equity (Loof, 2013).

The capital structure could affect the firm's profitability, shareholder risk, and returns as well as the firms' market value. Managers should therefore choose the capital structure that benefited all the stakeholders (Rajan & Zingales, 1995).

In that regard, Nurlaily, Rahardjo, & Hsu (2010) pointed that capital structure has both microeconomic and macroeconomic implications on financial performance. It was noted that large companies with more tangible assets influenced capital structure (Goyal et al., 2020). On a similar note, past growth and tangibility positively influenced capital structure, whereas asset turnover, profitability, non-debt tax shield, and firm age negatively impacted capital structure on a short-term basis.

In developing nations, the question about capital structure has received much attention from economists for quite some time (Myers, 2003). Through use of a database, it was found that firms which operate in capital markets of developing countries are less developed, and they have restricted access to finance (Atkin and Glen, 1992:371). There has been a general agreement among researchers (Mocking, Möhlmann, Palali, & van Veldhuizen, 2016; Bijlsma, Dubovik & Straathof, 2015) that these firms in less developed countries tend to rely more on external finance than on internal retentions. On the similar note, Singh, and Hamid (1992:1) examined 50 big manufacturing firms from nine less developed countries by using balance sheet data, and their findings indicated that these firms did not rely on retentions but relied more on external finance.

Singh (1995:1) conducted a more rigorous analysis using a bigger sample over a prolonged period and found evidence that the capital structures of firms in the less developed countries were less uniform. This is mainly caused by unique differences inherent in each firm and different data definitions. Nonetheless, firms in less developed countries rely more on external financing than on internal financing. Most firms in Africa have the same levels of leverage when compared to other firms in developing regions.

2.3.2 Liquidity

The liquidity of the firm is an indicator of the firm's performance. It indicates the ability of the company to meet obligations when due. Liquid firms do not relatively default from the obligations, and they are less exposed to financial challenges (Njagi, 2013). Keeping a certain level of liquidity is crucial to a firm as it enables a firm to meet corporate goals and objectives. On the other hand, low liquidity increases financial costs and reduced the ability to meet obligations. Where external sources of finance are costly or not available, liquid assets could be used to finance investments and activities (Xiaoyan, 2018). A high level of liquidity is recommended since it enables the firm to meet unexpected eventualities and to fare through turbulent periods of low income (Onsomu, 2013). Liquid companies can also repay debt interest and enjoy the tax shield benefits. Poor liquidity constrains the growth of a firm by limiting the possibilities of long-term growth and improved financial performance.

2.3.3 Firm size

The size of a firm influences its financial performance. The bigger the firm, the greater the scales of economies and hence reduce costs per unit produced (Bancel & Mittoo, 2002). Large firms are also responsive to environmental changes, and they can diversify their risks better than smaller firms. Gachoka (2015) argued that larger companies can afford to attract talented managers and they are able to operate in businesses that required huge capital investments, which increased their chances of making huge profits where competition is less stiff. Larger firms are also able to borrow funds at favourable terms compared to smaller businesses. On the other hand, advocators of smaller businesses state that the firms could be more profitable since they are highly liquid in a short term (Yabs, 2015).

2.3.4 Growth opportunities

Growth opportunities are measured in terms of the firms' assets which represent the portion of the firm's worth (Myers, 1984). Firms with greater growth opportunities could invest in new product lines, replace, refurbish, or renovate their assets. Rajan and

Zingales (1995) observed that growth opportunities influence the firm's future financial performance. Growth opportunities, therefore, catapult firms into better market positions and cushioned them against competitors. In the researcher's view, growth opportunities are intangible asset, which however, could not be measured and recognised on financial statements. To keep growth opportunities open, the pecking order theory suggested that internally generated funds should be used as they did not have any bankruptcy costs associated with them. The theory also discourages the use of borrowed finances since they limited the growth opportunities.

2.3.5 Macroeconomic Factors

Similarly, the financial performance of the company is affected by macroeconomic factors such as the Annual Growth Rate for Gross Domestic Product, exchange rates, unemployment, and inflation (Nurlaily et al., 2010). Athanasoglou, Brissimiss, and Delis (2012) discovered that an economic recession or go-slow, reduces the profitability of companies and thus, these macroeconomic variables relating to macro-economic conditions should also influence the profitability of the companies.

Exchange rate: The exchange rate is one of the key macroeconomic variables which affect the financial performance of firms. Fluctuations in the exchange rate affect firms' operating cash flows, sales, investment decisions, profits, and a firm's market value. The use of the real effective exchange rate (REER) was adapted from Mohd, Ahmed & Siddiqui (2020) who indicates that the REER is an ideal indicator of exchange rate movements which considers effects on changes in interest rates, inflation rate, the balance of trade, political constancy, domestic accords and features of some good governance by monetary authorities on exchange rates.

Inflation: High inflation is detrimental to the financial performance of firms in that it lowers the firms' market values (Ogeto & Osoro, 2014; and Oleka, Eyisi & Ebue, 2015). According to Iba and Wardhana (2012), inflation is a cost to the economy and thus affects the value of firms by reducing the real income of firms. Nnado & Ugwu (2016) indicates that inflation, even at low levels, can understate the true market value of the firm. Findings from the study by Combey & Togbenou (2016) using the pooled mean group estimator show that the inflation rate had no notable impact on ROA firms in the long run in Togo.

Gross domestic product (GDP) growth: In a country's national output improves then purchasing power and consumption levels of the public which provide an opportunity for firms to increase their sales that result in increased profits and returns. The effects of GDP growth vary from one country to another depending on other macroeconomic conditions prevailing in each economy. For instance, findings from the study conducted by Combey & Togbenou (2016) in Togo show that GDP growth had a significant positive impact on ROA firms in the short-run but had a significant negative impact on ROA of firms in the long run. A recent study conducted by Bui (2019) on the effect of economic growth on ROA of firms in the banking sector using the generalized method of moments (GMM) show that GDP growth has a positive and statistically significant effect on the financial performance (ROA) of firms operating in Asia.

Unemployment rate: Trends in unemployment levels in an economy are beyond the control of firms, hence the need to assess the heterogeneous effect of unemployment rate on firms' future financial performances as measured by ROA (Broadstock, Shu & Xu, 2011; and Mohd & Siddiqui, 2020). Some studies analysed the impact of unemployment rates on firms' financial performance found evidence of a positive and significant relationship on firms' ROA (Gjerde & Saettem, 1999; and Issah & Antwi, 2017). Issah & Antwi (2017) conducted a study to calibrate the effects of the unemployment rate on firms in diverse industries in the United Kingdom. They established that the unemployment rate had significant positive effects on ROA of firms in certain industries and positive but insignificant effects on ROA of firms in other industries. Mohd & Siddique (2020) indicate that unemployment has a considerable effect on firms' financial performance (ROA) that should consistently be analysed among other relevant macroeconomic variables.

2.4 Empirical evidence

Previous empirical studies on capital structure are discussed in the section under three categories, the global, the African, and the South African perspectives.

2.4.1 The Global Perspective

Several studies have assessed whether there could be an optimal financing structure and if firms made attempts to attain it. Some of the studies are reviewed in the following

paragraphs. Xiaoyan (2018) conducted a probit and logit analysis on firms in the United Kingdom (UK) to assess the cash issues of debt and equity, during the period between 1959 and 1970. The findings of the study indicate that firms prefer the use of financing instruments seemingly, with a target ratio in mind. The findings tipped to show that an optimal financing structure exists as was portrayed in the trade-off theory. However, the author did neither address what formulated an optimum financing structure nor explain whether the same factors would be applicable across all sectors, industries, and countries.

Okoye (2018) conducted a research study on the impacts of capital structure on financial performance, in the United Kingdom. The researcher used the trade-off theory. The findings of the study indicated that companies in the UK were being confronted by the need for more capital after the financial crisis. The companies did not have any stable cash flows or any significant credit history for them to gain credit worthiness. Afren PLC's involvement in using debt led to a high cost of capital and higher cost of debt as they attempted to aggressively use debt financing. The companies were using the trade-off theoretical framework in their adoption of the cost of capital approach. It was found that companies can minimise their cost of capital and increase their value by de-leveraging their debt to capital ratio to 40%. On the contrary, it was noted that the costs of overleverage by 5%, were much higher than the costs of under leveraging by the same rate (Okoye, 2018).

Nimalathasan and Valeriu (2010:23) carried out an investigation on the impact capital structure has on the profitability of listed manufacturing companies in Sri-Lanka. The analysis shows that the Debt- Equity ratio is positively and strongly associated with all profitability ratios (Gross Profit, Operating Profit, and Net Profit Ratios). Pratheepkanth (2011) conducted a study on the impacts of debt-to-equity level on the financial performance of firms in Sri Lanka during the period between 2005 and 2009, the findings indicated a negative association between debt-to-equity ratio (capital structure) and financial performances. The researcher measured financial performance using ROA, ROE, gross profit, and net profit of the Sri Lankan firms.

A research study by Chowdhury & Chowdhury (2010) supports Modigliani and Miller, (MM)'s argument. The authors tested how the debt-equity structure influenced the value of shares of various companies of different industries, sizes, and growth opportunities for firms listed on the Dhaka Stock exchange (DSE) and Chittagong Stock Exchange (CSE)

of Bangladesh. They observed that the market value of firms can be influenced by changing the capital structure composition. It, therefore, means that, by utilising debt, an optimal capital structure can be attained to maximise shareholder wealth. Furthermore, a study by Zeitun and Tian (2017), revealed that capital structure negatively affects a firms' performance. The study involved 168 Jordan firms between 1989 and 2003. The study also found that different mixes of equity and debt have different returns on assets and equity. An observation was made that firms that use debt would become profitable up to a point, remained constant for a while, then began to decline.

2.4.2 African Perspective

From an African perspective, Mauwa, Namusongeand & Onyango (2016) conducted a research study to appraise how the financial performance of firms listed on the Rwanda Stock Exchange (RSE) is affected by capital structure. The study surveyed six listed firms selected through purposive sampling. The findings indicate that the association of capital structure with ROA is negative. Similarly, the findings show a significant negative association between capital structure and ROE of listed firms. The study, therefore, suggests that when the capital structure of the firms is improved and when strategies are used to reduce liquidity ratios, financial performance would also improve. The study also shows that companies should keep their leverage in check by following clear working capital management guidelines to avoid bankruptcy.

A research study by Birru (2016) analysed the link between determinants of capital structure decision leverage and explored which capital structure theory is appropriate for Ethiopian commercial banks. The researcher examined growth, risk, profitability, tangibility, liquidity, and size as factors that determine the debt-equity ratio mix of a firm, using eight banks over a period of twelve years (2000 to 2011). The findings indicated that profitability, liquidity, growth, and tangibility have a negative effect on leverage. They also show that there is a positive relationship between leverage and size. The study, therefore, concluded that tangibility, liquidity, profitability, and firm size are key determinants for capital structure for firms in Ethiopia. Also, the capital structure theory found most applicable in Ethiopia is the pecking order theory.

However, a study by Onsomu (2013) involving 22 firms listed on the Nairobi Securities Exchange (NSE), from 1993 to 2001, failed to demonstrate that there is a considerable relationship between debt balances and firms' values. The result is in line with Modigliani & Miller's irrelevance theory, which argued that capital structure does not affect a firm's value. Musiega, Chitiavi, and Alala (2013) on the contrary found out that leverage positively and strongly influenced the financial performance of firms listed on NSE.

2.4.3 South African Perspective

From a South Africa context, Fatoki, George, and Mornay (2010) conducted research on 200 firms, of which 68 are listed on the Johannesburg Stock Exchange (JSE). The findings indicate that capital structure has a significant effect on the performance of the firms whereas total debt ratios and long-term debt have negative impacts on firms' performance. In addition, the researchers found that there is a significant negative relationship between long-term debt and return on assets, while there was a significant positive relationship between total debt and growth of sales as well as with gross profit margin. Fatoki, George, and Mornay (2010) also investigated the impact of debt usage on firms' profit in the Buffalo City Municipality, where they found out that there is a significant inverse relationship between debt usage and profitability of firms.

Furthermore, Fosu (2013) deployed the use of panel-data techniques on 257 South African firms between the period of 1998 and 2009 and found a positive relationship between leverage and the firm's performance. These findings are contrary to those of the studies by Fatoki, George, and Mornay (2010), which justifies that the debate on the impact of capital structure on the performance of a firm remains unresolved. Abata, Migiro, and Akande (2017) explored the influence of the debt-to-equity ratio on the performance of firms listed on JSE. It was found that corporate managers pay little attention to their firms' financial decisions in terms of applying appropriate debt and equity mix in South Africa. The study also indicates that capital structure and total debt to total assets have a negative relationship with return on assets and Tobin Q. Total debt to total equity and long-term debt to total assets are negatively related to return on equity. However, on the contrary, total assets and total debt are positively associated to return on equity.

While some of these empirical studies show that there is a relationship between capital structure and financial performance, some disapprove of these findings causing an unending debate over the impacts of capital structure on financial structure. This research study focuses on establishing the impact of capital structure on the financial performance of technological firms listed on the JSE in South Africa. Technological firms have been selected in this study since they are important for the growth of the

South African economy as they contribute 33% to the country's Gross Domestic Product. Moreover, technological firms, which like many other firms also utilize debt to achieve optimum capital structure to finance their operations.

2.5 Summary

This chapter provided a background of this study through reviewing previous literature. It discussed the measures of financial performance as well the capital structure variables. In addition, it made a brief review of theories underpinning capital structure, which include: Modigliani and Miller's irrelevance theory, Pecking order Theory, Tradeoff theory, and Agency theory. It further discussed the determinants of financial performance and the empirical studies from the global, African, and South African perspectives of the capital structure.

The next chapter discusses the research methodology and research design that were deployed in this study.

CHAPTER 3: RESEARCH METHODOLOGY

3.1. Introduction

This chapter discusses the research methodology employed in this study, the research design, population and sample, and model specification. Research methodology is a strategy used in a study that takes into account the underlying assumptions and develops through research design and data collection (Saunders, Lewis & Thornhill, 2012).

3.2. Research design

In this research study, a cross-sectional time series or panel data design was applied (Saunders, Lewis & Thornhill, 2012). Secondary quantitative data was collected to ensure empirical analysis of the relationship between capital structure and financial performance. This type of research design was chosen given that the focus of the research study is to estimate the effect of capital structure on financial performance. Furthermore, the design was selected based on the nature of research questions to be answered and the nature of data to be collected towards answering such questions in line with research objectives.

In line with the nature of the data to be used for analysis, a quantitative research method was applied in this research study. Quantitative research methodology is the most suitable research method that can be applied to an inquiry that identifies problem, involves testing hypotheses measured through numbers or a theory, and analysis using statistical measures (Leedy & Ormrod, 2010). Additionally, a quantitative method aims to determine whether the formulated research hypotheses can be retained or rejected with some acceptable degree of confidence (Saunders, Lewis & Thornhill, 2012:172). Therefore, a quantitative method affixed on the quantitative data analysis was used to test the stated hypotheses of the effect of capital structure and other control variables (firm growth and firm size) on the financial performance of firms in the technology sector (Collis & Hussey, 2014).

Njagi (2013) explained that panel data provide a rich environment for theoretical estimation and the development of estimation techniques. Based on this justification, the researcher was able to use time-series cross-sectional data in examining issues that could be difficult to study using time series alone or cross-section alone. Therefore, panel data was used to

measure changes in the relationship between financial performance and capital structure of the technological firms over the sample.

3.2. Population and sample

The population for this research study was technological firms operating in South Africa.

Official time series data on annual basis for the South African economy was collected. Technological firms were chosen for a myriad of reasons including intense increasing competition in the technological industry hence a motivation to assess and understand whether the financial performance of firms in the technological industry is influenced by their capital structures. Sampling is a process of choosing cases that can represent the total population to make inferences, while a sample is a subset of a population from which data is collected (Saunders et al., 2009). Sampling methods are categorised into probability and non-probability sampling. Probability sampling comprises a systematic, stratified, cluster, and simple random sampling methods, while non-probability sampling methods consist of purposive, convenience, and snowball sampling (Collis & Hussey, 2014).

In this research, purposive sampling was used as the suitable sampling approach based on the rationale that only technological firms that had published their financial statements with complete data on required variables were selected and used their data for econometric estimation. The major advantage of the purposive sampling method is that it is economical and does not require a list of elements in the population set. Panel data for fourteen firms spanning over a sample period of nine years from 2011 to 2019 was collected on variables from published financial statements and official sources. The sample period 2011-2019 was chosen since it is the period in which data across firms was completely available.

3.3. Variables Definitions and Measurements

The financial performance of a firm is determined by certain variables. According to trade-off theory (Myers, 1984), financial performance is influenced by capital structure, firm size, firm growth, and liquidity. To analyse the effect of capital structure on firm financial performance, this study used the return on asset (ROA) as a measure of performance, and debt-to-equity ratio (DER) as a proxy of capital structure (Khidmat & Rehman, 2014; Dewi,

Wayan & Kirya, 2015; Suyono & Gani, 2017, Fadilah, Ghani & Amaniyah, 2017; Hantono, 2018; and Irman, Purwati & Juliyanti, 2020). Firm size and firm growth are the control variables that influence firm performance; hence these variables were included in the financial performance model. The respective indicators were chosen because they are consistent with the objectives of this study and past empirical studies (Afeef, 2011; Doğan, 2013; Awan, 2014; AlGhusin, 2014, Ting, Kweh & Chan, 2014; Isik, Unal & Unal, 2017; Fuertes-Callen & Cuellar-Fernandez, 2019). All aforementioned variables deployed in this study are annual and were collected from IRESS Expert.

Since macroeconomic conditions influence firms' financial performance, macroeconomic variables gross domestic product (GDP) growth rate, exchange rate, inflation rate, and the unemployment rate were also included in the model as control variables. The selection and inclusion of these macroeconomic control variables in the model were consistent with previous empirical studies which include Sayedi (2014); Mulchandani & Totala (2016), Nnado & Chukwuma (2016), Ifeanyi & Chukwuma (2016), Issah & Antwi (2017), Jeevitha, Binoy & Shradha (2019), Yeboah & Takacs (2019) and Mohd & Siddique (2020). Data on these macroeconomic indicators were obtained online from World Bank's Indicators (WBI).

3.3.1. Return on Assets (ROA)

ROA is the most commonly used measure of the performance of a firm (Siddik, Kabiraj, & Joghee, 2017). The reason for its wide use is that it reflects the effectiveness of the assets being held by the company in generating profits. Through the use of ROA, the current conditions of the business are reflected (Demsetz & Villalonga, 2001). However, its use has been criticized because it uses historical data. In addition, different firms use different accounting standards, making it difficult to compare their performance (Booth, Aivazian, Demirguc-Kunt, & Maksimovic, 2001). There are different variations of ROA and as such, different studies have used different variations of ROA calculation. To calculate ROA, Booth et al. (2017) used total operating assets plus amortization and depreciation, divided by total assets.

ROA = (Total operating assets + amortization and depreciation) / Total Assets (TA)

On the other hand, Ghosh (2008) used moving average profitability on total assets in measuring performance. Net income before tax (EBIT) was also used by other researchers (Siddik et al., 2017). Studies have shown that the use of ROA varied from one firm to another depending on the sizes of the firms. However, many researchers have deployed the use of ROA as a profitability measure over many years in different sectors and across countries, including the United States of America, Pakistan, Jordan, Bangladesh (Gordon & Gordon, 1987; Siddik, Bancel & Mittoo, 2012; Kabiraj & Joghee, 2017; Siddik et al., 2017; and Zeitun & Tian, 2007a). Most importantly, it has been used as a profitability indicator based on capital structure ownership in Canada (King & Santor, 2008; and Rouf, 2015). In this study, Booth et al. (2017) measure of ROA was adopted, because it takes both amortization and depreciation into account to prevent overstatement of the return.

3.3.2. Capital Structure

The concept of capital structure in finance has to date dominated the centre stage in several finance discourses regarding the influence it can have on firm value based on the trade-off theory (Tifow & Sayilir, 2015:14). This respective theory postulates that an optimal capital structure is a necessary condition for ensuring a healthy financial status of a firm in the long run (Myers, 2001:81). According to Tifow and Sayilir (2015:14), optimal capital is achieved when an ideal level of leverage has been used where the financial benefits of debt in the form of tax shield obtained become almost equal to the costs of financial distress incurred from using borrowed funds or debt.

Corporate investors, shareholders, and investment analysts use the debt-to-equity ratio as a proxy of capital structure by assessing the amount of debt a company holds relative to the amount of equity owned by that company or shareholders (Irman, Purwati & Juliyanti, 2020:38). The rationale of using the debt-to-equity ratio as a proxy of capital structure is that the ratio provides a signal to avoid scenarios in which the amount of equity owned by the company becomes insufficient to pay off the firm's debt and leaves a firm with no choice other than using its assets to pay off debt (Irman, Purwati & Juliyanti, 2020:40).

In line with common practice, an empirical study on the effect of capital structure on profitability conducted by Honton (2018:65), total debt-to-equity ratio was used as the most ideal proxy of capital structure calculated as per the formula given below.

$$\text{Debt-to-equity ratio} = \frac{\text{Total debt}}{\text{Total equity}} \text{X100}$$

Where total debt consists of total short-term debt and total long-term debt.

The above function indicates that the cost of capital is less likely to rise even when the leverage usage has been increased to high levels. On that note, Solomon (1963: 276) argued that when the leverage position is extreme, the rise in the cost of capital is expected, since very high levels of debt induces markets to demand better rates of return. As a result, firms avoid a debt position by minimising the cost of capital and seeking an optimum mix of equity and debt.

In terms of interpretation of the ratio, a high debt-to-equity ratio considered too high provides a signal that the company is in financial distress and unable to pay its liabilities. Conversely, a reasonably low debt-to-equity ratio may suggest good company performance, while a too-low debt-to-equity ratio indicates that the company may be having over-reliance on equity to finance its business. Such a situation is usually undesirable and dangerous because it can put the company at risk for a leveraged buyout (Honton, 2018:65).

The debt-to-equity ratio was used as the indicator of capital structure in consistency with other past empirical studies which include Khidmat & Rehman (2014), Dewi, Wayan, and Kirya (2015), Suyono & Gani (2017), Fadilah, Ghani & Amaniyah (2017), Hantono (2018), and Irman, Purwati & Juliyanti (2020). Based on these past empirical studies, when the debt-to-equity ratio rises, a firm's market value increases in line with the current value of interest tax shield. The function below defines how the debt-to-equity ratio is calculated in this study.

Debt-to-Equity Ratio (DER) = (Total debt / Total equity)

3.3.3. Control variables

There are several factors that affect firms' financial performance besides capital structure. For the purpose of this study, based on existing literature, other factors included in this model include firm size, firm growth, and liquidity.

3.3.3.1 Firm size

Larger firms have greater to access to capital, therefore risk of bankruptcy is reduced (Titman and Wessels, 1988). In addition, bigger firms are expected to have a better diversified portfolio to spread their risk, which protects them from financial risk (Rajan and Zingales, 1995). Marsh (1982) claimed that, as a result, such firms are believed to achieve higher debt levels than firms of smaller sizes. The commonly used method of measuring firm size is using the total assets log (Frank and Goyal, 2009). This is, however, problematic since it uses relative terms variables in the regression. This can be avoided by using a relative ratio, so that the firm size can be measured by divided the firm-specific assets by the net book value of the sampled total assets.

Firm Size= Firm-specific assets/ the sum of total assets in the sample

3.3.3.2. Firm growth

The firms with a higher rate of return are the ones that have greater growth opportunities because they have the capabilities of generating more profit on their investments. In the studies conducted in the past, they showed a positive relationship between growth and firm performance (Nunes et al., 2009; Zeitun and Tian, 2007; Margaritis and Psillaki, 2010). It is suggested by capital structure theories that opportunities for growth are positively correlated to the financing behaviour of the firm. Therefore, it is generally believed by researchers that there is a negative relationship between growth opportunities and leverage, mainly due to the fact that future growth prospects are not easily collateralised since they are intangible (Barclay and Smith, 2005). In this study, firm growth has been defined as a change in the percentage of sales, thus measured as:

$$Firm\ Growth = [(Sales_{Tn} – Sales_{Tn-1})/Sales_{Tn-1}]*100$$

3.3.3.3 Liquidity ratio

A credible indicator for sound cash flows management in an enterprise is its financial liquidity levels (Awan, 2018). On that backdrop, quick ratio (QR) and current ratio (CR) are used as a common measure liquidity. Thus, current ratio is used to measure liquidity by simply comparing all current liabilities against all liquid assets. On the other hand, current ratio is used to calculate liquidity by dividing current assets by current liabilities as:

(Current assets) / (Current liabilities) = Current Ratio (CR)

The main challenge with the current ratio is including inventory in the total assets since it is convertible to cash within the period of 12 months. Thus, QR is used to address this weakness by excluding inventory from the total value of current assets. This is illustrated in the function shown below:

Quick Ratio (QR) = (Current assets – inventory)/ (Current liabilities)

Due to this identified weakness of the current ratio, quick ratio is deployed in this research.

3.3.3.4 Macroeconomic indicators

Macroeconomic conditions also affect firms' financial performance, hence gross domestic product (GDP) growth rate, exchange rate, inflation rate, and the unemployment rate were included in the model as control variables.

Gross domestic product (GDP) growth rate

The annual real GDP growth rate is the comprehensive indicator of economic activity in a country. The respective indicator, which shows the growth performance of a nation, is calculated as shown by the formula:

$$GDP\ growth\ rate = (GDP_t – GDP_{t-1})/ (GDP_{t-1})*100$$

where t represents the current period, and t-1 represents the previous period

Real Exchange Rate

The RER compares the price of a basket of goods in a foreign country with the same basket of goods in the domestic economy. An increase in domestic price level relative to a foreign price level of the same goods basket, ceteris paribus, implies a depreciation of the domestic currency. The RER is therefore computed as:

Real exchange rate (RER) = Nominal exchange rate{P /P }* $_{df}$

Where P and P are domestic and foreign price levels; respectively $_{d\ f}$

Inflation rate

The inflation rate is a measure of an increase or rate of increase in the general price level of particular goods and services over a specific period of time. Increases in the inflation rate can suggest a weakening in the purchasing power or value of a nation's currency, typically recorded as a percentage, calculated based on the formula below:

$$Inflation\ rate = (CPI_t - CPI_{t-1})/ (CPI_{t-1})*100$$

where CPI is the consumer price index, t denotes the current period, and t-1 represents the previous period.

Unemployment rate

The unemployment rate is calculated by dividing the number of unemployed people in the country by the total number of workers available in the labour force.

*Unemployment rate = (Number of unemployed$_t$)/ (Labour force$_t$)*100*

Unemployed persons have been defined as people aged between 15 and 64 years who are not employed in the reference work and are actively looking for work or have tried to start their own business in the past four weeks before the survey interview. They are also available to commence work, or they have not tried to look for a job during the past four weeks.

3.4. Data analysis

Panel data refers to multidimensional data that involve measurements over time (Brooks, 2008). It involved an analysis of the financial reports of the selected technological firms over nine years. Being a panel data analysis, the analysis of data was based on the performance of the 14 technological companies over 9 years to determine how the capital structures of firms influenced the financial performance of the firms. Through analysis of the data over time, the transitional effect of time of capital structure on the financial performance of firms was determined. In this model, a cross-sectional dimension is denoted by *subscript (i)* and a time-series dimension is denoted by *subscript (t)* (Greene, 2016).

3.4.1 Preliminary tests

The following preliminary tests were conducted.

Correlation analysis

Correlation is used to determine the strength of a relationship between two variables. It is called a bivariate statistical analysis because it measures the direction of the relationship of these variables. This study used correlation analysis to determine the relationship between variables of interest. The strength any relationship is shown in the correlation coefficient which is between -1 and +1, where a correlation coefficient nearer to ±1 is an indication of a close association of two variables. On the other hand, a correlation coefficient nearer 0 is an indication of a weak relationship between variables. The sign of the direction of an association is depicted in the sign the coefficient carries, thus a positive

(+) sign is an indication of a positive relationship while a negative (-) sign is an indication of a negative relationship. For this study, Pearson's correlation was used.

Stationarity test

Unit root tests on each series were conducted using the Levin, Lin, and Chu (LLC) test at both level and first difference. Variables that are found to have demonstrated unit root at a level were taken further for unit root testing at the first difference, a stage at which they all had to become stationary, thus becoming integrated of order one.

Unit root tests were conducted based on the three key conventional assumptions that series must have a constant mean over the sample period in a manner that its temporary deviance comes back to its long-run trajectory $E(x_t)=E(x_{t-k}) =\mu$, constant and determinate variance.

$E (x_t - \mu)^2 - E (x_{t-k} - \mu) = \sigma^2$ and the covariance should depend on optimal lag length such that $E (x_t - \mu) (x_{t-k} - \mu) = E (x_{t-h} - \mu) (x_{t-h-k} - \mu) = \sigma_k$. The tests were performed in levels and at

I (1) using the intercept, model at 1%, 5%, and 10% significance levels.

3.4.1.3 Model Specification

The econometric procedure followed in selecting the appropriate estimation model was based on an appraisal of the Random Effects (RE) model established on the Hausman test to determine whether the RE model was appropriate relative to the Fixed Effects (FE) model. In this survey, the RE model was specified as follows:

$$Y_{it}=\square +\square X_{it} + \square 1V_{it1} + \square 2V_{it2} + \square 3V_{it3} + \square 1Z_{it1} + \square 2Z_{it2}+ \square 3Z_{it3}+ \square 4Z_{it4}+\square_{it}$$

Where Y_{it} is the dependent variable return on equity (ROA) of company *i* at time *t*; X_{it} is the independent variable debt-to-equity ratio (DER) of company *i* at time *t*, V_{it1}, V_{it2} and

V_{it3} are control variables firm size (FS), firm growth (FG) and liquidity, respectively; Z_{it1}, Z_{it2}, Z_{it3}, and Z_{it4} denote macroeconomic control variables GDP growth rate, exchange rate, inflation rate, and unemployment rate, respectively. The parameters adjacent to each of

the independent and control variables are the respective estimated coefficients measuring the impacts they have on the dependent variable.

3.4.1.4 Diagnostic test

Subsequent to estimating the Random Effects model, the Hausman test was undertaken to choose between the Random Effects model and Fixed Effects model. A Hausman test with p-value statistically insignificant at 5 percent level suggests strong evidence that the Random Effects model is suitable as opposed to the Fixed Effects model. Thus, the Hausman test results were used to choose the suitable model between the RE and FE at 5 percent level of significance.

3.5. Conclusion

This chapter discussed the research methodology used in determining whether the capital structure and financial performance in selected companies listed on the Johannesburg Stock Exchange (JSE), specifically the technological sector, have any measurable linkages. Aspects covered include population, sample, and data used, variables definitions and measurements, preliminary tests conducted as well as the model specification deployed in the research.

CHAPTER 4: RESULTS

4.1. Introduction

This chapter presents results obtained from panel data regression estimations conducted on the linkage between capital structure and financial performance of selected technological firms listed with the Johannesburg Stock Exchange in South Africa. The chapter is organised into six sections. Section 4.2 presents descriptive statistics, whereas section 4.3 provides correlation statistics among variables used in the analysis. Unit root test results are presented in section 4.4, while results on the regression estimates of the linkage between capital structure and financial performance of firms are presented in section 4.5. The debt-to-equity ratio (DER) was used as the proxy of capital structure, while return on assets (ROA) was used as the proxy of financial performance of selected firms, and the real effective exchange rate was used as the ideal indicator which shows movements in the exchange rate. Results of the Hausman test, robust checks, and residual diagnostics were also conducted. Section 4.6 provides a summary of the chapter with a brief of the results and their interpretations.

4.2. Descriptive statistics

Variables on which descriptive statistics are presented in this section include return on assets (ROA); debt-to-equity ratio (DE ratio); firm growth (FG) and firms' size (FS); and macroeconomic variables, namely the real exchange rate (Exch rate), gross domestic product growth rate (GDP gr), inflation rate (Inf rate) and unemployment rate (Unempl rate). Descriptive statistics shown in Table 1 include arithmetic mean, median, minimum, maximum, standard deviation, skewness, kurtosis, Jarque-Bera normality test, the sum of each variable observations, the sum of squared deviations, and observations sample size.

Table 1- Descriptive statistics

	ROA	DER	FG	FS	Exch rate	GDP gr	Infl rate	Unempl rate
Mean	12.374	1.323	12.115	13.198	106.222	1.530	5.285	25.879
Median	11.750	1.100	12.155	11.565	106.000	1.414	5.181	25.149
Maximum	47.120	4.100	47.130	52.420	121.000	3.284	6.594	28.468
Minimum	-44.980	0.140	-62.980	-37.400	96.000	0.152	4.124	24.561
Std. Dev.	13.129	0.880	14.115	13.791	7.539	0.970	0.785	1.323
Skewness	-0.539	0.938	-1.519	0.054	0.519	0.257	0.124	0.639
Kurtosis	6.048	3.382	10.430	4.691	2.338	2.044	1.809	2.075
Jarque-Bera	54.891	19.261	338.346	15.076	7.963	6.179	7.759	13.075
Probability	0.000	0.000	0.000	0.001	0.018	0.045	0.020	0.001
Sum	1559.170	166.77	1526.610	1663.040	13384.00	192.8736	665.942	3260.783
Sum Sq. Dev.	21548.25	96.801	24906.60	23776.13	7105.778	117.7622	77.196	218.948
Observations	126	126	126	126	126	126	126	126

Table 1 descriptive statistics results indicate that the return on assets (ROA) for the panel selected firms recorded a maximum value of 47.12%, minimum value of -44.98%, and a mean of 12.37% during the sample period 2011-2019. The debt-to-equity (DER) ratio stood lowest at 0.14% and highest at 4.10% and a mean of 1.32%. Firm growth (FG) had the lowest minimum value of -62.98% and a maximum value of 47.13%, with an average of 12.12%. Firm size (FS) recorded a minimum value of -37.40% and a maximum value of 52.42%, with a mean of 13.20%.

In respect of ROA, a standard deviation of 13.13 given the minimum and maximum values of -44.98% and 47.12% respectively shows marginal variation in firms' financial performance. Similarly, the debt-to-equity ratio standard deviation of 0.88 given the minimum and maximum values of 0.14% and 4.10% shows a slight variation in the firms' capital structure. Firm growth and firm size had close levels of variation as per standard deviations.

With regards to macroeconomic control variables, the mean real effective exchange rate of 106.22 and a median of 106.0 all above an index of 100 generally suggest that South African rand had appreciated value relative to the weighted average of currencies of other trading partners, relative to the index of costs. Such a situation makes exports expensive and imports cheaper, and that leads to a loss in the country's trade competitiveness. GDP growth rate was lowest at 0.15%, highest at 3.28%, and averaged 1.53%. The inflation rate was lowest at 4.12%, highest at 6.59%, and averaged 5.28%, while the unemployment rate stood lowest at 24.56%, highest at 28.46%, with an average of 25.88%. The unemployment rate remained high despite the marginal variation as indicated by the standard deviation equal to 1.32% of the respective variable.

4.3. Correlation statistics

Table 2 presents correlations between variables to indicate the nature and magnitudes of associations between each pair of variables.

Table 2- Correlations between variables

	ROA	DER	FG	FS	Exch rate	GDP gr	Infl_rate	Unempl rate
ROA	1	-0.394	0.945*	0.973*	-0.022	0.064***	0.097***	-0.106
DER	-0.394	1	-0.464	-0.382	-0.082	-0.202	-0.104	0.207 *
FG	0.945*	-0.464	1	0.932 *	-0.053	0.094***	0.142***	-0.158
FS	0.973*	-0.382	0.932*	1	-0.032	0.055***	0.098***	-0.101
Exch rate	-0.022	-0.082	-0.053	-0.032	1	0.500*	-0.428	-0.078
GDP gr	0.064***	-0.202	0.094***	0.055***	0.500**	1	0.226 ***	-0.827
Infl_rate	0.097***	-0.104	0.142***	0.098***	-0.428**	0.226 ***	1	-0.448
Unempl rate	-0.106	0.207 *	-0.158	-0.101	-0.078	-0.827	-0.448**	1

Table 2 correlation results show that firms' financial performance (ROA) had high positive correlations of 0.945 with firm growth (FG) and 0.973 with firm size (FS). Although low, financial performance also had positive correlations with GDP growth rate (0.064) and inflation rate (0.097). However, ROA had a negative correlation of -0.394 with the debt-to-

equity ratio, and negative correlations of -0.02 and -0.11 with the real exchange rate and unemployment rate, respectively. The debt-to-equity ratio had negative correlations with firm growth (-0.464) and (-0.382) respectively, suggesting that the firms' capital structures comprised more equity and less debt or borrowing as firms' sizes expanded and grew. The negative correlation between the debt-to-equity ratio and ROA suggests that an increasing debt relative to equity was associated with reduced financial performance (ROA) of firms.

4.4. Unit root test

This section presents results of unit root tests conducted using the Levin, Lin, and Chu (LLC) test at both level and first difference. Section 4.4.1 presents unit root test results at level in Tables 3-10, whereas Tables 11-13 in section 4.4.2 present unit root test results at first difference of selected variables that contained unit roots at level in section.

4.4.1. Unit root tests at Level

The unit root test results in this section show that ROA, exchange rate, GDP growth rate, inflation rate, and the unemployment rate were stationary at level as reflected by LLC statistics and associated p-values, while remaining variables contain unit roots at level, indicating non-stationarity of the respective series. Variables that are nonstationary at level include the debt-to-equity ratio, firm growth, firm size, and liquidity ratio.

Table 3- Unit root test - Return on Assets (ROA) series

Panel unit root test: Summary

Series: ROA

Sample: 2011 2019

Exogenous variables: Individual effects

Automatic selection of maximum lags

Automatic lag length selection based on SIC: 0 to 1

Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.91513	0.0018	14	108
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.49018	0.3120	14	108
ADF - Fisher Chi-square	39.8646	0.0680	14	108
PP - Fisher Chi-square	35.7469	0.1492	14	112

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Table 4 - Debt/Equity ratio series

Panel unit root test: Summary

Series: DER

Sample: 2011 2019

Exogenous variables: Individual effects

Automatic selection of maximum lags

Automatic lag length selection based on SIC: 0 to 1

Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.50836	0.0657	14	107
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.45279	0.6747	14	107
ADF - Fisher Chi-square	32.2800	0.2633	14	107
PP - Fisher Chi-square	26.4773	0.5468	14	112

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Table 5- Unit root test – Firm Growth (FG) series

Panel unit root test: Summary

Series: FG

Sample: 2011 2019

Exogenous variables: Individual effects

Automatic selection of maximum lags

Automatic lag length selection based on SIC: 0 to 1

Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.52401	0.3001	14	108
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.48380	0.3143	14	108
ADF - Fisher Chi-square	39.9781	0.0664	14	108
PP - Fisher Chi-square	44.3399	0.0257	14	112

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Table 6 - Firm Size (FS) series

Panel unit root test: Summary

Series: FS

Sample: 2011 2019

Exogenous variables: Individual effects

Automatic selection of maximum lags

Automatic lag length selection based on SIC: 0 to 1

Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	1.87228	0.9694	14	108
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	2.41364	0.9921	14	108
ADF - Fisher Chi-square	32.7213	0.2462	14	108
PP - Fisher Chi-square	30.5168	0.3389	14	112

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Table 7 - Unit root test – Liquidity (LQ) series

Panel unit root test: Summary

Series: LQ

Sample: 2011 2019

Exogenous variables: Individual effects

Automatic selection of maximum lags

Automatic lag length selection based on SIC: 0 to 1

Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.61705	0.0529	14	107
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	1.01397	0.8447	14	107
ADF - Fisher Chi-square	25.7227	0.5883	14	107
PP - Fisher Chi-square	39.9596	0.0667	14	112

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Table 8– Exchange Rate (EXCH RATE) series

Panel unit root test: Summary

Series: EXCH_RATE

Sample: 2011 2019

Exogenous variables: Individual effects

Automatic selection of maximum lags

Automatic lag length selection based on SIC: 1

Newey-West automatic bandwidth selection and Bartlett kernel

Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-6.03663	0.0000	14	98
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.45603	0.0070	14	98
ADF - Fisher Chi-square	51.9335	0.0039	14	98
PP - Fisher Chi-square	46.9118	0.0140	14	112

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Table 9 - Unit root test – GDP Growth Rate (GDP gr) series

Panel unit root test: Summary

Series: GDP_GR

Date: 01/18/21 Time: 14:29

Sample: 2011 2019

Exogenous variables: Individual effects

Automatic selection of maximum lags

Automatic lag length selection based on SIC: 0

Newey-West automatic bandwidth selection and Bartlett kernel

Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-5.00106	0.0000	14	112
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat		0.23831	0.5942	14	112
ADF - Fisher Chi-square	18.9339	0.9002	14	112
PP - Fisher Chi-square	21.1065	0.8209	14	112

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Table 10- Unit root test – Inflation Rate (Infl Rate) series

Panel unit root test: Summary

Series: INFL_RATE

Sample: 2011 2019

Exogenous variables: Individual effects

Automatic selection of maximum lags

Automatic lag length selection based on SIC: 0

Newey-West automatic bandwidth selection and Bartlett kernel

Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-4.47531	0.0000	14	112
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.19513	0.0141	14	112
ADF - Fisher Chi-square	45.7878	0.0183	14	112
PP - Fisher Chi-square	45.7878	0.0183	14	112

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Table 11- Unit root test – Unempl Rate (Unempl Rate) series

Panel unit root test: Summary

Series: UNEMPL_RATE

Sample: 2011 2019

Exogenous variables: Individual effects

Automatic selection of maximum lags

Automatic lag length selection based on SIC: 0

Newey-West automatic bandwidth selection and Bartlett kernel

Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	6.56012	1.0000	14	112
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	6.45833	1.0000	14	112
ADF - Fisher Chi-square	0.49519	1.0000	14	112
PP - Fisher Chi-square	0.00778	1.0000	14	112

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

4.4.2. Unit root tests at First Difference

The unit root test results in this section show that all variables that contained unit roots at I (0) became integrated of order 1 or I (1), hence such variables were stationary at first difference. LLC statistics showing evidence of stationarity are the computed t-statistics with p-values statistically significant at 5 percent level as shown in Tables 12-15 below.

Table 12- Unit root test - Debt/Equity ratio series

Panel unit root test: Summary

Series: D(DER)

Sample: 2011 2019

Exogenous variables: Individual effects

Automatic selection of maximum lags

Automatic lag length selection based on SIC: 0 to 1

Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-6.43221	0.0000	14	92
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.69738	0.0448	14	92
ADF - Fisher Chi-square	50.3916	0.0058	14	92
PP - Fisher Chi-square	41.6180	0.0471	14	98

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Table 13- Unit root test – Firm Growth (FG) ratio series

Panel unit root test: Summary

Series: D(FG)

Sample: 2011 2019

Exogenous variables: Individual effects

Automatic selection of maximum lags

Automatic lag length selection based on SIC: 0 to 1

Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.80618	0.0025	14	95
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.07171	0.1419	14	95
ADF - Fisher Chi-square	83.4433	0.0000	14	95
PP - Fisher Chi-square	83.5680	0.0000	14	98

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Table 14 - Unit root test - Firm Size (FS) series

Panel unit root test: Summary

Series: D(FS)

Sample: 2011 2019

Exogenous variables: Individual effects

Automatic selection of maximum lags

Automatic lag length selection based on SIC: 0 to 1

Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-9.79051	0.0000	14	93
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.86746	0.0001	14	93
ADF - Fisher Chi-square	78.7539	0.0000	14	93
PP - Fisher Chi-square	73.5410	0.0000	14	98

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Table 15- Unit root test – Liquidity (LQ) series

Panel unit root test: Summary

Series: D(LQ)

Sample: 2011 2019

Exogenous variables: Individual effects

Automatic selection of maximum lags

Automatic lag length selection based on SIC: 0 to 1

Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-4.86152	0.0000	14	93
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.60441	0.0543	14	93
ADF - Fisher Chi-square	65.8363	0.0001	14	93
PP - Fisher Chi-square	88.4356	0.0000	14	98

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

4.5. Empirical Results

This section presents regression results and associated tests of the estimates in four sections. Section 4.5.1 presents the random effects model (Table 16) regression estimates showing the relationship between ROA and debt/equity ratio. Control variables in the model included firm growth and firm size, and macroeconomic variables exchange rate, GDP growth rate, inflation rate, and unemployment rate. The Hausman test and coefficient diagnostics are presented in section 4.5.2 (Table 17) and section 4.5.3 (Table 18), respectively. Robust checks and residual diagnostics results are presented in section 4.5.4 (Table 16) section 4.5.5 (Table 17), respectively.

4.5.1. Hausman test

To determine which estimation technique is most fitted for this research model, both random and fixed effect regression analysis were conducted. Hausman test was then conducted to choose the best-fitted estimation technique.

Table 16- Hausman test results

Test Summary		**Chi-Sq. Statistic**	**Chi-Sq. d.f.**	**Prob.**
Period random		**3.334786**	4	**0.5034**
Period random effects test comparisons:				
Root MSE	2.285467	R-squared		0.950390
Mean dependent var	-1.254694	Adjusted R-squared		0.944688
S.D. dependent var	10.31379	S.E. of regression		2.425651
Akaike info criterion	4.715508	Sum squared resid		511.8892
Schwarz criterion	5.005657	Log likelihood		-220.0599
Hannan-Quinn criter.	4.832867	F-statistic		166.6685
Durbin-Watson stat	2.132165	Prob(F-statistic)		0.000000

Table 16 correlated random effects Hausman test chi-square statistic (= 3.24) and the probability value (= 0.95) indicate that the null hypothesis that the random effects model is appropriate could not be rejected. Results, therefore, conclude that the random effects model estimates are appropriate in respect of this research study.

4.5.2. Regression estimates

The random effects (RE) model estimates were computed to determine whether the RE model was appropriate based on the Hausman test. Results are shown in Table 17 below.

Table 17- Random Effects model estimates

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	0.205261	0.452976	0.453140	0.6516
DEBT_RATIO	-0.081891	0.279084	-0.293428	0.7699
D(FG)	0.386044	0.044914	8.595090	0.0000
D(FS)	0.523397	0.049088	10.66240	0.0000
D (ROA (-1))	-0.055377	0.034403	-1.609657	0.1111
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	0.146893	0.449014	0.327145	0.7443
DEBT_RATIO	-0.036407	0.276629	-0.131610	0.8956
D(FG)	0.386997	0.044490	8.698430	0.0000
D(FS)	0.525964	0.048581	10.82654	0.0000
D (ROA (-1))	-0.059014	0.031964	-1.846275	0.0680
	Weighted Statistics			
Root MSE	2.342924	R-squared		0.947864
Mean dependent var	-1.254694	Adjusted R-squared		0.945622
S.D. dependent var	10.31379	S.E. of regression		2.405081
Sum squared resid	537.9507	F-statistic		422.7027
Durbin-Watson stat	2.142459	Prob(F-statistic)		0.000000
	Unweighted Statistics			
R-squared	0.947864	Mean dependent var		-1.254694
Sum squared resid	537.9507	Durbin-Watson stat		2.142459

Table 17 results indicate that financial performance in the past year (ROA (-1)) had a statistically significant and positive effect on financial performance in the present year. The estimated coefficient estimates show that a 1 percent increase in ROA in the previous year led to about 0.97 percent increase in ROA in the present year. This result was statistically significant (t-statistic = 48.54) at 5 percent significance level ($p < 0.05$). The debt-to-equity ratio had a negative (coefficient = -0.88) but statistically insignificant (t-statistic = -1.318; $p > 0.05$) effect on financial performance (ROA). Though statistically insignificant, the result suggests that an increase in borrowed capital relative to equity in the firms leads to a reduction in the return on assets, a proxy of financial performance.

The negative effect the debt-to-equity ratio had on the ROA in this study is consistent with Khidmat & Rehman (2014), Dewi, Wayan and Kirya (2015) who found a negative effect of the debt-to-equity ratio on ROA. Hantono (2018) emphasised that a high proportion of debt relative to equity negatively impacts a company's financial performance since high debt attracts a high-interest burden which finally results in lower net profits. The insignificant effect of the debt-to-equity ratio in this research study is consistent with findings from studies by Suyono & Gani (2017), Fadilah, Ghani & Amaniyah (2017), and Irman, Purwati & Juliyanti (2020) which indicate that the debt-to-equity ratio had no effect on firms' ROA.

Firm size and firm growth had statistically significant and positive effects on return on assets. Computed estimates indicate that firm size had a relatively more pronounced significant and positive effect on return on assets, relative to firm growth. Results show that a 1 percent increase in firm size led to about 0.54 percent increase in the ROA of firms over the study sample period. The result is consistent with Vinasithamby (2015) who similarly found that firms' sizes positively influence return on assets. Similar results were formerly reported by Doğan (2013) who found that firm size, measured by total assets, total sales, and number of employees, significantly and positively influence ROA of firms. Isik, Unal & Unal (2017) also found that firm size, measured by the firm's assets, sales, and the number of employees had a significant and positive influence on the ROA of firms in Turkey.

The result pertaining to firm growth's statistically significant and positive impact on ROA is consistent with AlGhusin (2014), Ting, Kweh & Chan (2014), and Fuertes-Callen & Cuellar-Fernandez (2019) whose empirical findings show that growth measured in terms of sales, the number of employees and changes in total assets and fixed assets had a positive impact on the ROA of firms sampled in this research study. Liquidity had a negative (coefficient = -0.058) and insignificant (t-statistic = -1.775; $p > 0.05$) impact on firms ROA. This result is consistent with Khidmat and Rehman (2014) who found that liquidity, measured by current ratio, had no significant impact on ROA. Also, Afeef (2011) established that liquidity, measured by the quick ratio and current ratio, had an insignificant negative impact on the ROA of firms. Awan (2014) also uncovered that liquidity had a negative insignificant effect on the ROA of food sector firms in Pakistan.

Macroeconomic indicators used as control variables in the ROA model had statistically insignificant impacts on ROA. The variables include the exchange rate, GDP growth rate, inflation rate, and unemployment rate. Results in this research study which show that both exchange rate and GDP growth rate had no significant impacts on ROA are consistent with Yeboah & Takacs (2019) who similarly reported that exchange rate and economic growth had no significant impacts on ROA of firms in the mining industry in South Africa. These results are also consistent with findings in an earlier study conducted by Sayedi (2014) in Nigeria which reported an insignificant positive effect of exchange rate on ROA of firms. Mulchandani & Totala (2016) similarly found that growth in national output had a positive but insignificant impact on ROA on commercial banks in India.

Results of changes in the general price level in the economy show that the inflation rate had a negative but insignificant impact on the ROA of firms. In other words, the inflation rate had no impact on the financial performance of firms. This result is consistent with Nnado & Chukwuma (2016) and Ifeanyi & Chukwuma (2016) who similarly found that inflation had a negative and insignificant effect on the ROA of selected manufacturing firms in Nigeria. Jeevitha, Binoy & Shradha (2019 also found that the inflation rate had insignificant negative impacts on the profitability of selected public sector, private sector, and foreign banks in India.

Estimated results further show that unemployment had a positive but insignificant effect on firms' ROA. This result is consistent with the findings by Issah & Antwi (2017) who found that the unemployment rate had positive but insignificant effects on ROA of firms in the machinery, equipment, furniture, recycling and construction industry, and the wholesale and retail trade industry in the United Kingdom. Mohd & Siddique (2020) also found that the unemployment rate had positive but insignificant impacts on the financial performance (ROA) of firms in the food and textile industries in Pakistan.

The weighted statistics coefficient of determination (adjusted R-squared = 0.973) shows that about 97.3 percent variation in return on assets is explained by the debt-to-equity ratio, and control variables firm growth and firm size, as well as macroeconomic variables incorporated in the specified estimated model. The F-statistic value (412.94) statistically significant at 1 percent level shows that the model was significant, and a Durbin Watson statistic (= 2.24) suggests the absence of autocorrelation in the model. The diagnostics of the estimated random effects model coefficients are presented in section 4.5.3 below.

4.5.3. Coefficient diagnostics

Table 18- Coefficient confidence intervals

Coefficient Confidence Intervals

Sample: 2011 2019

Included observations: 112

Variable	Coefficient	90% CI		95% CI		99% CI	
		Low	High	Low	High	Low	High
C	2.157	-8.292	12.608	-10.329	14.645	-14.367	18.683
ROA (-1)	0.969	0.936	1.002	0.929	1.009	0.917	1.022
D(DER)	-0.887	-2.004	0.230	-2.222	0.447	-2.654	0.879
D(FG)	0.447	0.334	0.560	0.312	0.582	0.268	0.626
D(FS)	0.543	0.459	0.626	0.443	0.643	0.411	0.675
D(LQ)	-0.058	-0.113	-0.003	-0.124	0.006	-0.145	0.028
EXCH_RATE	-0.008	-0.090	0.073	-0.1061	0.089	-0.137	0.121
GDP_GR	0.078	-0.898	1.055	-1.088	1.246	-1.466	1.623
INFL_RATE	-0.225	-0.932	0.481	-1.070	0.619	-1.343	0.892
D(UNEMPL_RATE)	0.528	-0.596	1.653	-0.816	1.872	-1.251	2.307

Table 18 coefficient diagnostics show that the estimated coefficients of the random effects model all lie within the 95% confidence intervals, signifying the reliability of estimates. The results of the robust checks are presented in the next section.

4.5.4. Robust checks

The stepwise regression analysis approach was conducted as a robust check of model results. Technically, stepwise regression permits some or all the variables in a specified standard linear multivariate regression model to be selected automatically using several statistical criteria from a given set of variables. Results of the robust check of the stepwise regression are presented in Table 19 below.

Table 19- Robust test estimates

Correlated Random Effects - Hausman Test				
Equation: Untitled				
Test period random effects				
Test Summary		**Chi-Sq. Statistic**	**Chi-Sq. d.f.**	**Prob.**
Period random		**3.334786**	4	**0.5034**
Variable	**Fixed**	**Random**	**Var (Diff.)**	**Prob.**
DEBT_RATIO	-0.081891	-0.036407	0.001364	0.2182
D(FG)	0.386044	0.386997	0.000038	0.8769
D(FS)	0.523397	0.525964	0.000050	0.7153
D (ROA (-1))	-0.055377	-0.059014	0.000162	0.7750
Root MSE	2.285467	R-squared		0.950390
Mean dependent var	-1.254694	Adjusted R-squared		0.944688
S.D. dependent var	10.31379	S.E. of regression		2.425651
Akaike info criterion	4.715508	Sum squared resid		511.8892
Schwarz criterion	5.005657	Log likelihood		-220.0599
Hannan-Quinn criter.	4.832867	F-statistic		166.6685
Durbin-Watson stat	2.132165	Prob(F-statistic)		0.000000

Table 19 stepwise regression robust estimates show that firms' ROA in the previous year had a statistically significant and positive impact on ROA in the current year. Results show

that a 1 percent rise in ROA in the past year led to about 0.97 percent increase in ROA in the current year, and this result was significant (t-statistic = 50.75) at 5 percent level ($p < 0.05$). Debt-to-equity ratio had a negative (coefficient = -0.89) but insignificant (t-statistic = -1.378; $p > 0.05$) impact on firms' ROA. Although statistically insignificant, the result suggests that an increase in debt relative to equity leads to a reduction in the ROA of firms.

The negative impact of the debt-to-equity ratio on ROA is consistent with Khidmat & Rehman (2014), Dewi, Wayan, and Kirya (2015) who found a negative impact of the debt-to-equity ratio on ROA. Furthermore, Hantono (2018) accentuated that a high proportion of debt relative to equity negatively impacts a company's financial performance since high debt causes a high-interest burden which results in lower net profits. The insignificant effect of the debt-to-equity ratio in this study is consistent with findings from studies by Suyono & Gani (2017), Fadilah, Ghani & Amaniyah (2017), and Irman, Purwati & Juliyanti (2020) which indicate that the debt-to-equity ratio had no significant effect on ROA of firms.

Firm size and firm growth had statistically significant and positive effects on return on assets. Results indicate that firm size had a relatively more remarkable significant and positive effect on ROA, relative to the analogous impact of firm growth. Estimates show that a 1 percent increase in firm size was associated with about 0.54 percent increase in ROA of firms. This result is consistent with Vinasithamby (2015) who found that a firm's size significantly and positively influences the firm's return on assets. Similar results were earlier reported by Doğan (2013) who found that firm size; measured by total assets, total sales, and the number of employees, significantly and positively influenced ROA of firms. Isik, Unal & Unal (2017) similarly found that firm size had a significant and positive impact on the ROA of surveyed firms in Turkey.

The result relating to firm growth show that firm growth had a statistically significant positive effect on ROA. The result conforms to AlGhusin (2014), Ting, Kweh & Chan (2014), and Fuertes-Callen & Cuellar-Fernandez (2019) whose empirical findings indicate that growth measured in terms of sales, number of employees, and changes in total assets and fixed assets had a positive impact on the ROA of firms sampled in this research study. Liquidity had no significant impact on firms' ROA, which is consistent with

Khidmat and Rehman (2014) who found that liquidity, measured by current ratio, had no significant impact on ROA. Moreover, Afeef (2011) found that liquidity (measured by quick ratio and current ratio) had an insignificant negative impact on the ROA of firms, and Awan (2014) found that liquidity had a negative but insignificant effect on the ROA of food sector firms in Pakistan.

Macroeconomic indicators used as control variables in the ROA model had statistically insignificant impacts on ROA. The variables include the exchange rate, GDP growth rate, inflation rate, and unemployment rate. Results in this research study which show that both exchange rate and GDP growth rate had no significant impacts on ROA are consistent with Yeboah & Takacs who similarly reported that exchange rate and economic growth had no significant impacts on ROA of firms in the mining industry in South Africa. These results are consistent with findings in a prior study conducted by Sayedi (2014) in Nigeria which reported an insignificant positive effect of real exchange rate on ROA of firms. Mulchandani & Totala (2016) similarly found that growth in national output had a positive but insignificant impact on ROA on commercial banks operating in India.

Results relating to changes in the general price level in the economy show that the inflation rate had a negative but insignificant impact on the ROA of firms. In other words, the inflation rate had no impact on the financial performance of firms. This result is consistent with Nnado & Chukwuma (2016) and Ifeanyi & Chukwuma (2016) who similarly found that inflation had a negative and insignificant effect on the ROA of selected manufacturing firms in Nigeria. Jeevitha, Binoy & Shradha (2019 also found that the inflation rate had insignificant negative impacts on the profitability of selected public sector, private sector, and foreign banks in India.

Furthermore, results show that unemployment had a positive insignificant effect on firms' ROA. This result is consistent with Issah & Antwi (2017) who found that the unemployment rate had positive but insignificant effects on the ROA of firms in the machinery, equipment, furniture, recycling and construction industry, and the wholesale and retail trade industry in the United Kingdom. Mohd & Siddique (2020) also found that the unemployment rate had positive but insignificant impacts on firms ROA in the food and textile industries in Pakistan.

The weighted statistics coefficient of determination (adjusted R-squared = 0.973) shows that about 97.3 percent variation in return on assets is explained by the debt-to-equity ratio, and control variables firm growth and firm size, as well as macroeconomic variables incorporated in the specified estimated model. The F-statistic value (412.94) statistically significant at 1 percent level shows that the model was significant, and a Durbin Watson statistic (= 2.24) suggests the absence of autocorrelation in the estimated model.

4.5.5. Residual diagnostics

Results of the cross-section dependence test are presented in Table 20 below.

Table 20- Cross-section dependence

Residual Cross-Section Dependence Test			
Null hypothesis: No cross-section dependence (correlation) in residuals			
Equation: Untitled			
Periods included: 8			
Cross-sections included: 14			
Total panel observations: 112			
Note: non-zero cross-section means detected in data			
Cross-section means were removed during the computation of correlations			
Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	168.2010	91	0.0000
Pesaran scaled LM	5.722519		0.0000
Pesaran CD	1.140609		0.2540

Table 20 results could not reject the null hypothesis of no cross-section dependence, thus suggesting the presence of cross-section dependence in the estimated model's panels.

4.6. Chapter Summary

This chapter presented the results of panel regressions conducted on the linkage between capital structure and financial performance of selected technological firms listed with Johannesburg Stock Exchange in South Africa. Results presented include descriptive statistics, correlation statistics between variables, unit root tests, and regression estimates of the effect of capital structure (measured by debt-to-equity ratio) and ROA as the proxy of financial performance of firms, together with results of the associated Hausman test, robust checks, and residual diagnostics. Results from both the random effects (RE) model and the robust stepwise regression consistently indicate that the capital structure had no significant impact on financial performance, while control variables firm growth and firm size had positive and statistically significant impacts on the financial performance of firms. All macroeconomic control variables also had no significant impact on financial performance.

CHAPTER 5: CONCLUSION

5.1 Introduction

This chapter presents a summary of the findings of this study indicating the key results that financial performance depends on the capital structure of an organisation. The conclusion and policy recommendations deduced from the findings are also presented in this chapter. Most importantly, due to some limitations encountered in the process of carrying out this research, suggestion for further research on this research area is also presented.

5.2 Summary of findings

This study attempted to determine the relationship between capital structure and the financial performance of technological companies registered on the Johannesburg Stock Exchange. This objective was achieved by using a descriptive design. In this study, the capital structure is used as the independent variable whereas financial performance is the dependent variable. The control variables deployed in this study included the size of the firm growth and liquidity.

The descriptive statistics results indicate that the return on assets (ROA) for the panel selected firms recorded a maximum value of 47.12%, a minimum value of -44.98%, and a mean of 12.37% during the sample period 2011-2019. The debt-to-equity (DER) ratio stood lowest at 0.14% and highest at 4.10% and a mean of 1.32%. Firm growth (FG) had the lowest minimum value of -62.98% and a maximum value of 47.13%, with an average of 12.12%. Firm size (FS) recorded a minimum value of -37.40% and a maximum value of 52.42%, with a mean of 13.20%.

In respect of ROA, a standard deviation of 13.13 given the minimum and maximum values of -44.98% and 47.12% respectively shows marginal variation in firms' financial performance. Similarly, the debt-to-equity ratio standard deviation of 0.88 given the minimum and maximum values of 0.14% and 4.10% shows a slight variation in the firms'

capital structure. Firm growth and firm size had close levels of variation as per standard deviations.

With regards to macroeconomic control variables, the mean real effective exchange rate of 106.22 and a median of 106.0 all above an index of 100 generally suggest that South African rand had appreciated value relative to the weighted average of currencies of other trading partners, relative to the index of costs. Such a situation makes exports expensive and imports cheaper, and that leads to a loss in the country's trade competitiveness. GDP growth rate was lowest at 0.15%, highest at 3.28%, and averaged 1.53%. The inflation rate was lowest at 4.12%, highest at 6.59%, and averaged 5.28%, while the unemployment rate stood lowest at 24.56%, highest at 28.46%, with an average of 25.88%. The unemployment rate remained high despite a marginal variation as indicated by the standard deviation equal to 1.32% of the respective variable.

5.3 Conclusions

The findings of this study have shown that the debt/equity ratio had a negative but statistically insignificant effect on return on assets. Firm growth and firm size had statistically significant and positive effects on return on assets. These results indicate that firm size has a relatively more pronounced significant influence than capital structure on financial performance of technological firms listed at the JSE. This is an indication that the capital structure of the firms listed at the JSE does not affect their financial performance.

The findings of this study on the association between capital structure and financial performance in technological firms give a notion of an inverse relationship. Such a negative relationship between capital structure and financial performance was also evident in the findings of Umar et al. (2012) as well as that of Zeitun and Tian (2007) who observed a negative relationship between ROA and capital structure variables. On a similar note, in the study by Fosu (2013) in South Africa, the researcher observed that the relationship between ROA and capital structure was insignificant.

From these findings, the results of this study have contributed to the body of knowledge regarding the association between capital structure and financial performance of technological firms listed at the JSE in South African. It has been noted that most technological firms listed at the JSE preferred sourcing finances from commercial banks instead of the stock exchange for fear of losing their businesses to lenders. Consequently, this research concludes that the key source of financing for technological firms is debt, which is in line with the findings of Demirguc-Kunt, Klapper, Singer, & Van Oudheusden, (2015). The findings of this study will inform the technological firm managers' decisions when making their financing choices.

5.4 Recommendations

This study concludes that capital structure has an insignificant negative relationship with the financial performance of technological companies. This is an indication that the relationship is inverse between the levels of debt and the return on assets. This study, therefore, recommends that the management for technological firms should seek to determine the optimal levels of debt, where high debt may not have a negative impact on other goals of the firms. Similarly, this study recommends that technological firms should rely less on debt as compared to equity for their source of capital to boost their financial performance. In addition, relating to the firm's financial performance, asset turnover is considered to have a significant positive effect on the financial performance of technological firms.

This study has also concluded that the liquidity of the company has significant influences on the financial performance of technological firms. It, therefore, recommends that technological firms should properly implement liquidity management strategies to guarantee that they have the optimal levels of liquidity. This optimal structure is achieved when the debt-equity mix can maximise the firm's value. The firms should strive to attain an optimised capital structure by using an appropriate debt-equity capital mix. In addition, the capital structure should be planned adequately, to safeguard the interests of shareholders, equity holders, and financial requirements of the firm.

Furthermore, this study concluded that the size of the firm had an insignificant influence on the financial performance of the technological firms. On the contrary, the findings of this study have shown that there is a positive relationship between firm size and financial performance. The recommendation made by this study is that the technological firms should ensure that they invest more in assets for them to generate more sales and attain economies of scale.

This survey further concluded that growth opportunities of the listed technological firms do not influence the financial performance of the company. The findings of this study have shown that there is a positive relationship between growth opportunities and financial performance. It, therefore, recommended that listed technological firms should pursue opportunities that would lead to the growth of the firm in terms of revenue and size.

Management of firms should be cautious when employing debt financing as a source of capital, even though the benefit of debt financing is that no tax is charged on the borrowed funds on the organisation. Instead, the management should finance their business activities using retained earnings, and then using debt as the option of last resort to finance activities as supported by the pecking theory.

5.5 Suggestions for further studies

This study has used the debt-equity ratio in measuring capital structure whereas the financial performance was measured using the return on assets ratio. This study, therefore, recommended that an investigation on the relationship between financial performance and capital structure using other measures such as long-term debt and debt ratio in measuring capital structure and return on equity, and using net profit margin as measures of financial performance.

This study was conducted in the context of listed technological firms using the data that were collected over five years. Related studies can be conducted for longer periods such as ten years or more. In the same vein, further study may incorporate other firms which are not listed on the JSE to determine if comparable findings could be obtained. More so, this study recommended that further studies can be conducted using the economic measures of performance such as Economic Value Added, and other market economic

indicators such as the Tobin Q and earnings per share. Also, this study recommends that a study can be conducted to determine capital structure influence on the organisation's financial performance using non-financial measures.

5.6 Summary

This chapter presented a summary of the findings of this study indicating the key results that financial performance depended on the capital structure. It also discussed the conclusions of the study which were deduced from the findings. In turn, the recommendations were derived from the conclusions. The key recommendations are that management should seek the most appropriate mix of debt-equity which maximises the return on assets and increase revenues and sales. Otherwise, management should avoid using debt finance and use it only as a last resort source of finance. The chapter ended with suggestions for further research related to capital structure and financial performance.

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