FIRM INVESTMENT BEHAVIOR: THE ROLE OF LEVERAGE, LIQUIDITY AND CASH FLOW VOLATILITY: AFRICAN EVIDENCE.

BY

EDSON VENGESAI

215082581

A thesis submitted in fulfilment of the requirements for the degree

Of

DOCTOR OF PHILOSOPHY IN FINANCE

COLLEGE OF LAW AND MANAGEMENT STUDIES

SCHOOL OF ACCOUNTING, ECONOMICS AND FINANCE

SUPERVISOR: Dr Farai Kwenda

2017

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ACKNOWLEDGEMENTS

My sincere gratitude goes to the Father in heaven who is the source of life, intelligence, knowledge and wisdom on earth. Without Him I would not be here, I would like to thank God for taking me this far. I acknowledge spiritual and emotional support from my spiritual parents Prophet and Prophetess Emmanuel and Ruth Makandiwa you always gave me hope when I was hopeless and, when I was directionless, you deposited a spirit of victory in me. You always showed me that all things are possible and for that I am grateful.

Special appreciation goes to my Supervisor Dr Farai Kwenda for nurturing in me a desire to pursue the field of research and academic enquiry. I am highly indebted to you, Dr, I greatly appreciate your guidance, advice encouragement and patience throughout this research. Not only as a supervisor but also you stood with me as a father and brother whenever I was in need.

I am grateful to Macro working group (MWG) for your constructive criticism and support which has led to the completion of this work.

To my late parents Jerry and Eliza Vengesai, I am grateful for your cultivating in me an appreciation of education, excellence and determination. My special thanks go to my wife to be Verily Pedzisai, My Brother Brian and sisters Rosemary, Gracious, Rumbidzai, Ruraramai and Florence. I really appreciate your financial and emotional support. Without you guys my life is nothing and I would not have been here.

DEDICATION

This thesis is dedicated to GOD, my love Verily, my Brother Brian and sisters Gracious, Rosemary, Rumby, Rura and Florence.

ABSTRACT

The main corporate financial strategic pillars that drive a firm's value are mainly financing and investment. Conventional finance theories hold that leverage is power that amplifies investment. Cash flows and liquidity are the lifeblood of any firm which gives life to and fuels higher investments. To this end, there is an indispensable interplay between financing, investment, cash flows and liquidity. Existing studies on investment decisions are largely centered on developed economies but no studies, to the best of my knowledge, have been done in developing economies like those in Africa. However, there is persistent behavioural and structural heterogeneity between firms in developing and developed economies, resulting in diverging economic implications for a firm's behaviour. This study was motivated by the observation that leverage levels in African firms are generally low but now on the rise as compared to developed economies, investment levels are stagnant, low liquidity of stock markets coupled with cash flows that are too volatile. Given the progressively vital role developing economies have for global growth, this study sought to find how this trend in leverage levels is impacting on investment in Africa, a concern for the global economy. Given the inseparability of investment and leverage from liquidity and cash flow, the study also examines the role of liquidity and cash flows in investment decision making.

This study extends the reduced form investment model to a dynamic panel data model estimated with a novel technique; the generalised method of moments (GMM) on the panel data of 815 listed African non-financial firms. The methodology controls for unobservable heterogeneity, endogeneity, autocorrelation, heteroscedasticity and probable bi-directional relationships. The study found evidence that leverage constrains investment and its impact is more pronounced in firms with low-growth opportunities. These results suggest that investment policy does not solely depend on the neoclassical fundamentals but also on financing strategy and are inclined to the hypothesis that leverage plays a disciplinary role to avoid over-investment. The study also found that stock market liquidity is associated with higher average capital expenditures. The effect of liquidity on investment was found to be heterogeneous with financial constraints and growth opportunities. The study reveals that cash flows are not only an important determinant of investment decisions, but the variability of the cash flows also has a significant bearing on the investment policy. The experimental analysis shows that an increase in debt may reduce the negative effect of leverage on investment. However, the shallow, illiquid debt markets of African firms would mean higher costs and this countermands any benefits from debt. Based on these, findings, the study recommends that African firms should consider relying more on internally generated funds and the stock markets so as not to suppress any available cash flows and improved liquidity. African firms should trade off the effects of managing volatility and the resulting negative impact of cash flow volatility on investment levels.

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1) ***The impact of Leverage on discretional investment: African Evidence*. Paper presented at the 2017 Economic Society of South Africa Conference** held from 30th of August to 1st of September 2017 at Rhodes University, in Grahamstown, South Africa.

2) ***Cash Flow Volatility and Investment Based on African Listed Firm* Paper presented at the College of Law and Management Studies Research Day**. South Africa; 28-30 September 2017.

3) ***Stock Market liquidity and firm discretional investment: Evidence from Africa:*** Paper accepted for presentation at the 36th International Academic Conference, London UK organized by the International Institute of Social and Economic Sciences in London, United Kingdom.

PUBLICATIONS:

1) Vengesai, E. and Kwenda, F. (2017) **The impact of leverage on discretional investment: Evidence from African listed firms.** *African Journal of Economic and Management Studies (Accepted for publication -Vol 9 issue 1 upcoming)*

2) Vengesai, E. and Kwenda F. **Cash Flow Volatility and Investment Based on African Listed Firm: (Under Review)**

3) Vengesai. E and Kwenda F, **Stock Market Liquidity and Firm Investment Decision: African Evidence (Under Review)**

4) Vengesai, E. and Kwenda F**, Leverage and Investment Tangibility in African Firms (To Be Advised)**

ABBREVIATIONS AND NOTATIONS

ABBREVATION	**DEATAIL**
GMM	GENERELISED METHOD OF MOMENTS
POT	PECKING ORDER THEORY
MM	(Modigliani and Miller, 1958,1959, Modigliani and Miller, 1963)
CV	CASH FLOW VOLATILITY
Q	TOBINS Q A PROXY FOR GROWTH OPPORTUNITIES
CVCF	COEFFICIENT OF VARIATION OF CASH FLOW
CF	OPERATING CASH FLOW
OPCF	OPERATING CASH FLOW
LEV	LEVERAGE
INV	INVESTMENT
LTD	LONG-TERM DEBT
TD	TOTAL DEBT
STD	SHORT TERM DEBT
EWMA	EXPONENTIALLY WEIGHTED MOVING AVERAGE
CF2	SQUARE OF OPERATING CASH FLOW
TA	TOTAL ASSETS
FA	FIXED ASSETS
AB	ARELLANO AND BOND (1991)
DIFF	DIFFERENCE GENERELISED METHOD OF MOMENTS
SYS	SYSTEM GENERELISED METHOD OF MOMENTS
CAPEX	CAPITAL EXPENDITURES
L.CAPEX	LAG OF CAPITAL EXPENDITURES
GARCH	GENERELISSKEDASTICITYED AUTOREGRESSIVE CONDITIONAL HETEROSKEDASTICITY
NPV	NET PRESENT VALUE
US	UNITED STATES OF AMERICA
IV	INSTRUMENTAL VARIABLE
OLS	ORDINARY LEAST SQUARES
FE	FIXED EFFECTS

NOTATION	DETAIL
$\boldsymbol{\beta}$	BETA
$\boldsymbol{\sigma}$	STANDARD DEVIATION
$\boldsymbol{I_t}$	INVESTMENT AT TIME T
$\boldsymbol{\beta_i}$	REGRESSION COEFFICIENT TO BE ESTIMATED
$\boldsymbol{D}$	DUMMY VARIABLE
$\boldsymbol{\alpha}$	CONSTANT

CHAPTER 1

Introduction and background

1.0 Introduction

The main corporate financial strategic decisions on value creation are pinned on financing policy, payout policy and investment decisions. The traditional corporate finance goal of firm value maximization is dependent upon these strategic corporate finance pillars. The interplay between financing and investment is a central issue in corporate finance and has stirred a lot of debate. Contentious and inconclusive findings warrant further investigations in this discipline. A firm's decisions on financing inevitably impact on investments, the worth of such investments, and on the firm's value at large. Financial theory reveals that leverage is power; it amplifies performance liquidity and cash flows are a firm's lifeblood.

Given the fundamental role of leverage, numerous studies on the relationship between capital structure and firm value in both developed and developing economies can be found in the financial literature. However, studies centered on leverage and investment have not received much attention. The few existing studies in this area were conducted in developed economies and have yielded inconclusive results. This study sought to provide new substantiated evidence on the association between investment, firm-level leverage, liquidity and cash flow volatility in the context of developing markets, particularly in Africa.

There is an indispensable interplay between financing, investment, cash flows and liquidity. This can best be explained by a basic budget equation of a firm. Analysing investment and leverage only is an imbalance of the budget equation hence the need to examine the behaviour of firms with regard to cash flows and liquidity as these decisions are inseparable. The basic firm budget equation can be expressed broadly in terms of the sources and uses of funds as follows:

$$\underbrace{I_t + \Delta CH_t + \Delta CA_t + DIV_t}_{uses} = \underbrace{FCF_t + \Delta E_t + \Delta D_t}_{sources}.$$

The left-hand side of the equation depicts the uses of funds. A firm can use its cash for investment in long-term movable and immovable assets over time I_t, increase in current assets for the financing of daily operations CA_t, and payment of dividends to shareholders, DIV_t. On the right-hand side of the equation are the sources of funds. The firm can generate cash through positive cash flows from its operations CFT_t, issue equity $E_t$or debt D_t. It is of paramount importance to note the interplay of these financial decisions. Hence to analyse the investment (uses of funds) and leverage (sources of funds) relationship it is crucial to consider the other balancing financial decisions of firms.

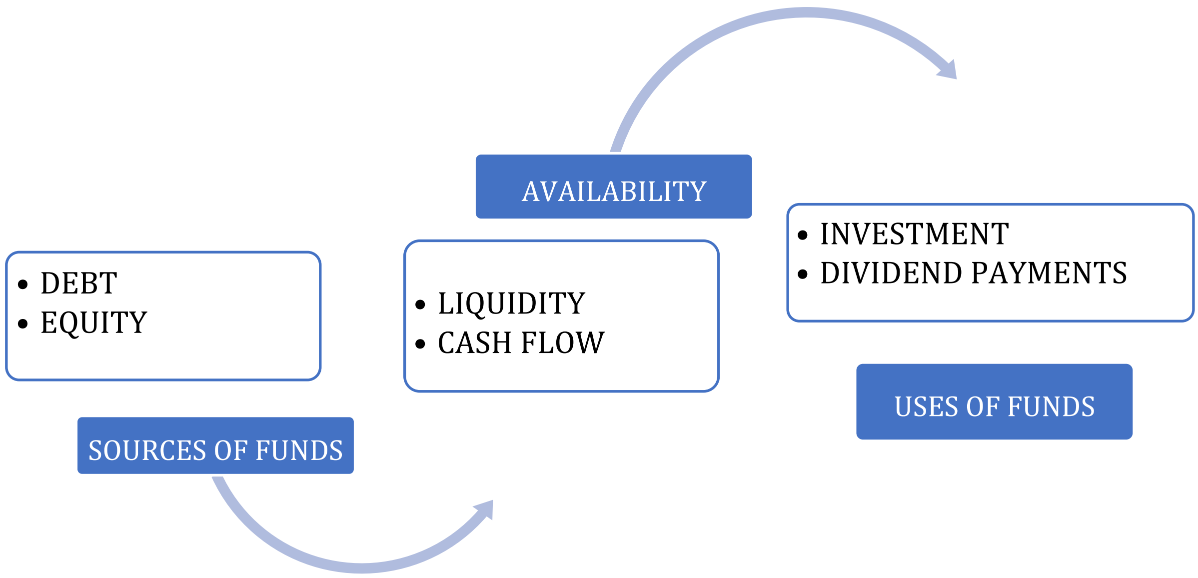


Figure 1-1 Sources and uses of funds process

Source: Aanderson and Prezas (1998) and own construction for the thesis based on the basic firm budget equation.

Figure 1-1 shows the corporate finance value creation process of a firm. The figure shows that there is an inseparable link between these financial pillars. The sources of funds affect the availability of funds which in turn determines the uses of the funds. This study explores the relationship and interplay between these financial pillars in African firms.

This study contributes to the literature on firm investment policy in several ways. It provides evidence from Africa, as a developing continent, that has not been explored. The few existing studies are concentrated on developed nations and, given that firms in developing nations may behave differently due to different market implications and conditions, it is worthwhile to analyse firms in developing nations separately. This study importantly extends the existing literature to examine how conservative leverage levels of African firms, which have been reported to be rising, volatile cash flows, illiquid and shallow markets are impacting on investments. From a research method perspective, a dynamic panel data model is employed which takes account of heterogeneity in individual countries and firms. The generalised method of moments (GMM) estimation technique, which is robust in controlling endogeneity, and a possible bidirectional causality between leverage and investment through differencing and use of natural instruments as a system of equations both in levels and, at first, difference with orthogonality conditions, is used. Given the nature of our data, a dynamic approach and GMM become handy tools. To the best of our knowledge, this is the first study to use a dynamic model and GMM to estimate the association between leverage and investment in Africa.

Despite different settings, markets and methodologies, the negative relationship between leverage and investment is confirmed. In support of the agency cost theory by Myers (1977), we found that the current leverage levels of African firms are having a significantly negative impact on investment. This concurs with findings from different markets in developed economies, including those of Aivazian et al., (2005) from Canadian firms, Lang et al., (1996b), Seoungpil et al., (2005) using USA firms, and Yuan and Motohashib (2014) in China. The study reveals that volatility of cash flows is associated with lower average investment levels in capital expenditure. This research reveals that cash flows are not only an important determinant of investment decisions, but the variability of the cash flows also has a significant bearing on the investment levels of African firms. Our results also give evidence of a positive relationship between investment and stock market liquidity. These results support the channels proposed by Butler et al., (2005a). Higher liquidity is associated with low stock issuance costs and hence higher investment. Polk and Sapienza (2009) maintain that firm investment is greater when shares are overvalued. Overvaluation of shares by the market is an overreaction signal to a firm’s good prospects and it portends higher trading volume and liquidity.

African firms' investment policy does not solely depend on the neoclassical fundamental determinants of profitability, net worth and cash flow. Financing strategy also has a considerable bearing on the investment policy. Our experimental analysis shows that African firms may be underutilizing the interest tax shield advantage of debt which is affecting investment negatively. By increasing the leverage, we found that investment may be boosted. As such given the shallow capital markets and lack of fully-fledged debt markets, African countries should consider relying more on internally generated funds since underutilised leverage suppresses the few available volatile cash flows to interest payments and loan covenants from debt holders thereby constraining investment. Low debt will reduce the shareholder-bondholder conflict and the firm can freely take on investment opportunities as they arise. With a greater need not to constrain investment, African firms should also aim at maintaining the stability of cash flows and promote market liquidity as cash flow variability and low liquidity are associated with low investment.

1.2 Background to the study

There is persistent behavioural and structural heterogeneity between firms in developing and developed economies, resulting in diverging economic implications for firm's fundamentals. This study has been motivated by the observation that leverage levels in African firms are generally low (and rising) as compared to firms in developed economies. *The Global Credit Report (GCR*) by Moody (2015) reveals that there is a divergence in leverage trends between developed and developing economies. Leverage of firms in developing countries is very low, being almost half that of firms in developed countries (Souza et al., 2015). Firms in developing economies can increase their leverage from their low levels while their compatriots in developed economies may have to reduce their high-leverage levels. Given the progressively vital role developing economies have for global growth it is thus important to find how these rising levels of leverage are impacting on investment in African listed firms, which is a potential concern for the global economy.

Leverage can confer crucial benefits on investment and it can foster economic growth as advocated by financial theory. Moody's GCR (2015) reveals book values of debt above 60 per cent on average in firms in developed economies, compared to African firms where we found less than 19 per cent on average debt values. The IMF (2015) also reported that nonfinancial firms' leverage level across emerging markets increased between 2004 and 2014, with debt levels of firms quadrupling from about $4 trillion to well over $18 trillion, with noteworthy heterogeneity across countries. Atkins (2015) states that there has been a higher increase in firm leverage in developing economies since 2007. It is thus compelling to find out how these rising levels of leverage are impacting on investment in African listed firms.

In a study by Kasozi and Ngwenya (2013) the average debt ratios for Southern African firms' book and market values are lower compared to firms in developed nations. Studies reveal book values of debt to be 69%, By comparison this figure is 73% for Japanese, German and French firms. (Kasozi and Ngwenya, 2013). Murangi (2010) also found that African firms used debt more conservatively compared to companies from the US evidenced by the median market to debt capital ratio 12,7% for sampled firms compared to 31,4% for US firms. The conservative leverage use by African firms prompts an interest to examine the effect on firms' investment behaviour.

Previous studies in developed economies reveal that leverage constrains investment and this indicates that low-leveraged firms should invest more (Aivazian et al., 2005, Ahn et al., 2006). Firms in African countries use leverage conservatively; however, investment is stagnant and insignificant, and the economies of these countries are not growing. The European Parliamentary Research Service (EPRS) reports economic stagnation in most countries in Sub-Saharan African (SSA) countries during the period 2000-2015 (Zamfir, 2016). *The United Nations 2014 Economic Development Report on Africa* states that if Africa is to make a substantial improvement it will have to sustain growth rates of at least 7 per cent, and this will require investment rates of 25 per cent of gross domestic product (GDP) and above (Clarke, 2013). However, the investment rate in Africa has, on average for the past two decades, hovered around 18 per cent of GDP, which is well below the 25 per cent estimated as a requirement, and so the continent has not achieved the 7 per cent average growth rate necessary for significant progress towards growth (UNCTAD, 2014 p. 4).

Over the past two decades, the investment level was either unchanged or declining in many countries in Africa (UNCTAD, 2014). From the year 2000, the average investment rate in African countries was below 14 per cent, which is a decline from the continental average of 18.7 per cent over years and far below the world average which is above 22 per cent (Eyraud, 2009). In light of this trend and requirements, it shows that Africa has low investment levels relative to the average for developing countries and also relative to what is expected, essentially, to achieve development goals (UNCATD, 2015). On average, Africa had an 18 per cent investment rate over the period 1990–1999 compared to 24 per cent for developing economies. Similarly, in the period 2000–2011, the average investment rate for Africa was about 14 per cent compared to 26 per cent for developing economies (UN, 2014). Due to consistent public budget deficits, the private sector remains the main pillar and driver of investment in developing economies thus the need to examine listed firms.

Goldsmith (2012) reports increased investment is necessary to maintain growth and tackle poverty in Africa. The United Nations (UN) states that to meet the Millennium Development Goals (MDGs), infrastructure investments would need to reach about 15 per cent of GDP (around $93 billion a year) for Sub-Saharan Africa (SSA) countries alone. But actual investment on the subcontinent is $45 billion, implying a funding gap of about US$ 50 billion per year (Rod et al., 2015). The estimate does not include North Africa, so adding this region will increase the investment-funding gap for the continent significantly. Considering this trend, the size of the investment gap must be closed if the continent is to realize the United Nations' Millennium Development goals. It also indicates that there is no significant growth in Africa and investment is stagnant.

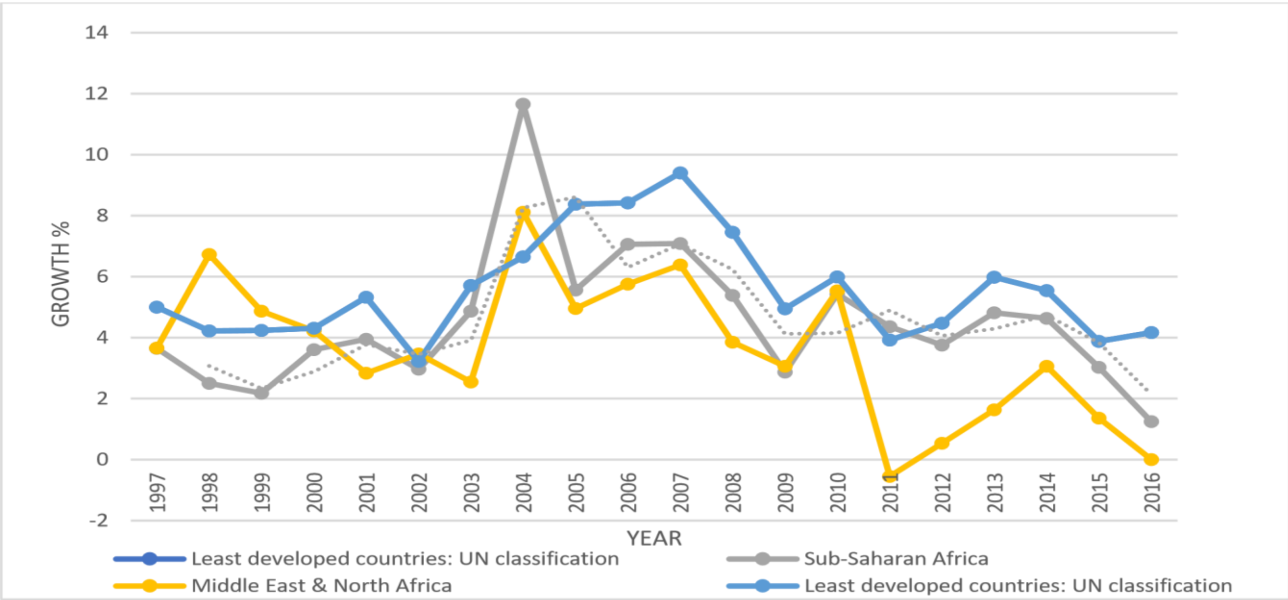


Figure 1-2 Pecentage growth rates for selected regions

Source: World Development Indicators

Figure 1-2 shows the percentage growth rates for Sub-Saharan Africa, Middle East & North Africa and least developed countries by UN classification. The graph depicts that on average there is a general decline in growth rates in these countries from their historic peaks between 2003 and 2006. The growth rates in Sub-Saharan Africa declined from a high of 11.9 per cent in 2004 to below 2 per cent by 2016. For countries in North Africa and in the Middle East, the growth rates by 2016 had declined to nearly zero per cent with negative growth in some years like 2011. As shown in the graph above, the growth rates in countries in sub-Saharan Africa and in North Africa are lower than the average of all the least developed nations by UN classifications in the whole world. Low growth rates suggest low investments and poor development strategies in African countries. This trend calls for active policies and strategies to revive growth in African countries. This research sought to reflect the situation from a firm investment perspective, as one of the major determinants of economic growth.

The African Development Bank (ADB) reveals that investment is not growing in African firms as evidenced by the declining trend line in GDP for the past few years, the decline in inventory levels and increased bankruptcy of firms and widening of investment gaps from the developed nations to be covered.

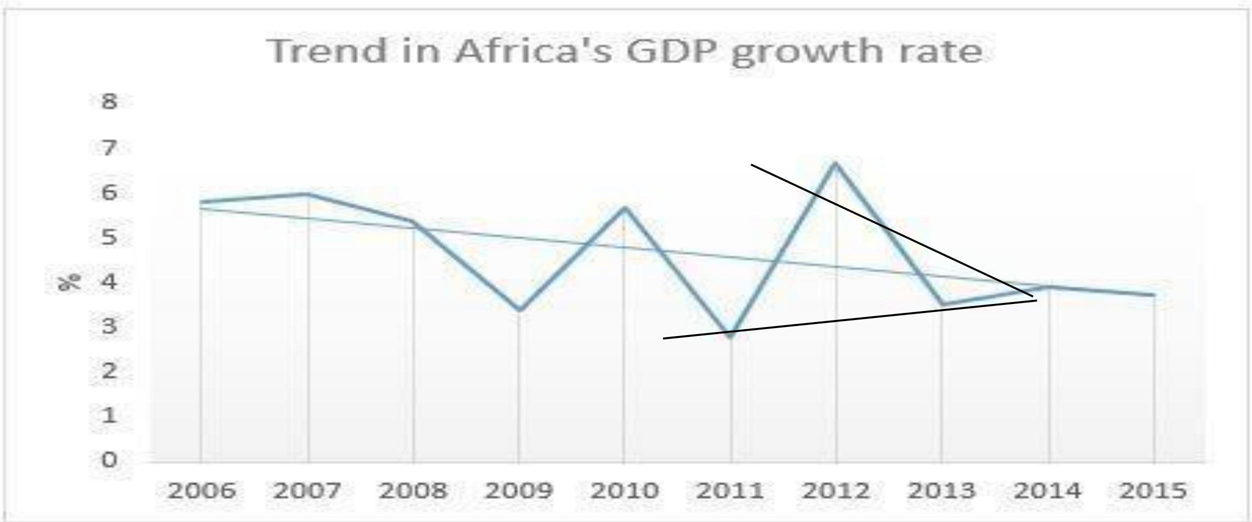


Figure 1-3 Trends in Africa's GDP growth rate

Source: ADB/AUC/UNECA African Statistical Yearbook (2015)

Figure 1-3 shows that GDP levels are too variable and a trend analysis from (2011-2015), produces a descending triangle reflecting a decline in average GDP growth over time. A decline in GDP reflects the fact that the economies are not growing, suggesting that investment is either declining or stagnant in these economies.

In theory, firms finance their growth and investments externally using capital markets through the issue of equity and debt. One of the most influential capital structure theories is the trade-off theory. It suggests that high levels of debt introduce bankruptcy costs which countermands all the benefits from debt financing thereby reducing the firm's value. The free cash flow theories by Jensen and Meckling (1986) and Myers (1977) also reveal that debt introduces agency costs which may constrain firm investments and accentuate underinvestment. African firms operate at conservative leverage levels. Investment trends of African firms leave many questions unanswered. Considering that investment in Africa is not growing one may ask whether or not low leverage is a good practice? Studies in developed economies reveal a negative relationship between leverage and investment. In line with those findings, low-leverage levels of African firms should lead to more investment. Low leverage also should suggest low bankruptcy cost and more tax shield benefits. However, investment stagnation remains amidst low-leverage levels in developing economies. Alternatively, does this situation reflect a different relationship because of the region's peculiar characteristics? Considering these unanswered questions, it becomes necessary to explore the African evidence on the relationship between leverage and investment to ascertain the best strategies to finance and stimulate investment for economic growth in these economies. To the best of our knowledge, no study has analysed this relationship in Africa.

Efficient investment depends on the availability of free cash flows (Jensen, 1986b). One cannot successfully analyse firm's investment decision and financing without also analysing its liquidity and cash flow patterns. Liquidity (cash flow) is the lifeblood of firms and markets. Compared to international norms, liquidity in African markets is very low coupled with too volatile and uncertain a cash flow in firms. Liquidity inadequacies in these financial markets are deterring international investors (Oosthuyse et al., 2014). Oosthuyse et al. (2014) noted that the liquidity of African stock exchanges is as low as 4 per cent to 5 per cent. The development of stock markets in Africa has not matched the fortune expectations the Africans had when these stock markets opened (Okechukwu, 2013); one of the major drawbacks cited is illiquidity. According to Sally (2013) African stock markets represent less than 2 per cent of the world market capitalisation and remain highly illiquid, fragmented, small, and weak which deters international investors and capital inflows lowering growth of these developing economies.

The African Union further stresses that African stock markets (ASM) are less liquid and are weak performers. There are very few shares traded and wide gaps exist between buy and sell orders (Sally, 2013). Thomas (2015) added that ASM have high trading costs of between 2,5 per cent and 5 per cent, and investors tend to hold on for some time for a decent yield before exiting. High trading costs slow down the velocity of trade (Oosthuyse et al., 2014). This has seen growth in Africa become stagnant at 2.2 per cent compared to 9.7 per cent in East Asia in the past two decades (Sally, 2013). Michael (2015) concurs that the gap between Africa and other regions is even starker than in other parts of the global financial system., Only a third of the countries in the region have stock markets, which are mostly small and illiquid. Many studies in developing economies have examined the relationship between liquidity and economic growth variables as GDP. This study thus seeks to extend the literature and to examine the relationship between the African market's liquidity, volatile cash flows together with leverage, and investment.

1.3 Problem statement

Effective corporate financial management is dependant on proper sources and uses of funds. Ideally, capital structure decisions have many implications for the firm's investment and value. Recent developments in capital structure theory show that leverage constrains investment based on the agency cost theory (Aivaziana et al., 2003a). This implies that firms that use low debt ratios should invest more. However, trends from African markets indicate that African firms use leverage more conservatively compared to developed economies (GCR 2013), Investment and economic growth are stagnant in Africa (IMF, 2015), there is a huge investment gap to be closed (Rod et al., 2015), coupled with decline in liquidity and inventory levels, too much cash flow volatility and increased bankruptcy of firms. Is the poor investment landscape for African firms attributable to the region's peculiar financial and economic characteristics? This unanswered question leaves financial practitioners in a dilemma as to the best financing strategies to boost investment. Leverage is low in African firms, though now rising, yet apparently, no research has been done on this phenomenon.

This study thus seeks to examine how the conservative use of leverage by African firms, volatile cash flows and illiquidity is impacting on their investments.

1.4 The research objectives:

The main objective:

The primary objective of this study is:

1. To examine the practical impact of leverage on investment both in low-growth and high growth firms in developing economies in Africa.

The secondary objectives:

Given the inseparability of the interplay of financial pillars, to fully examine the investment and leverage decisions liquidity and cash flows play a significant role which needs to be integrated into the analysis. The following secondary objectives are identified and investigated.

1. To examine fully the practical impact of leverage on firm investment in African firms.
2. To determine how leverage is controlled by tangible and intangible investments that African firms undertake;
3. To examine the impact of liquidity on investment in Africa using trading volumes as measures of liquidity; and
4. To investigate the impact of cash flow volatility on discretional investment in listed African firms.

1.5 Research questions

To examine African firm's investment decisions, the following research questions will be answered in this study:

1. What effect is the rising levels of leverage having on investment in African listed firms?

2. How does investment tangibility influence leverage?
3. What are the investment behaviours of highly traded stocks in the African context?
4. How does the sensitivities of firm's operating cash flows influence firm investment decisions?

1.6 Contribution of the study:

The theoretical framework on capital structure choice attempts to explain a firm's decisions on the uses and sources of funds. Little research has been done in developed economies on the relationship between investment and leverage, liquidity and cash-flow volatility. The few studies undertaken have been restricted to firms in developed economies mainly in the USA and Europe. However, there is persistent behavioural and structural heterogeneity between firms in developed and developing economies (Fan et al., 2011). Compared to developing economies, developed economies have advanced institutions, more developed financial systems and economic conditions that are very different in terms of market perfections and imperfections (Aivazian et al., 2001). In light of these distinctions, results relating to each of the developed economies cannot be generalised and adapted to developing economies such as those in this study. These institutional, structural and behavioural differences therefore justify and motivate a separate study of African listed firms. This study will also enable a comparison of results across two different and quite independent economies and close the research gap in relation to leverage, investment in African firms and shed more light on mixed empirical results on the interplay between leverage and investment and its effect on growth opportunities.

Empirical studies conducted in developed economies with highly levered firms evidenced a negative relationship between leverage and investment (Lang et al., 1996b, Aivaziana et al., 2003a, Ahn, 2004, Seoungpil et al., 2005), this implies that leverage constrains investment and, subsequently, growth. The low leverage levels of African firms should then mean an increase in investment. On the contrary, reports show that investment is stagnant in Africa as witnessed by a huge investment gap that needs to be closed, and the decline in inventory levels and increased bankruptcy of African firms (Rod et al., 2015). This questions the assumed relationship between leverage and investment in Africa. Considering that this is a financial strategic issue on whether or not African firms should increase their leverage to match developed nations standards or reduce debt, this important question begs an answer. Because of structural differences of firms in Africa and those in developed nations, total adoption of findings from developed nations might be a black box also given that the leverage levels, cash flow variations and liquidity levels are different. This research thus aims to examine these issues.

From the methodological point of view, this study extends prior studies and will hopefully contribute to the body of knowledge by employing a cross-country dynamic panel fixed effects model and the GMM which is robust in controlling for endogeneity and heterogeneity problems in the relationship between leverage and investment common in corporate finance studies. Previous studies mainly used the ordinary least squares (OLS) estimator and pooled regression methods on cross-sectional and time series data which make the models suffer from serious endogeneity and heterogeneity issues

1.7 Definition of terms

Leverage relates to the use of borrowed funds to finance capital investment expecting interest payable to be less than the profits made. Conventional finance theories suggest that the cost of debt is substantially less than the cost of raising equity financing thus leverage should amplify returns.

Investment refers to the allocation of funds and resources expecting some future returns. In this context, we look at long-term investment that involves the acquisition and expansion of fixed assets and long-term operational strategies.

Liquidity relates to the speed at which and the degree to which a firm's stock can easily be sold or bought in the stock market without substantial loss in assets price or delays.

Cash flow the net amount of physical cash and cash equivalent that moves in and out of the firm from its operations.

Cash flow volatility the degree of uncertainty and state of predictability of cash flows generated by a firm from its operations**.**

Panel / longitudinal data relates to data where multiple firms are observed at many periods for a total of n times t observations. Panel data is a combination of cross-sectional and time series data.

Dynamic panel model describes the scenario in which the lag of the response variable makes one of the explanatory variables.

The Generalized method of moments in econometrics. This is a generic method for parameter estimation in statistical models usually applied in semiparametric models where the parameter of interest is finite-dimensional, while the data distribution function shape may not be known thus the maximum likelihood estimation is not applicable. The order condition for identification would be where there are many equations than there are parameters.

1.8 Organisation of the thesis

The thesis follows an essays approach with each chapter separately dealing with the corporate finance pillars leverage, liquidity and cash flow. The study is organised as follows; Chapter one has covered the introduction, the problem setting, background to the study, the statement of the problem and objectives. The objectives are presented in separate chapters following an essays approach. Chapter two covers African continent economic and financial system overview. Section three covers the first objective of the impact of leverage and investment. Chapter four presents objective two on investment tangibility and leverage. Chapter five covers the third objective on the liquidity of African stock markets and investment. Chapter six presents the examination of cash flow and its volatility on investment decisions objective four. The last section presents the summary conclusions and implications of the study.

CHAPTER 2

The African continent's economic and financial system overview

2.O Introduction

The preceding introductory chapter provided the background to the study, the statement of the problem, the objectives of the study and the motivation of the study. The study is based on the African listed firms hence we provide an overview of the peculiar economic environments, financial system structure, market challenges and opportunities in which these firms operate. This chapter reviews the economic and financial system of African countries and stock markets to provide insights into the nature of corporate strategic issues in relation to investment, capital structure decisions, stock market interaction and operational dilemmas faced by African firms. The general economic and financial system review of African countries helps to provide a better understanding of the behaviours exhibited by these firms.

Africa is a culturally and economically diverse continent made up of 58 countries with diverse financial systems and different regional blocks (Allen et al., 2011). Africa is the second largest continent in the world. Geographically, the continent can be categorised into Northern Africa, Eastern Africa, Central Africa, Southern Africa and West Africa. The map below shows the distribution of African countries into different regions. According to the World Bank development indicators, Africa is considered the poorest continent in the world with the lowest GDP per capita. In 2016 the GDP per capita in the Sub Saharan Africa was only 1,449.997 with a five-year (2012 to 2016) average of 1,673.8536 as compared to 57,466.787 and 43,929.691 for the US and UK respectively over the same period. (*World Bank national accounts data, 2017*). These statistics indicate that the GDP per capita in most African countries is almost 2.5 per cent of the GDP per capita in the developed economies which shows the serious levels of poverty and unproductiveness of African countries.

2.1 African countries geographical regions

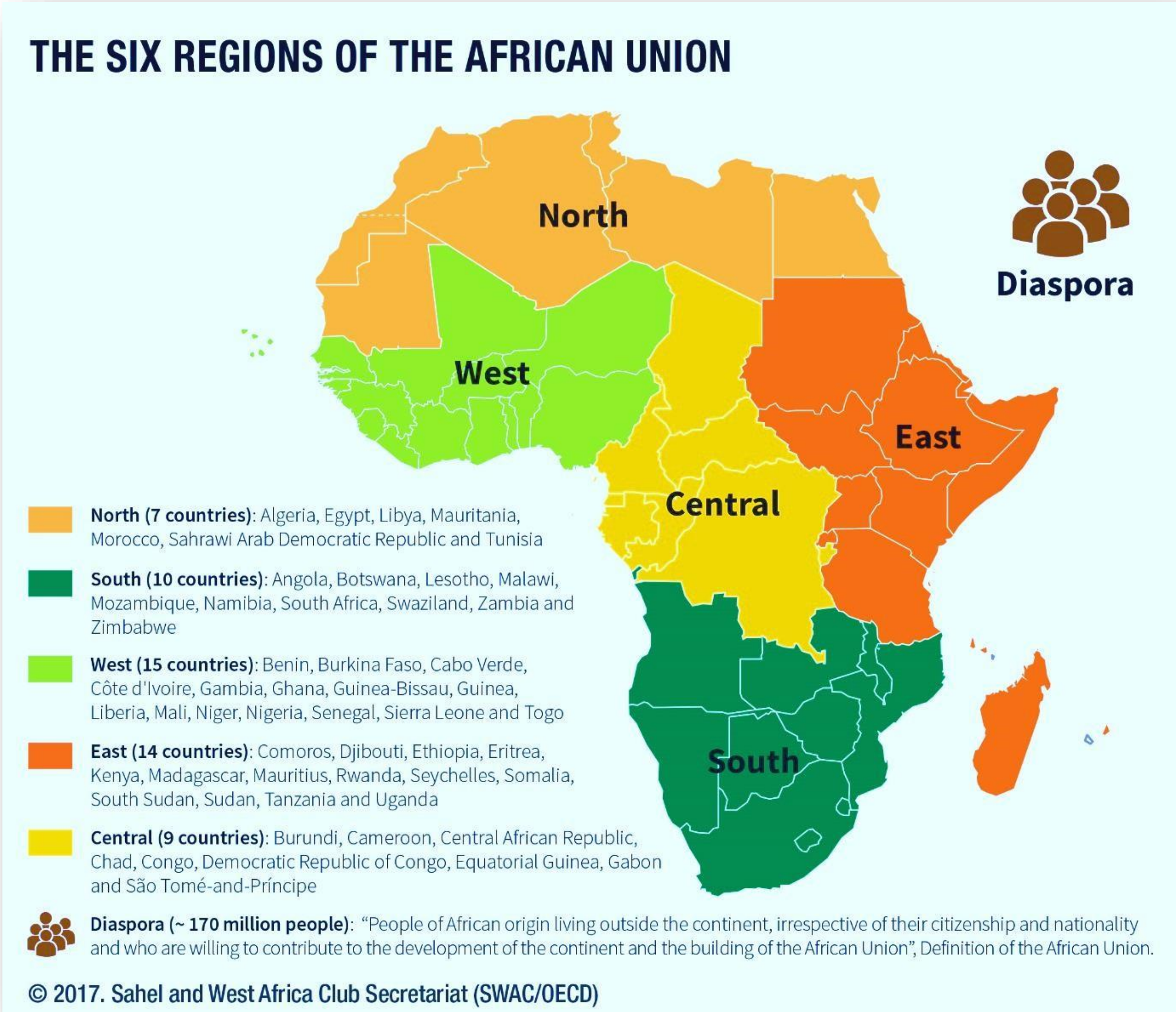


Figure 2-1 African continent geographical regions

The map in figure 2-1above shows the distribution of African countries from the five regions. Eastern Africa and western Africa form the largest proportion of African nations. Geographically Algeria is the largest African country and the tenth largest in the whole world. African countries began to gain their independence from their colonial masters in the 1950s. The oldest independent countries are Ethiopia, Libya (1951), Tunisia, Morocco and Ghana. The world's first great civilisation emerged in Egypt. Most of the African countries fall in the Sub-Saharan region as shown by the map in figure 5 below.

Figure 2-2 Sub-Saharan Africa regions

2.2 Economic growth and development Overview

Figure 2-3 GDP Trend growth for African countries from 1960

Source: Source: World Development Indicators

According to the 2016 World Bank development indicators, Africa as a whole is the most economically underdeveloped continent in the world. Figure 2-3 shows the GDP growth of selected African countries from 1960. The figure shows that most of the African countries' GDP has either remained unchanged, increased slightly or declined over the years with more volatility oscillating between -10 per cent to 15 per cent. As at 2016 on average the GDP in Africa stood as low as US$ 1.5 trillion against US$ 18.559 trillion, US$ 11,199 trillion, for the USA and China respectively. African countries average GDP is less than 8 per cent of the USA. In 2014 the GDP in the Sub Saharan region reached its historic peak at US$ 1.775 trillion and declined to USD$ 1.601 and USD$ 1.498 over 2015 and 2016. South Africa makes up 20% of Africa's GDP, excluding South Africa, the GDP of African countries for 2016 is almost US$ 1.2 trillion. Despite the low GDP of these economies the *African Development Bank Report* of 2013, indicated that 13 out of the 20 fast-growing economies in the world (from 2012-2014) were from Africa. Stifling underdevelopment issues in these nations indicate that although African countries are becoming integrated into the global community the growth of these nationals is still insignificant.

The oil-rich countries in Arab North Africa, Gabon and Congo are the ones with the highest GDP per capita from 9 692.164 to 10 716 between 2011 and 2017 in Gabon. On the other hand, Eastern and Central African countries suffered the lowest per capita income levels in the continent as low as 300.795, and 382.213 respectively whilst the figure was 382.069 for Malawi, Central African Republic and Mozambique. Based on the World Bank's financial development indicators, the African continent is also financially underdeveloped with the Sub-Saharan African region (which constitutes the majority of African countries) having the least developed financial system even by other developing regions standards. From the 1980s due to the effect of globalisation, most of the African countries have been subject to serious financial and economic reforms which resulted in improvements in the growth and development of these countries (Allen et al., 2011).

2.2.1 Sub- Saharan Africa GDP growth

Figure 2-4below shows the annual growth of sub-Sahara countries from 1997 to 2016. There is a notable sharp increase in growth from 1998 to 2004 where the GDP reached its historical maximum. Since 2004 there has been a steady decline in average growth for the sub-Saharan countries. This can be attributed to the effects of the approach of 2008-2009 global financial crises. After 2009 there was a slight increase in average growth until 2010 followed by a steady decline in GDP. Since 2004 the growth rate of the African countries on average has been downward sloping amidst the global economic slowdown. This shows stagnation, slow and insignificant growth of most African countries. In this regard firms operating in these economies are bound to face the same as they cannot grow or perform beyond their economies but are rather victims of the market catastrophes.

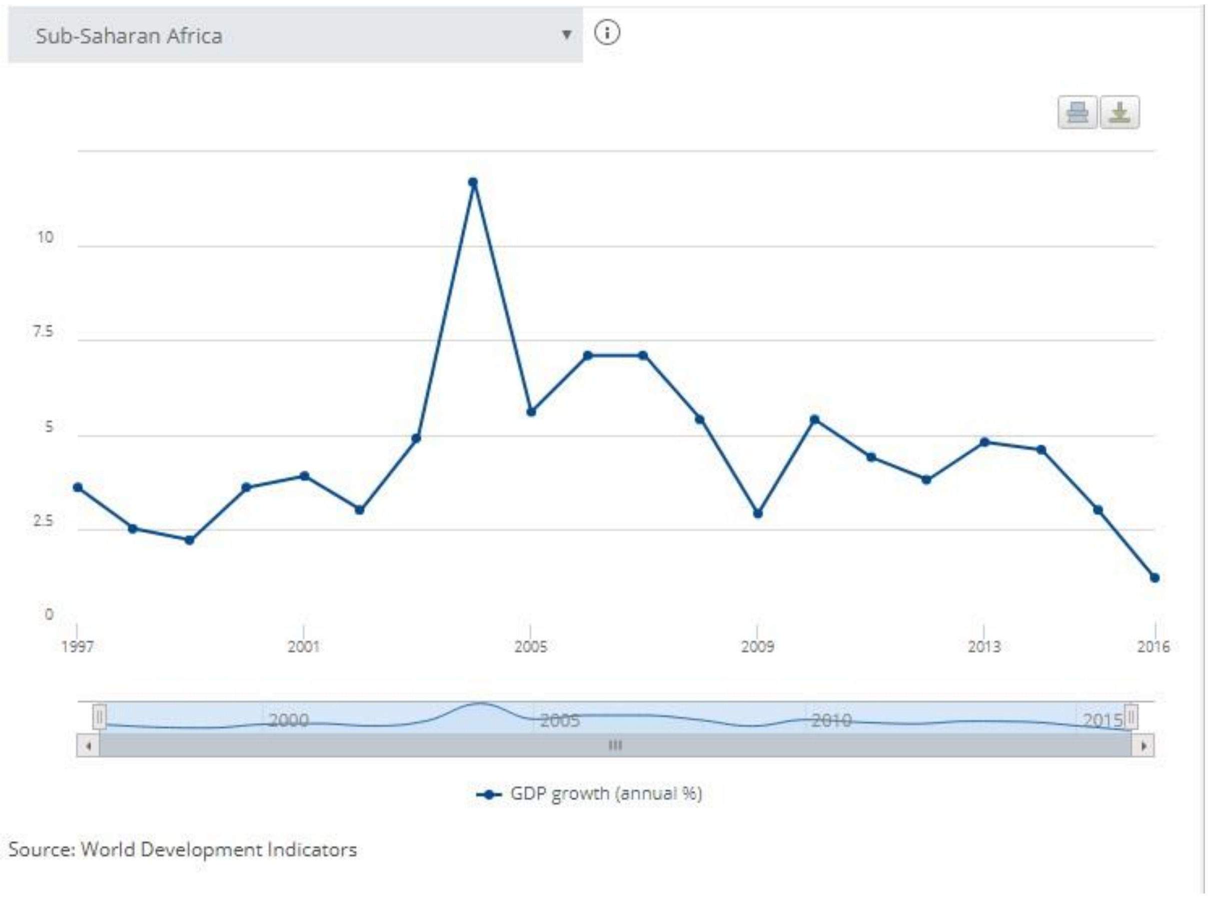


Figure 2-4 Sub-Sahara Africa GDP growth

Regarding investment in new projects, the African continent is projected to surpass the developed economies by 2023 (Ernest and Young 2011). FDI projects in Africa have grown at a rate of 20 per cent from 2007 which has resulted in an increase in the global share of FDI from 4.5 per cent to 5.5 per cent from 2010 (Ernest and Young 2011). Africa has become highly attractive to foreign investors. Despite the increase in FDI inflows and growth in most African countries in the twentieth century, economic development in Africa lags behind the standards of developed economies. The living standards are generally low, and poverty is pervasive. (Danso and Adomako,2014).

The dominant occupation of most African countries remains agriculture. However, the productivity of agricultural yields remains deplorably low compared to international standards (European Investment Bank 2013). Most African countries still utilise primitive ways of production therefore struggling to produce sufficiently for their economies and relying mostly on imports. In addition, most African economies have large deposits of mineral resources such as gold, silver, copper and diamonds (World Bank, 2015). Rich natural resource deposits should have been adequate in improving the welfare of Africans. However, limited exploitation capacity, lack of advanced technologies to refine the minerals and control by foreign companies cripples the benefits that can be drawn from these. African economies lack diversity as they depend largely on the primary sector. Exports from African economies are predominantly raw and unprocessed materials fetching low value on the international markets. This, hinders the continent's sustainable growth and competitiveness. Furthermore, small and less competitive markets create a perilous business atmosphere making the markets less attractive to international investors. This deters capital formation, financial-resources growth and transport-services supply (Venables, 2010).

Continental and regional economic integration initiatives were implemented by the African economies to attract investment from international communities and to expand markets. The economic integration blocks include among others, the African Union (AU), established in May 2001 in Addis Ababa, the Economic Community of Central African States (ECCAS), formed in 1983 by 10 central African member states, the Arab Maghreb Union (AMU) for Arab nations in Northern Africa, the Economic Community of West African States (ECOWAS), established in May 1975 with 15 western African countries, the Southern African Development Community (SADC), formed in 1980 with 16 southern African countries. Continental and regional economic integration is aimed at improving self-sufficiency, advanced socio-economic integration and co-operation to improve economic conditions of major states. Each African country belongs to at least one economic group.

Regardless of these socio-economic integration groups, the continent's economies remain small, highly disjointed and perceived as risky so deterring international investors (Geda and Kibret, 2008).

2.2.3 Infrastructural development

A well-developed infrastructure reduces operating costs, enhances FDI and trade (Danso and Adomako, 2014). According to the European Investment Bank 2013 research, most economies in Africa are heavily hampered economically by a shortage of infrastructure. The most critical issue affecting African countries remains electricity-shortages which costs the continent almost 2 per cent of total GDP (Danso and Adomako, 2014). Telecommunications expansion has increased access to financial services in many communities. For instance, the access to mobile banking. The World Bank reports poor connection to key commercial centres in transport services which include road networks, railways. maritime and air transport services that are predominantly inefficient and underdeveloped. Africa is faced with a myriad of developmental challenges ranging from the infrastructural gap, dependence on primary commodities, lack of capacity in institutions and chronic political instability among others (World Bank, 2013). Such circumstances contribute to low capital resource inflows in these economies, low firm productivity and decline in investment levels. This ultimately hinders growth.

2.3 African financial system overview

The financial system plays a critical role in economic development and growth. Considering that African firms are to contribute tremendously to the development and growth of the continent, the role of access to funds cannot be underestimated. The main hurdle faced by African firms is access to finance. The financial systems in many African countries remain underdeveloped and incapacitated, despite various initiatives adopted by these countries to align with global standards. Dahou et al., (2009) assert that lack of liquidity and narrow capital markets remain African countries' major challenges that deter access to stable and reliable long-term financing for more innovative and more capital-intensive projects that can turn the economic fortunes of the continent. The bond markets for most African countries are heavily underdeveloped and governments of these economies are the major players issuing bonds with relatively minor and insignificant involvement of the corporate sector

(Andrianaivo and Yartey, 2009). This section briefly analyses the financial development of African economies, the stock markets and the banking sector where African firms access credit for investment purposes.

Figure 2-5 depicts the financial development for African countries as measured by the financial development index created by Sahay et al., (2015) and Svirydzenka (2016) for the period 1980 to 2013. The index combines sub-indices on financial markets and institutions along the dimensions of financial efficiency, depth and access. A value of one reflects the most developed financial system and a value of zero reflects the least developed system.

2.3.1 Financial development

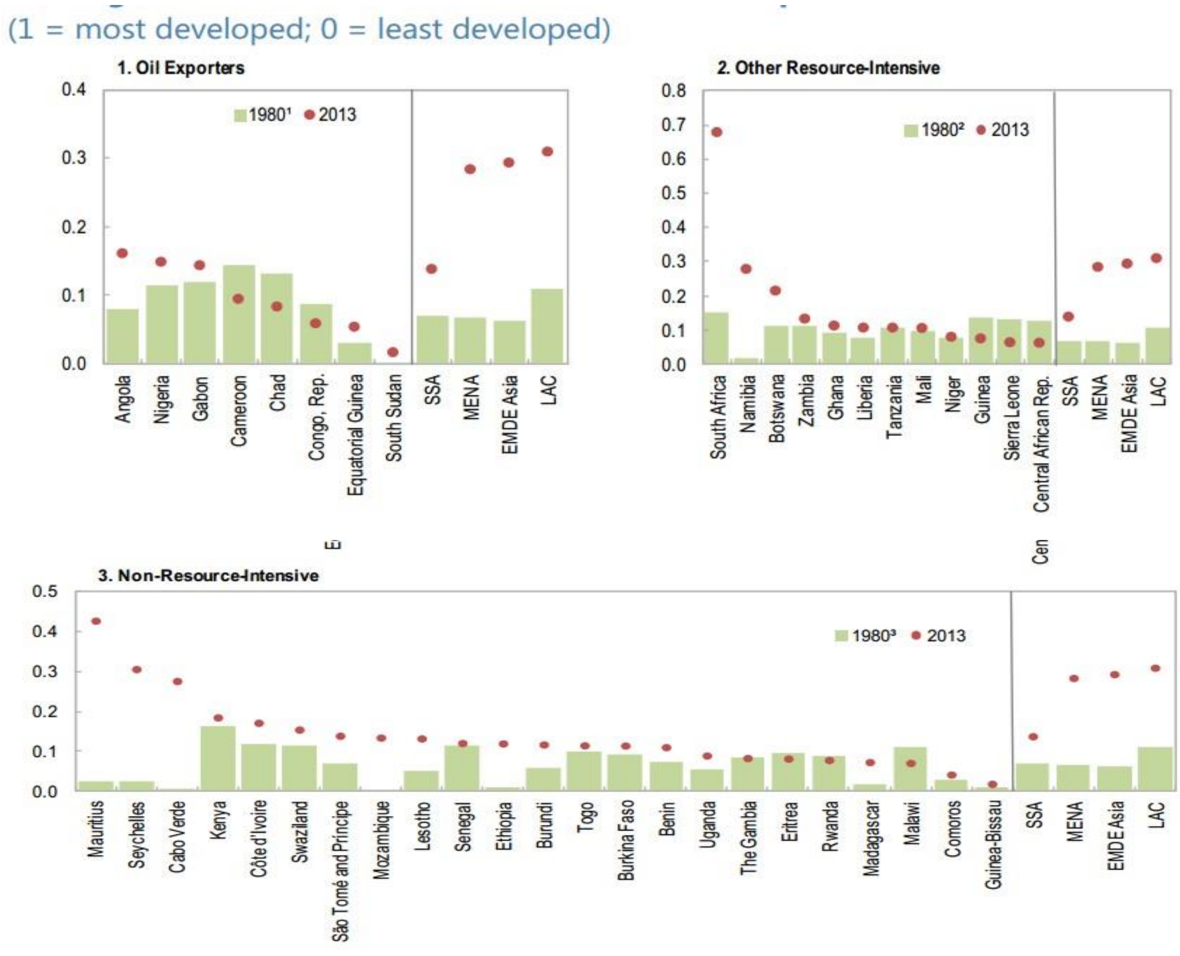


Figure 2-5 Africa: Financial sector development Index from 1980-2013

Note: SSA - Sub-Saharan Africa; MENA - the Middle East and North Africa region; EMDE Asia is Emerging market and developing Asia; LIC = low-income countries; LAC is Latin America and the Caribbean.

Sources: Sahay et al., (2015) and IMF.

The financial development index of African countries, excluding the middle-income group is below 0.2 and closer to zero, indicating the least level of development. The level of development is low compared to other developing and low-income economies from other continents such as EMDE (Emerging market and development -Asia), LIC (low-income countries) with an index above 0.2 as shown on the figure below. The efficiency dimension of the index shows that in terms of competitiveness African countries are still behind. As shown in Figure 2-5, financial development in African countries has been lacklustre. However, South Africa, Namibia, Seychelles and Mauritius (middle-income countries) have witnessed modest financial development over the years.

2.3.2 The banking system in Africa

This study investigates the leverage and investment behaviour of African firms. Therefore, we cannot effectively analyse the effects of leverage on these firms without exploring the funding dynamics to which these firms are exposed. This section looks at the banking sector as one of the major suppliers of debt to African firms.

The banking system plays a dominant role in a well-functioning and development of any economic system. Banks, as financial intermediaries, provide access to finance for firm investment, advice, risk management services and the overall stability of the financial system. A well-functioning banking system provides sustainable long-term credit for firm investment. The banking system, as a core of any economy, is highly sensitive to any economic shocks and their fragility is contagious to other systems of the economy and to other economies at large. Due to the important role played by the banks and their fragility to economic shocks they are, therefore, highly regulated. In response to the contagious nature of the financial systems, the G10 countries under the Bank for International Settlements (BIS) formed the Basel Committee on Bank Supervision in 1974 with a mandate of providing a recommendation on banking regulations regarding market risk, capital risk and operational risk. From the 1980s many African countries have been investing in structural and economic reforms with the banking systems undergoing financial transformation and restructuring following the prudential Basel recommendations on banking regulations to improve the resilience of the financial system and the economy at large.

Some African countries have engaged in serious financial liberalisation. Foreign banks and financial institutions have been attracted to the liberalisation of the banking system in many African countries. For instance, foreign banks such as the SG-SSB in Ghana, Stanbic and BSIC, in Zimbabwe, Barclays, MBCA, and Stanbic, in Malawi. However, despite these developments in the financial system, most African countries are still characterised by less than four banks dominating the lending behaviour (Venables, 2010). South Africa, the most developed economy in the continent is dominated by the big four major banks (Standard Bank, FNB Bank, Capitec Bank and Nedbank). In providing finance, such banks are biased towards big enterprises which are less risky and more creditworthy (Mahou et al., 2009). This indicates lack of competition and competitiveness in the banking sector in African economies (European Investment Bank 2013). Lack of competitiveness in the financial sector leads to bottlenecks and hinders the efficient capital allocation to firms for investment purposes.

Danso and Adomako (2014) noted that many banks in African economies invest a larger proportion of their funds in government securities. This demonstrates an inefficient and dysfunctional intermediation process that disregards private supply of credit to the private sector and favouring government securities that are considered risk-free (Allen et al., 2011). Generally, in African economies, individuals and organisations have extremely limited access to banking facilities (KPMG, 2013). Financial-system reforms in Africa are yet to increase credit availability to the private sector, which remains a chief obstacle to firms' growth on the continent.

2.3.2.1 Commercial Bank branches per 100 000 adults.

Figure 2-6 Commercial bank branches per 100 000 Adults

Source: World Bank on line data

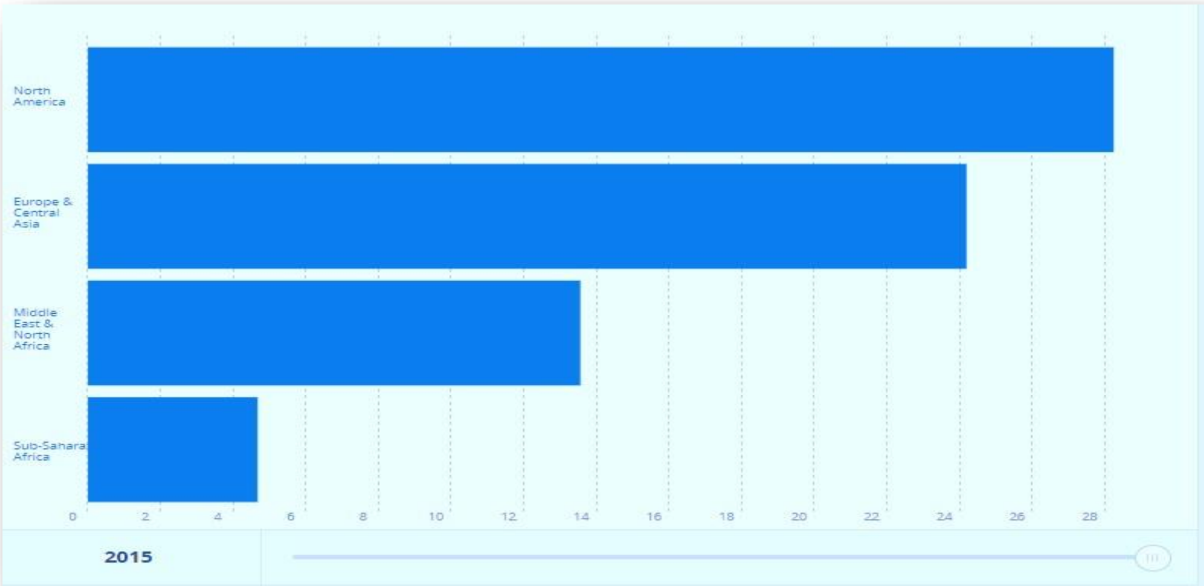


Figure 2-7 Commercial bank branches per 100 000 adults (2015)

Source: World Bank online data

Figure 2-6 and figure 2-7 show the number of commercial banks per 100,000 adults in the sub-Sahara Africa, Middle East & North Africa, Europe and Central Asia and North America from 2004 to 2015. The figures indicate that African countries have the least number of commercial bank branches per given population. On average, from 2004 to 2015, countries in Sub-Sahara Africa have less than 5 commercial bank branches per 100 000 adults compared to more than 24 for Europe and America. This indicates limited access to financial services among many firms and people on the African continent. Over the last decade, there has been a massive development in the banking sector due to the new technology including mobile banking which has reduced the unbanked population and the number of people with access to the banking services. However, firms will still be required to meet prudential credit requirements including collateral and credit rating and history. As such, many African firms have limited access to credit as they might be uncreditworthy to the few available dominating banks that mainly focus on big less risky firms and government securities.

2.3.2.2 Domestic Credit provided by the financial sector (% of GDP)

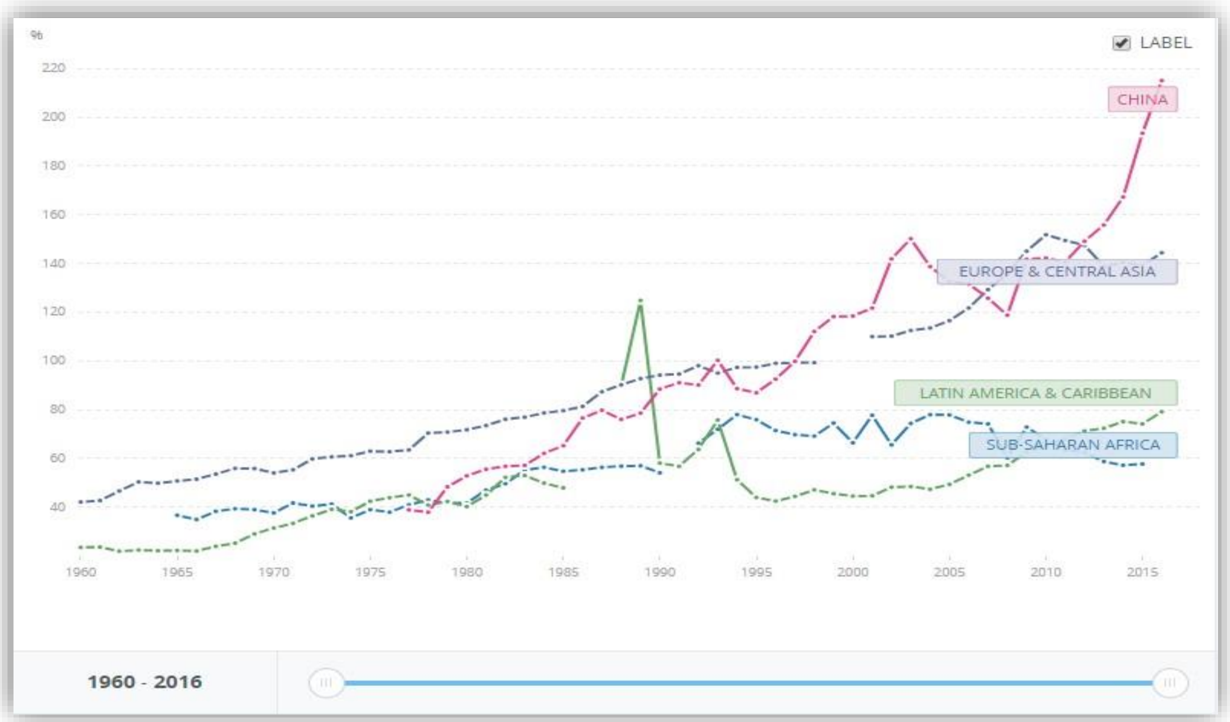


Figure 2-8 Domestic credit provided by the financial sector % of GDP (1960-2016)

Source: International Monetary Fund and World Bank online estimates

The Figure 2-8 above shows the domestic credit provided by the financial sector to the private sector for sub-Saharan Africa, North America the Caribbean, China, Europe and central Asia from 1960 to 2016. The figure shows that China is the economy with the highest domestic credit provided by the financial sector (215.026 % of GDP) which suggests that Chinese firms do have more access to credit. More access to funding and more credit provided by the financial institutions may be one of the explanations behind China's rapid growth. Europe and Central Asia have a relatively higher proportion of credit provided by the financial sector (144.36% in 2016). The Latin American financial sector extended up to 79.15 per cent in 2016. By comparison the financial sector in Sub-Saharan Africa provided only 57.68 per cent which is extremely low compared to other continents which proves that there is a lack of financing to African firms.

From 1990 to 2016 there was a notably higher increase in credit from the financial sector in China, Europe and central Asia. In China, the percentage of credit from the financial sector increased from 80 per cent in 1990 to 215 per cent in 2016. Europe and Central Asia experienced a modest increase from less than 100 per cent in the 1990s to 144.39 per cent in 2016. However, in Africa, the proportion of financing provided by the financial system has oscillated between 60 per cent and 80 per cent from 1990 to 2010, which then declined from 2010 to 56.67 per cent in 2016. As shown in Figure 2-8, from 2010, the percentage of credit extended by the financial sector to sub-Saharan African countries is declining on average when compared to the other continents. Europe America and China experienced an increase in the proportion of credit extended by the financial sector. The decline in credit extended by the financial sector attests to the shortage of financing among African firms and the lower leverage levels in firms in these economies.

The lower domestic credit provided by the financial sector could be due to the higher risk premiums of these economies and their firms. As shown in Figure 2-9, some selected African countries exhibit very high credit-risk premiums which may make financial institutions reluctant to extend credit locally. For instance, in 2016, according to the World Bank financial survey data, countries like Malawi have as high as 20.49 per cent, Zimbabwe more than 100 per cent, Nigeria 7 per cent, Mozambique 11 per cent compared to as low as 2.15 per cent in Germany and 1.46 per cent in Malaysia. African countries are high-risk and financial institutions extend less credit to the private sector which hinders investment and growth in these countries. According to the *World Bank Enterprise Survey of 2016*, only

21.33 per cent of firms in Africa use banks to finance their investments indicating a lack of financing for most African firms.

2.3.3 Risk premium on lending

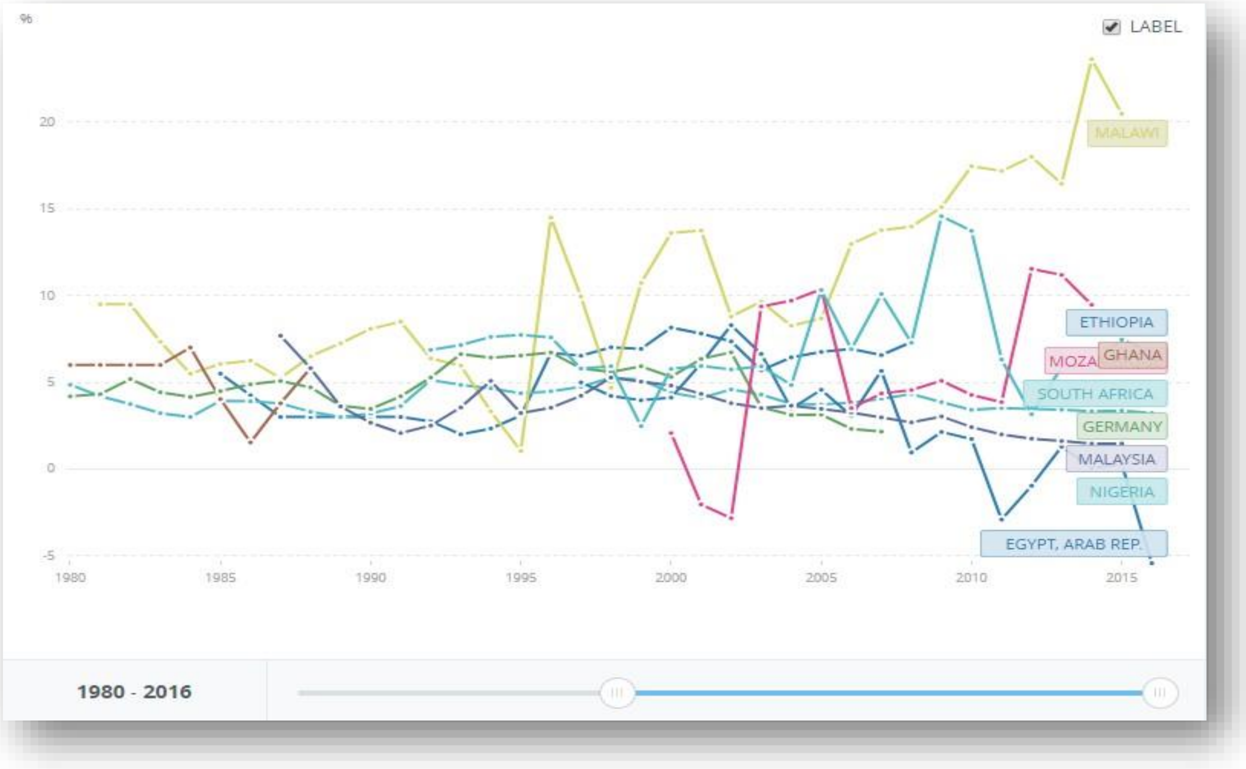


Figure 2-9 Risk premiums on lending

Source: International Monetary Fund and World Bank online estimates

2.3.4 Domestic credit to private sector (% of GDP)

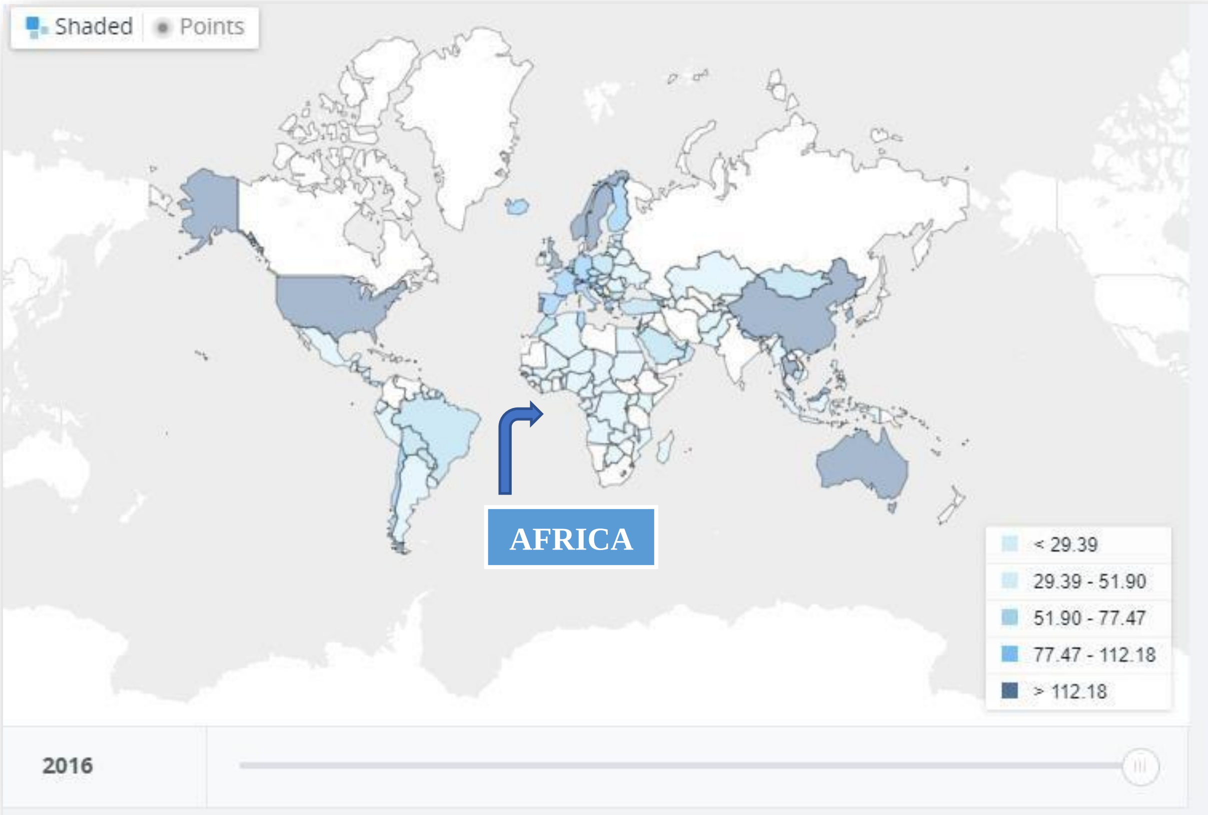


Figure 2-10 Domestic credit to private sector (% of GDP)

Source: International Monetary Fund and World Bank estimates.

Figure 2-10 shows the percentage of domestic credit to the private sector as a percentage of GDP. The map shows that African countries have the lowest proportion of credit channelled to the private sector and this could be one of the key reasons explaining the lower leverage of African firms. On average in African countries, from the smaller proportion (57,68%) of credit extended by the financial sector (as shown in figure 2-10) only 29 per cent was extended to the private sector as in 2016 (International Monetary Fund data). This is extremely low compared to other continents and economies in the developed regions. For example, the average credit extended to the private sector as a percentage of GDP as at 2016 in the US stands at 192.739 percent, 157 per cent in China, Australia 142.858 per cent, 77.471 per cent in Germany and the United Kingdom at 135.894 per cent. These statistics show that African firms suffer a serious shortage of funding which is attributable to the less developed financial systems, lack of competitiveness in the financial system, fewer financial institutions and banks in these countries as shown above. African firms might be underutilising, or they might not be enjoying, the interest tax -shield benefit of leverage as suggested by the trade-off theory on the benefits of debt financing. Therefore, they have low firm values. If this is the case and if leverage really amplifies investment as suggested by financial theory, the lower credit extended to African firms may suggest an underutilised tool which may boost investment if used correctly.

Danso and Adomako (2014) show that, on average, more than 50 per cent of firms in sub-Saharan Africa identify shortage of funds as a major constraint to investment and growth. *The World Bank Enterprise Survey* of 2013 indicates that, in the high-income countries on average, 14 per cent of firms specify access to finance as a constraint. This shows that access to financing is a major constraint that hinders firms' investment and development in Africa. Higher interest rates (due to high chances of default from many risky African firms) makes it difficult for firms to access finance where credit is available.

African firms thus face different financing models compared to their compatriots in the developed economies because most of the financial markets in the African continent are still in their developmental stages hence limiting the sources of finance for firms operating in these economies. There are no bond markets in most economies in Africa, or the bond market is dominated by governments with very few corporates participating in the issuance of bonds**.**

2.4. Corporate bond market capitalisation (% of GDP)

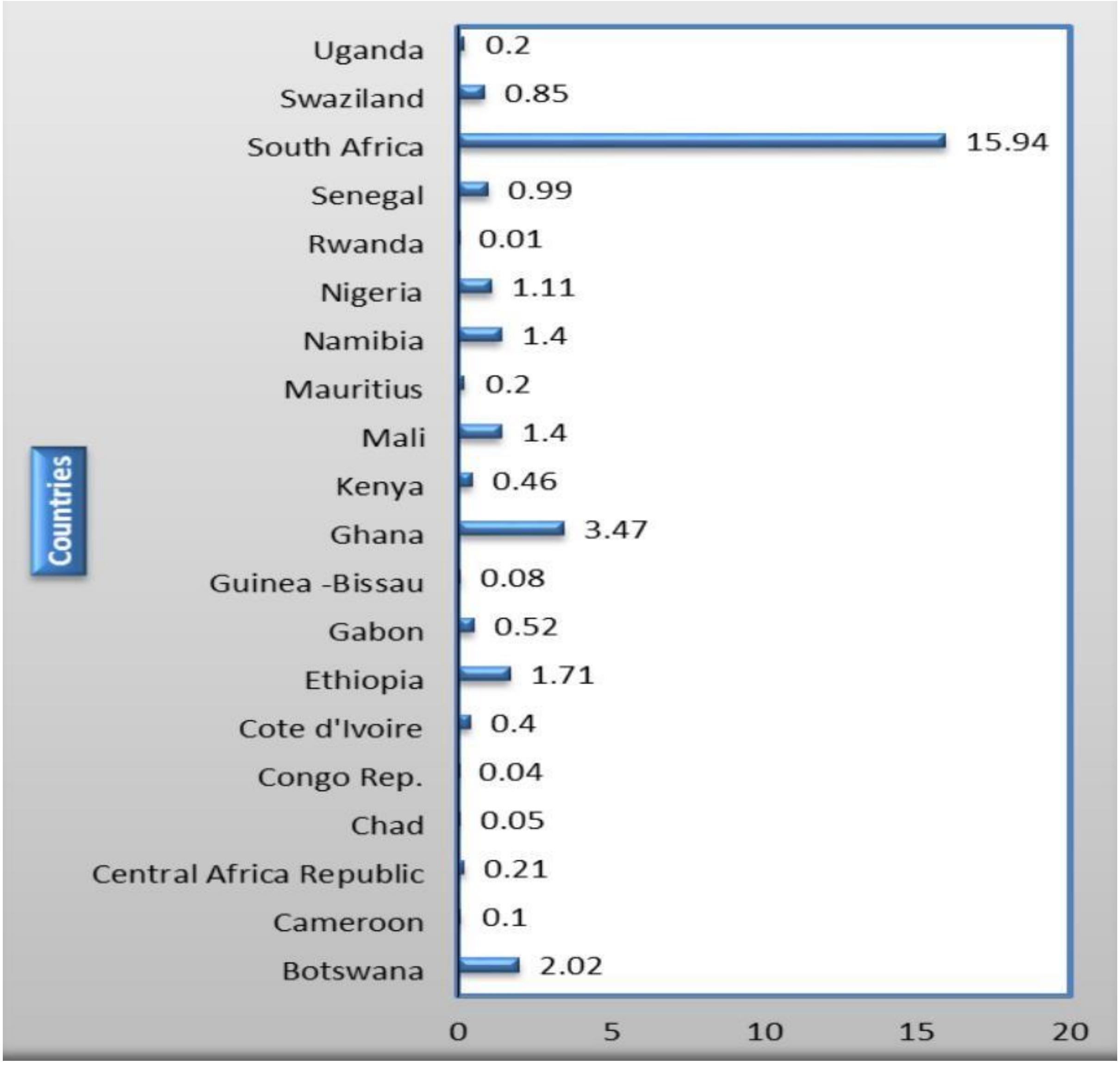


Figure 2-11 Corporate bond market capitalisation

Source: Mu, Phelps and Stotsky (2013)

Figure 2-11 shows the bond market capitalisation of African countries as a percentage of GDP in the sub-Saharan region with bond markets. In 2013 most of the countries have less than 0.5 per cent, except for South Africa, Ghana and Botswana with 15.94,3,47 and 2.02 respectively. On average, the market capitalisation of the bonds is less than 1.3 per cent in the Sub-Saharan region and 1.8 per cent for all African countries compared to 98.6 per cent and 46.4 per cent in the USA and Europe respectively (Mu et al., 2013). The first country in Africa to issue bonds was South Africa, followed by Ghana in 2007 when they issued $750m debt on the international capital market. This indicates that the debt market in Africa is still at its developmental stage suggesting limited supply and access to finance for African firms**.** Therefore, many African firms depend more on equity financing than on debt financing (*World Enterprise Surveys*, 2011) as opposed to firms in developed economies with well-established financial systems and institutions**.** Could this explain the low activity on the stock markets and the perception that the issuance of stocks is taken as a bad signal that firms financing through the stock market have limited growth opportunities ,therefore, they want to spread the risk.

2.5 Debt capital market activity

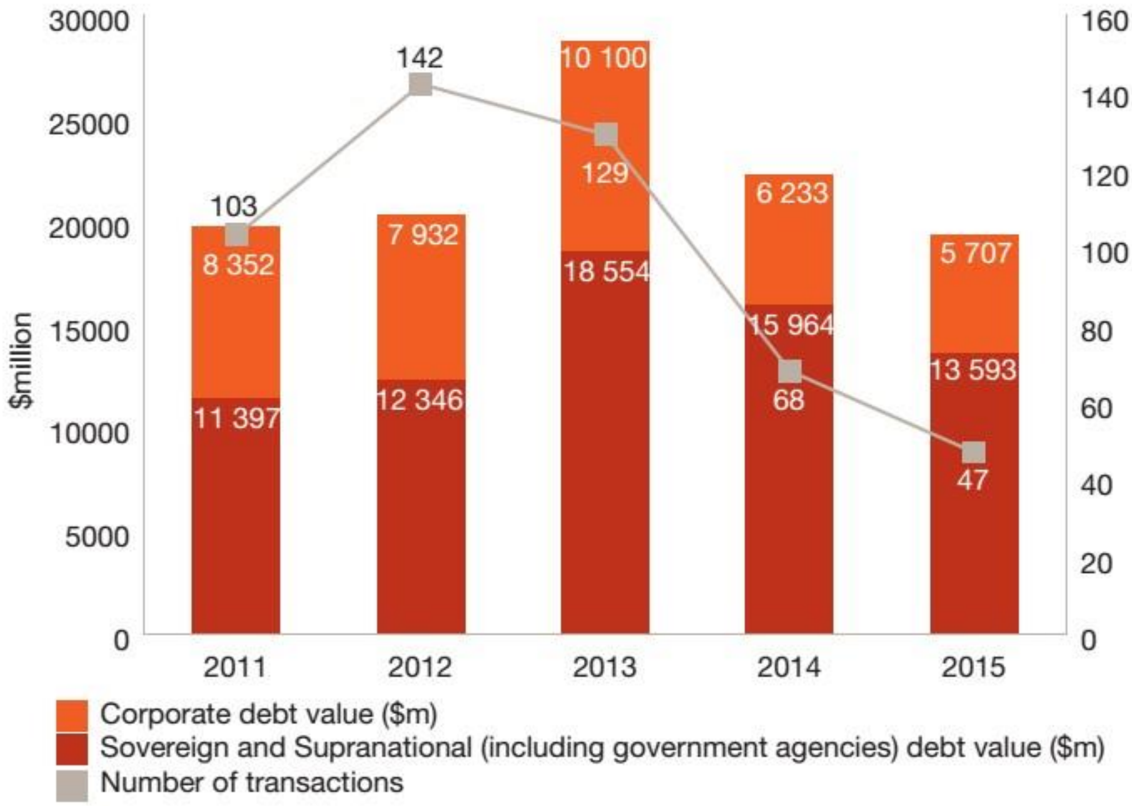


Figure 2-12 Debt capital market activity

Source: PwC Africa Capital market survey (2016)

Figure 2-12 shows African debt market activity. The debt capital market constitutes a small proportion of total debt raised by the firms with the larger portion raised through loans from financial institutions (PwC, 2016). There is a notable decline in debt market activity in

Africa from an historic peak in 2013, which is a result of African economies responding to the signals of the impending monetary-policy tightening of the US by tapping the debt markets (PwC, 2016). According to the *PwC capital market survey report of 2016* that, in 2007, Egypt, South Africa and Tunisia were the only economies with sovereign bonds issued in the international capital markets. To date, almost 15 African economies have come on board the debt markets. For example, in 2013, Nigeria launched its Nigeria over-the-counter (OTC) trading platform which created a secondary market for local debt. It is worth noting that the larger proportion of the average debt outstanding on the debt capital markets for African countries is sovereign debt. Corporate debt remains low and is declining over the years indicating less financing to the private sector. The increase in sovereign debt questions the sustainability of indebtedness levels for some of these countries. In total, from 2011 to 2015, 489 transactions took place in the African debt market, or internationally, by African firms, raising $110.2 billion (PwC 2016). The low debt levels in African economies entails lower sources of finance, therefore, the heavy reliance on equity and the foregoing of some positive NPV investment should the firm fail to raise equity-financing.

2.6 Sources of funds for investment

Firms can finance their operations internally through retained earnings or externally through capital and debt markets. Table 2-1 shows that African firms use more internal financing and less external financing from the stock markets and debt markets. On average 9.7 per cent and 2.9 per cent of total financing comes from debt and the stock market respectively. The proportion of financing from the stock market and banks/bonds remains low. This can be explained by the lack of development in the stock and bond markets of these countries. Lack of funding constitutes the main drawback for corporate sector development in African countries. The growth of Pan African banks and Micro-finance institutions (MFIs) has alleviated financing problems. For instance, the Ecobank operating in at least 32 countries on the continent, The United Bank of Africa, Stanbic and the Standard bank have also spread across Sub-Saharan Africa, controlling more than 30% of total deposits in this region in at least 13 countries *(European Investment Bank, 2013).*

Sources of capital for African firms

Table 2-1 Sources of capital for African firms

Country	Investment proportion financed internally (per cent)	Investment proportion financed by banks (per cent)	Investment proportion financed by equity/stock sales (per cent)
Benin	88.5	2	0.6
Burkina Faso	77.2	15.6	2.4
Cameroon	67.3	13	3.5
Cape Verde	56.7	23.9	13.9
Chad	83.8	2.3	2.5
Congo Rep.	84.6	4	1.2
Cote d'Ivoire	89	3.7	-
Eritrea	94	1.3	1.1
Ghana[17]	86.5	9.6	0.6
Gabon	92.9	3.2	0.4
Lesotho	50.9	23.3	6.6
Liberia	79.8	6.7	2.8
Madagascar	79.5	6.1	2
Malawi	75.5	13.4	2.9
Mauritius	51.9	30.8	-
Niger	89.2	7.8	1
Nigeria[18]	92.8	1.3	0.1
Sierra Leone	87	3.7	5.2
Togo	70.3	13.1	1.8
Average	***78.8***	***9.7***	***2.9***

Source: World Bank Enterprise Surveys (2011)

2.7 African Stock Markets

The preceding sections covered the financial and credit facilities accessible to African firms because it is crucial to develop an in-depth understanding of major issues underpinning and surrounding the financing choice and investment behaviour of these firms. The adoption of global financial liberalization in many economies has resulted in a shift from the developmental approach towards more emphasis on the private sector and the involvement of the standardized capital markets as a source of finance for the private firms (Yartey and Adjasi, 2007). The stock markets play a central role in the financial market liberalization and in creating a market-dominated economic system (Nwankwo and Richards, 2001). The stock markets offer the provision of long-term capital through equity and diversified financial markets because firms will not rely predominately on the traditional source of capital (the banking sector), but can also utilize the stock markets to raise capital. Institutionalization of the stock markets enhances economic development through the provision of the means of savings that can improve the quality and quantity of investment for economic growth (Yartey, 2009). Considering the above, this section reviews the stock markets from which African firms operate.

Table 2-2 below shows the list of stock markets in Africa and their founding dates. There are 29 stock markets in Africa serving 38 economies. The continent has two regional exchanges: in Central Africa, the Bourse Regionale des Valeurs Mobiliers (BRVM) situated in Abidjan, Cote d'Ivoire, serving Burkina Faso, Benin, Guinea Bissau, Mali, Cote d'Ivoire, Niger, Togo and Senegal. The second regional exchange is the Bourse Regionale des Valeurs Mobilieres d'Afrique Centrale (BVMAC) situated in Gabon. The BVMAC serves Chad, Congo, Equatorial Guinea, Gabon and the Central African Republic.

The stock market history in Africa dates back to the establishment of the Egyptian Exchange and the Johannesburg Stock Exchange (JSE) which were founded in 1883 and 1887 respectively. Most of the stock exchanges in Africa were established within the past 30 years. Out of 53 countries in Africa, there are only 28 stock exchanges on the continent, with two regional stock exchanges, Bourse Regionale des Valeurs and Bourse Regionale des Valeurs Mobilieres d'Afrique Centrale. Danso and Adomako (2014) note that stock markets establishment in African countries were mainly the result of government initiative rather than as a response to the corporate world demand to widen their financing options. Consequently, stock markets in Africa remain underutilised, shallow, illiquid, heavily undercapitalized and with very few securities traded.

Table 2-2 List of stock exchanges in Africa

Economy	Exchange	Founded	Listings
Algeria	Algiers Stock Exchange	1997	5
Angola	Angolan Debt and Stock Exchange	2016	-
Botswana	Botswana Stock Exchange	1989	44
Cameroon	Douala Stock Exchange	2001	2
Cape Verde	Bolsa de Valores de Cabo Verde	2005	4
Cote d'ivore	Bourse Regionale des Valeurs Mobilieres	1998	39
Egypt	Egyptian Exchange	1883	833
Ghana	Ghana Stock Exchange	1990	37
Kenya	Nairobi Securities Exchange	1954	64
Lesotho	Maseru securities Exchange	2016	-
Libya	Libyan Stock Exchange	2007	7
Malawi	Malawi Stock Exchange	1995	14
Mauritius	Stock Exchange of Mauritius	1988	170
Morocco	Casablanca Stock Exchange	1929	81
Mozambique	Bolsa de Valores de Mozambique	1999	8
Namibia	Namibia Stock Exchange	1992	34
Nigeria	Nigerian Stock Exchange	1960	223
Rwanda	Rwanda Stock Exchange	2008	8
Seychelles	Seychelles Stock Exchange	2012	21
Somalia	Somali Stock Exchange	2015	2
South Africa	JSE Limited	1887	402
Sudan	Khartoum Stock Exchange	1994	54
Swaziland	Swaziland Stock Exchange	1990	10
Tanzania	Dar salaam stock exchange	1998	25
Tunisia	Bourse de Tunis	1969	56
Uganda	Uganda securities Exchange	1997	17
	ALTX East Africa Exchange	2013	3
Zambia	Lusaka Stock Exchange	1994	16
Zimbabwe	Zimbabwe Stock Exchange	1948	64

Source: Bloomberg online financial database & African stock markets

Most of the stock markets in Africa have low market capitalization. According to PwC, between 2011 and 2016, African stock markets, for instance, Uganda, Tanzania, Zambia, Zimbabwe, Botswana, Namibia, Ghana and Mauritius, have between USD$ 1-$6 billion market capitalization. Tunisia is in the range of $6-$30, Kenya $30-100 billion and those above $100 billion are South Africa, Nigeria, Egypt and Morocco. Almost half of the countries do not possess a stock exchange or rather belong to a regional stock exchange. Although there has been an increase in activity of African stock markets, the motion is slow when compared to the standard of developed economies. For instance, between 2011 and 2015, 105 Initial Public Offerings (IPO) raised US$ 43.3 billion which is only 0.04389 per cent of the $US 986.7 billion raised the whole world over during the same period, with the UK accounting for 19 per cent, China 13 per cent, Hong Kong 11 per cent, UK 10 per cent and Japan 8-9 per cent (PwC, 2015). There were 489 sovereign and corporate debt issues between 2011 and 2015, raising US$ 110.2 billion in total for the whole continent, an amount that can be raised by one capital market in the developed economies in one year.

In sub-Saharan Africa, the JSE, as the oldest exchange, remains the most developed with relatively more securities traded and higher market capitalization, to date. In the early 2000s, the JSE was accounting for more than 90 per cent of the traded stocks and market capitalization in the region (Yartey and Adjasi, 2007). Over the last 15 years, there has been a remarkable development in the performance of other stock markets in other economies which now account for almost 50 per cent of the total market capitalization in the region. The JSE, as the most developed exchange in Africa, is ranked in the top 20 in terms of market capitalization by the global standards. African economies have made efforts to improve the condition of their stock markets. However, these stock markets experience serious reform challenges such as high transaction costs, low levels of liquidity, informational deficiencies, high costs in going public, inadequate infrastructure and manual operations (KPMG, 2013: Deutsche Bank, 2013)

2.7.1 Equity Capital Market activity in Africa

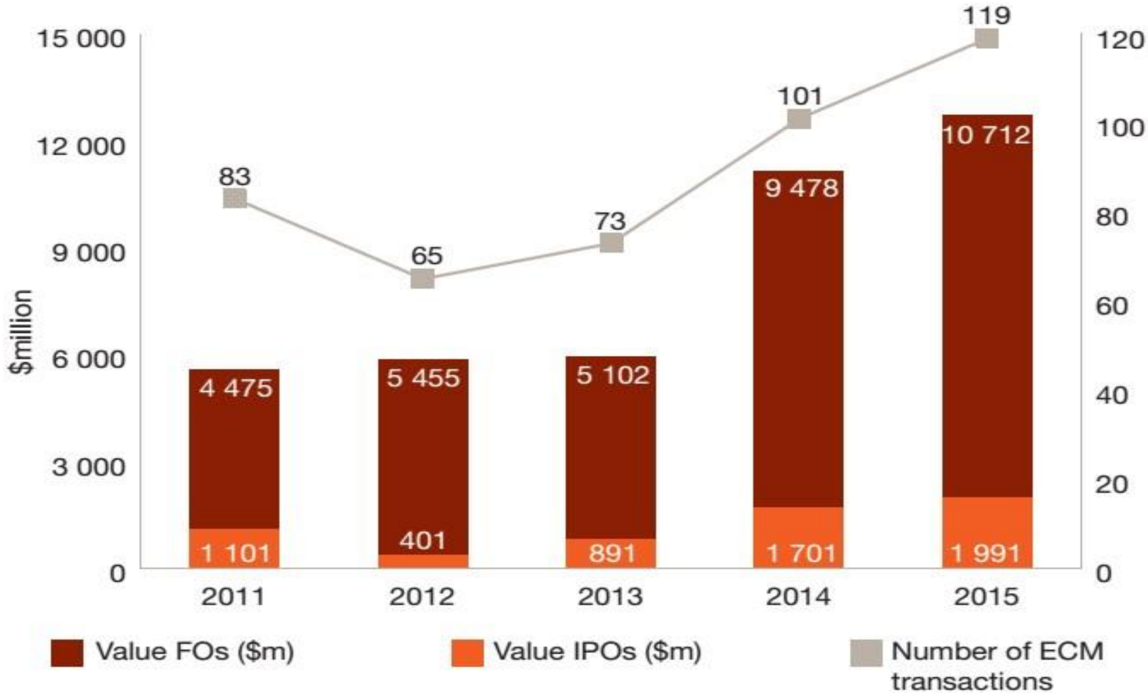


Figure 2-13: African Equity Capital Market activity

Source: PwC Africa Capital market survey (2016)

World IPO and FOs transactions average from (2011 – 2015)

YEAR	2011	2012	2013	2014	2015	TOTAL
IPOs	1036	719	858	1154	144	3911
FOs	2894	2506	3036	3170	3281	14887
Total						**18798**

Source PwC Africa Capital market survey (2016)

The figure shows the equity capital market activity in Africa from 2011 to 2015. It shows a steady increase in equity-market transaction activity over the years, indicating an improvement in the trading activities of many African stock markets in providing funding for firms. A steady increase in the number of IPO transactions indicates that companies continue to be attracted to the African continent despite the global volatility of the equities markets. This suggests better or untapped investment opportunities in Africa. However, there are relatively more further offers (FOs) than IPOs indicating a smaller increase in the number of new securities traded.

The number of equity capital market transactions increased from 65 in 2012 to 119 in 2015 to a total of 441 IPOs and FOs. The 441 transactions in Africa are only 0.023 per cent of the total 18 798 world transactions compared to the US which accounts for more than 25 per cent, China 13 per cent and UK 9 per cent of the total transactions for the period. The value of IPOs in 2015 in Africa was only US$ 10,712 billion versus US$ 38.133 billion for the US, US$ 26.091 billion for China, US$ 20.07 billion for the UK and US$ 200.7 billion for the whole world (PwC 2015). This shows that African stock markets are less developed, shallow and illiquid and incapacitated to provide enough capital for significant firm investment.

2.7.2 Stocks traded turnover ratio of domestic shares traded

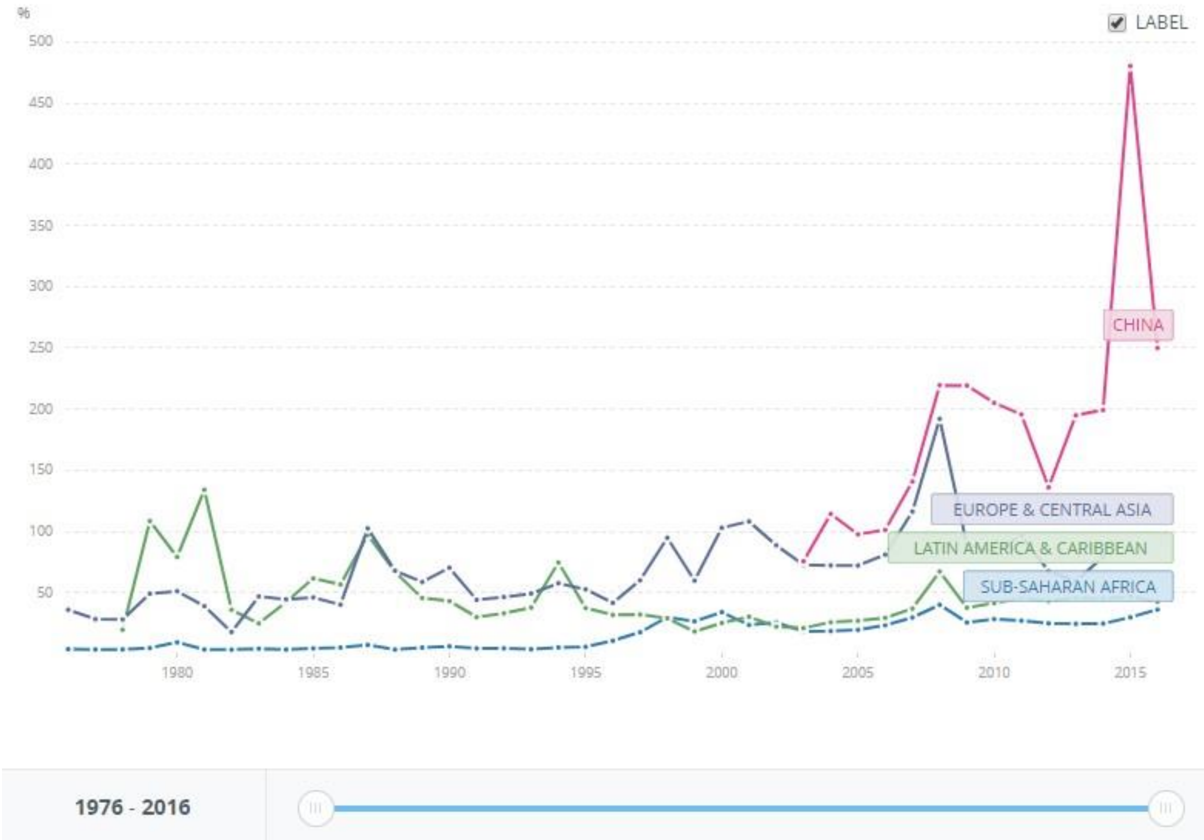


Figure 2-14 Stock turnover ratio on traded stocks

Source: World Federation of exchanges online database

The figure shows the turnover ratios of domestic stocks traded from 1976 to 2016 for China, Europe, Central Asia, Latin America, the Caribbean and Sub-Saharan Africa. As shown in the figure above, the sub-Saharan African region experiences the least returns; less than 20 per cent on domestic stocks traded over the years. China experiences the highest returns from 2005 until 2016. It is worth noting that, irrespective of higher risks, the returns of the sub-Saharan stock markets are low and relatively 'small change' compared to other regions.

2.7.3 African Stock Markets Performance

Figure 2-15 African stock market performance

Source: PwC 2016

The figure above shows the stock market performance of selected African countries from November 2016 to September 2017. As shown in the figure, from 2016, most of the African stock markets were below 0 per cent with few slightly above 10 per cent. Morocco, Nigeria and Egypt are among the best performers historically for the period shown in the figure above. The underperformance of stock markets suggests lack of proper financing and allocation of resources for investment purposes in these economies.

There are sixty major stock markets in the world with over USD$ 60 trillion market capitalisation. 16 of these stock markets have over USD$ 1 trillion in capitalisation comprising the '$1 Trillion Club' which accounts for 87 per cent of the global market capitalisation. Over 93 per cent of the world's stock market capitalisation is divided into three continents Asia, America and Europe. Stock markets in Africa are generally small in comparison to those in developed regions. Most of the stock markets in Africa have a market capitalisation of below US$ 50 billion and very few listings of less than 15 securities in many countries. For the past 10 years, African stock markets have experienced a modest growth in stock market capitalisation and number of listings. In 1999 the total market capitalisation was only $ 113 billion which rose sharply to $ 1.5 trillion by 2013 for the whole continent of Africa. Despite the growth in these markets, this is a relatively insignificant amount compared to the standards of the developed economies. For instance, the total market capitalisation of Africa as a continent is less than 10 per cent of the New York Stock Exchange alone with almost $ 20 trillion capitalisation and almost 5 per cent of US (NYSE and NASDAQ). South Africa has the largest stock market accounting for more than 60 per cent of the total capitalisation of African stock markets with at least $ 970 billion and almost 400 listings.

2.7.4 Top Stock markets in Africa by capitalisation and listings

The Johannesburg Stock exchange was founded in 1887 and is Africa's biggest stock market with a market capitalisation in excess of $ 990 billion as of March 2017 There are 400 listed companies, 76 foreign-domiciled firms and, on average, 2788.78 per cent market capitalisation over GDP. The JSE, besides being the largest African stock market, is highly competitive in the global stock markets. In 2015 it appeared in the top 5 fastest growing stock markets, with between 25 per cent to above 30 per cent growth in total market value, in the world. The second largest stock market in Africa is the Nigerian Stock Exchange (NSE), formed in 1960 as the Lagos Stock Exchange. The NSE is among the most developed stock markets in Africa offering a wide range (by African standard) of instruments in equities, derivatives and bonds. The NSE has a market capitalisation of over $ 115 billion with more than 200 listings and 8.83 per cent market capitalisation to GDP. The Egyptian Stock Market (EGX), one of the oldest stock markets in Africa, founded back in 1883, is the third biggest stock market in Africa. The EGX has two exchanges, the Alexandria, formed in 1883 and the Cairo Stock Exchange, opened in 1990. The EGX has a market capitalisation above $ 57 billion with more than 222 listings and 17.61 per cent market capitalisation to GDP. The fourth largest stock market in Africa is the Casablanca Stock Exchange (CBE) in Morocco, established in 1929. The CBE has a market capitalisation of $54.8 billion, 75 listings and 46.43 per cent market Cap to GDP. The Namibian Stock Exchange (NSEX) is the fifth largest stock market in Africa and is one of the oldest exchanges in the region, founded in 1904. The NSEX has $ 136 billion market capitalisation with more than 40 listings. In terms of market capitalisation, the NSEX comes second to the JSE and fifth in terms of listings and activity. Botswana is also part of the largest stock markets in Africa by capitalisation with more than 40 listings and $ 58 billion in market capitalisation. Ghana and Kenya also have relatively larger stock markets. Ghana has $ 28 billion capitalisation with 34 listings and Kenya has 61 listings accounting for $21 billion in market capitalisation. 96 per cent of the average daily transactions in Africa are accounted for by these top five stock markets (JSE, NSE, CBSE, EGX and the NSEX). However, the larger proportion, almost 75 per cent, is represented by South Africa.

2.7.5 The smallest stock markets in Africa and the world

Seychelles securities exchange opened in 2012. It is the smallest capital market in Africa and ranks number one on the world's smallest 8 stock markets with a market capitalisation of USD$ 43 million and 4 listings. The second smallest stock market in Africa is Cameroon (*Douala* Stock Exchange) and ranks number three in the world's 8 smallest stock markets. Douala Stock exchange has $ 317 million market capitalisation and 3 listings. Rwanda stock exchange is the third smallest stock exchange in Africa ranking fourth in the world's 8 smallest exchanges with $ 480 million market capitalisation and three listings. The fourth smallest stock market is the Bolsa de *Valores* in Mozambique with $ 1.5 billion capitalisation and 3 listings and ranks number seven in the 8 smallest stock markets in the world. Of the eight smallest stock markets in the world, four of them come from Africa with Seychelles being the smallest both in Africa and the world. This indicates that stock markets in Africa are relatively smaller, illiquid and shallow compared to world standards.

Stock markets in Africa are excessively risky, less liquid and shallow with very few securities traded in underdeveloped institutional environments. With regard to African stock markets listings, the PwC Africa capital markets watch indicated that in 2016 only 20 IPOs were issued, 110 IPOs between 2012 and in 2016, 110 IPOs. $ 1.5 billion proceeds were raised in 2016 and $ 6.5 billion raised between 2012 and 2012 across Africa. A relatively larger proportion was raised on further offers (FOs); $ 7.3 billion in 2016 and $ 38.4 billion from 2012 to 2016. Compared to global transactions, the 20 IPOs in 2016 represent only 2 per cent of the 982 global transactions in 2016 with the proceeds raised $ 1.5 billion only accounting for 1 per cent of the $ 140.3 billion proceeds on the global scale. Whereas developed nations, such as the US, accounts for 18 per cent, China 17 per cent and Hong Kong 15 per cent Afego (2013) also shows that African stock markets have below 50 per cent stock market capitalisation as a percentage of GDP which shows lack of depth in these stock markets. As illustrated by low turnover, very few securities, range of tradable liquidity instruments and inactivity remain major problems in African stock markets compared with developed economies.

2.8 Chapter Summary

This study focuses on firms listed in African stock markets. In providing the necessary background information to the context from which this study is premised, this chapter presented a financial and macroeconomic overview of Africa from where our sample was drawn. Evidently, African economies experience enormous developmental, operational and structural challenges. On the other hand, they present great investment opportunities for international investment due to capacity, underutilisation and shortage of finances. With regard to economic development, Africa is not synchronized with the rest of the world due to massive infrastructural gaps and relatively poor, shallow and underdeveloped operating and financial environments. The capital markets which are key to resource allocation in different sectors of the economy for investment purposes remain shallow, illiquid and narrow. The financial systems of African economies are small and largely inefficient for the financial intermediation process. Such inefficient capital markets and financial systems hinder capital formation. Therefore, African firms have much less access to financing from banks and the capital markets which hinders firms' investment potential and, ultimately, economic growth. Consequently, firms in Africa and other developing countries are bound to behave differently from those in the developed economies because of their different economic and financial levels of development. In light of the above, due to compromised financing structures and shallow illiquid capital markets, the performance and cash flows of firms in these markets become more volatile, unpredictable and low thus affecting the investment behaviour of these firms. The next chapter presents the empirical analysis of the association between leverage and investment in African firms.

CHAPTER 3

The impact of leverage on investment:

Evidence from the GMM estimation

3.0 Introduction

Economic theory postulates that there is an interaction between financing and economic growth via investments (Mishkin, 2007, Benhabib and Spiegel, 2000, Kargbo11 and Adamu, 2009). Leverage fuels investments and investment leads to economic growth (Omet and Mashharawe,2003) Financial theory posits that leverage is power; it amplifies returns (Guschanski and Onaran, 2016). Firms can support and fuel their profitable growth and expansions using leverage if their operations generate higher returns and they currently have insufficient funds to undertake or fund growth or expansion. On the other hand, too much debt can be harmful to firms causing financial distress and bankruptcy. Given the fundamental role of leverage, numerous studies on the relationship between capital structure and firm value in both developed and developing economies can be found in the financial literature. However, studies centred on leverage and investment have not gained much attention. The few existing studies in this area were conducted in developed economies yielding inconclusive results. There is no (general) consensus on the effect of leverage on a firm's decisions this may leave financial practitioners especially in developing economies in a dilemma on the best practices to adopt. Thus, such an investigation will help cover this gap. African firms' leverage levels are increasing from their low levels but investment is low and their economies are not growing (Souza et al., 2015). This study seeks to provide new substantiation evidence on how the conservative use of leverage by African firms is impacting on investment. This section covers the first objective of the study which sought to examine the impact of leverage on discretional investment in African firms**.**

This study contributes to the literature on the relationship between investment and financial leverage in a number of ways. It provides evidence from Africa, a developing continent that has not yet been explored. As has been pointed out in Chapter One, the few existing studies have concentrated on developed nations and, considering that firms in developing nations may behave differently due to different market systems and conditions, analysing firms in developing economies separately becomes important. This study extends the existing literature in several ways and shows how conservative leverage levels of African firms (which have been reported to be rising) are impacting on investments. Pertaining to empirical methodology, we employ a dynamic panel-data model which controls the heterogeneity in individual countries and firms. The GMM-estimation technique, which is robust in controlling endogeneity, and a possible bidirectional causality between leverage and investment through differencing and use of natural instruments as a system of equations both in levels and at first difference with orthogonality conditions. Given the nature of our data, a dynamic approach and GMM become handy tools. To the best of our knowledge, this is the first study to use a dynamic model and GMM to estimate the association between leverage and investment.

In spite of different settings, markets and methodologies, the negative relationship between leverage and investment is confirmed. In support of the agency-cost theory by Myers (1977), we found that current low leverage levels are having a significantly negative impact on investment in African firms. This concurs with findings from different markets in developed economies, including those of Aivazian et al., (2005) from Canadian firms, Lang et al., (1996b), Seoungpil et al., (2005) using USA firms, and Yuan and Motohashib (2014) in China. The negative impact is maintained even for non-constrained firms. Our results also indicate that the negative impact is stronger in firms with low-growth prospects than in firms for which markets recognises better prospects.

African firms' investment policy does not depend solely on the neoclassical fundamental determinants of profitability, net worth and cash-flow alone, but the financing strategy also has a considerable bearing on the investment policy. Considering the current underdeveloped financial debt markets, African firms should consider relying more on internally-generated funds so as not to suppress any available cash-flow to interest payments and loan covenants from debt holders. Low debt will reduce the shareholder-bondholder conflict and the firm can freely take on any investment opportunities as they arise. However, low debt can fuel shareholder-manager conflict for those firms with no growth opportunities. Policy-makers in African economies should focus more on the advancement of financial markets to ensure availability of capital to firms.

The rest of the section is structured as follows: Section Two presents the theoretical aspects on leverage and investment; Section Three provides the research methodology and design; Section Four presents the results and findings and Section Five concludes the section.

3.2 Literature review

In establishing the unique theoretical grounds of this study, this section utilizes micro and macro-level approaches in analysing international literature on leverage, investment, liquidity and cash-flow sensitivity. The literature review is divided into three sections. Firstly, an overview of capital-structure theories and concepts relating to the research is outlined in developing the main theoretical foundations of this study. The section then reviews the literature on leverage and investment examining the determinants of firm investment policy based on theoretical and empirical studies. Secondly, the theories on stock-market liquidity are then related to firm-investment policy in Chapter Five. Finally, the chapter concentrates on cash flows and cash-flow sensitivity in relation to firm investment decision in Chapter Six. The hypotheses are discussed in view of theoretical literature on each pillar. To this end, the study establishes some theoretical framework for testing the impact of leverage, liquidity and cash-flow sensitivity on firms' investment policy.

3.2.1 Description and concepts

3.2.1.1 Financial leverage

In general, leverage is viewed as the capacity to stimulate an environment to multiply the outcome without correspondingly increasing the resources. This is a situation where costs are low with relatively higher yields. Gill et al., (2011) defined financial leverage as the degree to which firms use debt-financing in its capital structure. Leverage is a financial measure that looks at the ratio of capital that comes in the form of debt (Kramer, 2015). It can also be viewed as the use of borrowed money to influence production (Goldsmith, 2001). Different measures of financial leverage have been used in financial literature. Abor (2005) measured leverage in three different ways, all based on book values. Namely,short-term debt to total capital, long-term debt to total capital and total debt to total capital. Chen and Strange (2005) used two measures of leverage based on both market and book values. These include total debt to total assets, a book value measure and total debt to the market value of total assets, a market value measure (Jason Kasozi, 2010). Frank and Goyal (2003: 12) used five alternative measures of leverage that includes those above and others that consider the interest-coverage ratio instead of a debt ratio. These ratios differ based on whether or not book value measures or market value measures of leverage are used. They also differ in whether or not all debt or only long-term debt is considered (Jason Kasozi, 2010).

3.2.1.2 Investment

Firm investment takes into consideration funds used to acquire and upgrade physical assets (Baglioni et al., 2013). Investment is measured mainly by capital expenditure (CAPEX). An expense is considered to be capital expenditure if it is a newly-acquired capital asset or an investment that improves the existing asset's useful life (Aivazian et al., 2005). Investment can also be measured through the growth in physical or fixed assets.

3.2.1.3 Cash-flow

Cash-flow refers to a measure of cash generated from a firm's core business operations. Operating cash-flow demarcates the ability of a firm in the generation of sufficient funds to grow and maintain its operations or the need to borrow from external sources for expansion (Kim and Kross, 2005). Operating cash-flow excludes investment costs and long-term capital. Negative cash-flow may signal intensive investment in anticipation of future returns. Companies that have negative cash-flow use more funds than they generate implying a need to source external finance (Orpurt and Zang, 2009). Operating cash-flow is measured as earnings after tax plus non-cash charges plus or minus the increase in net working capital. The generally-accepted accounting principles (GAAP) require firms to compute cash-flow from operations indirectly through adjusting net income to cash-flow by changing non-cash accounts as depreciation and accounts as receivables (Bhattacharya et al., 2003). On the other hand, the *International Financial Reporting Standards (IFRS*) requires firms to calculate operating cash-flow as cash generated from operations (cash from operating customers minus cash from operating suppliers), less interest paid, tax, investment-income received less dividends paid (Barth et al., 2008).

3.2.1.4 Liquidity

Stock-market liquidity refers to how easily shares of stocks can be converted into cash (Blease and Donna, 2008). Liquidity can also be defined as the extent to which stocks can be sold at stable prices on the stock markets (Moffatt, 2015). A firm's stock is said to be liquid if it can trade rapidly and the trading volume has little impact on the price of the stock. Liquidity in a firm's stock can be assessed through the bid-ask spread. The bid-ask spread measures the difference between the buying and selling prices of a stock representing the yield to the broker or the dealer. For liquid stocks, the spread is thin, less than 1% of the stock's price (Wyatt, 2011).

3.2.2 Theoretical framework

The interplay of leverage, liquidity cash-flow and investment is a topical issue in corporate finance. The main theories underlying this study stem from the capital-structure theories from the works of Modigliani and Miller (1958a), popularly known as MM propositions. Using algebraic derivations, they demonstrated that in a world without corporate taxes the value of the firm is independent of its capital structure. Therefore, the value of a levered firm is equal to an otherwise identical unlevered firm. The implication of the MM propositions is that the sources of financing and firm value are independent decisions. Recent empirical development in the financial literature, based on market imperfections, have proved that these decisions are interdependent. If the original MM proposition holds, a firm's investment policy should depend only on those factors that increase profitability, net worth and cashflow. Several theories such as the trade-off, agency-cost, asymmetric and signalling hypothesis pecking-order theories have challenged this position over the years, advocating the benefits of leverage through tax shields emanating from taking on debt, trade-offs with the bankruptcy deadweight costs, the existence of agency costs and asymmetric information (Kraus and Litzenberger, 1973, Kim, 1978, Scott Jr, 1976, Myers and Majluf, 1984, Myers, 1984, Frank and Goyal, 2007). The main theory underlying this study explaining the investment policy is the agency-cost theory developed by Jensen and Meckling (1976) in explaining the managerial-behaviour agency cost and ownership structure.

The next section presents the overview of the capital-structure theories in developing the main theory underlying this study.

3.2.2.1 Overview of capital-structure theories

3.2.2.1. An Irrelevance proposition Miller and Modigliani (1958)

Modigliani and Miller (1958a) are the proponents of the capital-structure theory. Their theory was based on perfect markets with no transaction costs and informational asymmetries. Although the Modigliani and Miller (1958) proposition fails in imperfect markets, it builds a foundation for the understanding and development of capital-structure theory. Modigliani and Miller's (1958a) irrelevance proposition states that in perfect and efficient markets the value of a firm is independent of its capital structure or how the firm is financed. Rather, the value of a firm depends on its operating profits, (earning- power) and the risk of its underlying assets. A perfect market is a market in which there are no frictions such as transaction costs, information asymmetries and bankruptcy costs. The value of a levered firm is the same as the value of an otherwise identical all-equity firm. However, the proposition is based on restrictive assumptions that there are no taxes, agency costs, bankruptcy costs and informational asymmetries which are not attainable in the real world. According to the MM proposition II, without taxes the weighted average cost of capital (WACC) of a firm should remain constant with the increase in leverage because there is no tax benefit from interest expenses which keeps the cost of debt the same. Firms finance their investments with internally-generated funds or external financing through equity or debt. If the MM proposition that the financing structure is not relevant holds, then the investment policy of a firm should not be dependent on its financing policy. Recent developments in capital theory challenged this proposition advocating that investment and financing decisions are interdependent due the presence of agency costs and informational asymmetries (Darrough and Stoughton, 1986).

Modigliani and Miller later revised the irrelevance proposition relaxing the perfect market assumption of the irrelevance proposition to consider market imperfections. Developments in capital-structure theories are grounded and revolve around this school of thought. In 1963, MM presented a follow-up paper to take into consideration the effect of taxation. Since interest expense is tax deductible, firms can reduce their tax bill as it takes on more debt. Therefore, there are advantages in increasing leverage. MM with taxes proposition suggests that, as debt increases in the firms' capital structure, the value of the firm increases because of the present value of the interest tax shield. This proposition assumes that the optimal capital structure is hundred percent debt and the cost of capital decreases with an increase in leverage as equity is replaced by cheaper debt. The benefit of cheaper debt still offsets the increase in the required return on equity perfectly, but the company realises the additional benefit of the tax shield on interest payments. Solomon (1963) challenged this implication, suggesting that the cost of capital must increase with the increase in leverage as markets will demand higher returns at excessive leverage levels.

Modigliani and Miller relaxed their restrictive assumptions to take into account the existence of imperfect markets and informational asymmetry. Recognising the tax benefits of debt and the presence of bankruptcy costs has seen the progression in capital structure theories from the irrelevance propositions to the theoretical existence of optional levels of capital structure. The capital-structure theory and firm investment policy originate from the works of MM (1958) on the irrelevancy proposition under the restrictive assumption of perfect markets. Follow-up research in the 1960s considers the effects of imperfect markets following the tax benefits of debt and the existence of financial distress costs. In the 1970s the capital structure puzzle shifted to informational asymmetry and agency-costs arguments, dominantly from the works of Myers (1977), Jensen and Meckling (1976), Jensen (1986b), Myers and Majluf (1984). Figure 3-1 below, shows this evolution of the main capital-structure theories.

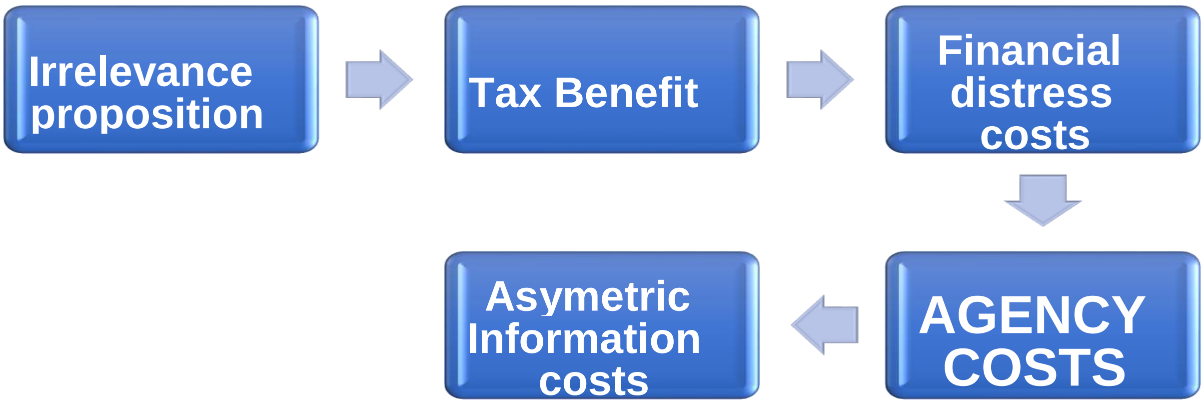


Figure 3-1 Development of capital-structure theories

Source: Author's Construction

3.2.2.1.B The Trade-off theory

The trade-off theory originates from the works of MM (1963) and Kraus and Litzenberger (1973) who introduced the existence of financial distress along with the interest tax shield from debt financing. According to the trade-off theory of capital structure, an optional level of leverage is identifiable and can be maintained at a point where the firm value is maximized. The trade-off theory suggests that firms attempt to balance the interest tax shield benefits and the costs of financial distress (Myers, 2001). Therefore, an optional level is a trade-off between the tax shields (benefits of debt) and the bankruptcy costs. Modigliani and Miller (1963), following their irrelevant proposition, indicate that, in the presence of taxation, leverage becomes valuable due to the interest tax shield. therefore, firms should use 100 per cent debt to fully exploit the advantage of debt. However, with the introduction of bankruptcy costs, the optional point becomes a trade-off between the benefits and costs of debt (Myers and Majluf, 1984, Frank and Goyal, 2007). According to the trade-off theory, a firm’s optimal capital structure should be at a point where they maximize the tax benefits whilst minimizing the costs of financial distress from excess debt.

The trade-off theory predicts that firms have a target level of debt which differs from firm to firm. Graham and Harvey (2001) document differing target-debt levels for non-financial firms in the USA confirming the prediction of the trade-off theory. Secondly, the trade-off theory predicts that an assets’ tangibility reduces the exposure to the financial distress costs. Therefore, firms with more tangible assets are expected to borrow more and firms with intangible assets are more exposed to bankruptcy and, therefore, should borrow less. Rajan and Zingales (1995) empirically examined seven developed economies and confirmed the prediction of the trade-off theory that firms have varying target-debt levels. Frank and Goyal (2007), for firms in the USA and Qiu and La (2010) for non-financial firms in Australia, also found that firms have a target level of debt and these target ratios vary from one firm to another as predicted by the trade-off theory.

3.2.2.1. C The Signalling Theory

The signalling theory is rooted in the informational asymmetries between firm management and shareholders. Managers are involved in the day-to-day operations of the firms. Therefore, they have insider information and their actions on capital-structure decisions will send signals to the market (Ross, 1977). If the firm is overvalued on the market, managers prefer to issue equity to take advantage of higher stock prices and issue debt when stocks are undervalued to avoid significant dilution. In this regard, an increase in debt sends a good signal into the market as management are expecting superior future earnings. Since debt is a binding contractual agreement by a firm to make future interest payments, taking on more debt is a sign that the firm is able to generate positive cash-flow to service the debt. Therefore, it is a positive signal.

Smith (1986), found a reduction in stock price following an announcement of new share issues and an increase in share prices after the announcement of debt issues. Bhana (2007), in analysing the reaction of the market to announcements of share repurchases using South African evidence, also found that a firm's management signals their optimism about the firm's prospects through share repurchases thereby confirming the effect of the signalling theory. Investors view equity issuance as a bad signal and debt announcement as an indication of a brighter future. Financial managers time their equity issuance based on their market assessment of their stock in order to take advantage of the developments on the stock market.

3.2.2.1. D The Pecking Order Theory and the Signaling hypothesis:

The Pecking Order Theory of capital structure was first suggested by Donaldson (1961) and further developed by Myers and Majluf in 1984. According to this theory, firms have no target-capital structure. There is a preferred hierarchy in financing a firms' operations from the three sources available, retained earnings, debt and equity. Firms prefer debt because of lower information costs associated with debt issuance. Firms prefer internal financing to external financing due to adverse selection. According to the Pecking Order Theory, managers value flexibility and control.

Internal financing through retained earnings enables managers to preserve control of the firm. Through debt financing, debt holders may impose restrictive covenants and reduce operational and financing flexibility and issuing new equity dilutes this control. (Myers and Majluf, 1984) Consequently, managers only consider external funds when internal resources are insufficient and, through not having to rely on external funds, firms build a slack fund or a reservoir of funds to use in periods of lower cash flow. Therefore, internal funds, through retained earnings, are the best alternative.

The information-asymmetry hypothesis posits that managers have more information than the investing public. Therefore, the actions of management are taken as a signal by the market participants. In the presence of asymmetric information, external financing results in a signalling problem. For example, equity issuance may signal overpricing of shares. The interaction of the threats of financial distress and the benefits of interest-tax shields play a secondary role in such signalling effects. Therefore, the imbalance between internal cash flows and investment opportunities, causes a shift in leverage (debt ratios). Therefore, firms with more investment opportunities exceeding their internally-generated funds, will go for external financing through first issuing debt. While those firms with more internally generated funds, but with little investment opportunities, will lower leverage (Shyam-Sunder and Myers, 1999). Consequently, high-growth firms should have a positive relationship with investment and leverage and low-growth firms, a negative association.

3.2.2.1.E Predictions of the Pecking order theory

According to the Pecking Order Theory, low leverage is expected for those firms generating strong cash-flow but with limited growth opportunities. Firms generating strong cash-flow will be able to finance their investments from retained earnings. For those firms with more growth opportunities, even at high cash-flow levels and higher retained earnings, may seek external financing to finance their investment prospects. The implication of the Pecking Order Theory is that firms with better profit opportunities will try not to issue shares, but use retained earnings or debt first in order to retain control and flexibility. Therefore, debt issuance is an indication that the company has excellent prospects that owners wish to retain for investment prospects.

According to the Pecking Order Theory, firms prefer retained earnings to debt and equity issuance. For firms with better profitability prospects, should retained earnings be insufficient, they would issue debt so that they don’t dilute the control of the firm and predict a positive relationship between investment and debt financing since, according to the Pecking Order Theory, the increase in profitability and investment opportunities is associated with debt issuance.

Lower-than-expected debt-equity ratios are maintained to take advantage of any investment opportunities without issuing equity. Increase in investment opportunities can be seen by an increase in debt-ratio. Therefore, there is a positive association between leverage and investment. A firm is said to own a 'war chest' for any investment prospects. Internal financing incurs no floatation costs and no additional disclosures are required on proprietary financial information. The Pecking Order Theory allows for the dynamics of the firm to dilute financing mix. The capital mix of a firm is a function of its investment prospects and internally-generated funds.

The Pecking Order Theory predicts that companies with few investment opportunities and high levels of free cash-flow will have low leverage. On the other hand, high-growth firms with low free cash-flow will have more leverage (Myers and Majluf 1984).

However, the Pecking Order Theory does not explain the set of investment opportunities available to a firm and it does not take into consideration the influence of taxes, agency costs and financial distress in the capital markets.

Rajan and Zingales (2002) found some evidence supporting the Pecking Order Theory from seven industrialised countries with a negative relationship between leverage and profitability. Shyam-Sunder and Myers (1999), in the USA, found evidence that strong cashflow generating firms use low leverage and high-growth firms order debt financing first should retained earnings not be sufficient. This finding supports the prediction of the Pecking Order Theory. Flannery and Rangan (2006) confirm the existence of the Pecking Order Theory using a partial adjustment model of leverage on listed firms in the United States. On the other hand, Frank and Goyal (2003), in a cross-sectional study of the American firms, found that net-equity issuance is more related to financing deficit than debt issuance. This observation contradicts the Perking Order Theory. Helwege and Liang (1996) found that the external financing of small firms in the USA does not follow the Pecking Order Theory.

Seifert and Gonenc (2010), in their regression of net debt on financial deficit in emerging markets countries, document that Pecking Order financing is only prevalent in economies with the issue of asymmetric information and significant agency costs. This is in line with the theory that firms' financial decisions are a function of the prevalent market conditions that they are operating in. Therefore, investigating the financing and investment behaviour of firms in developing economies with different market structures separately, is crucial.

3.2.2.1.F Summary of related studies on pecking order theory:

Table 3-1 Summary of related studies on POT

Rajan and Zingales (1996)	Report a negative relationship between leverage and profitability in seven industrialised countries. The negative relationship is evidence of the POT.
Shayam- Sunder and Myers (1999)	Supports the financing hierarchy in USA firms as predicted by the POT.
Frank and Goyal (2003)	Found evidence that contradicts the POT from a cross-sectional analysis of American firms. Contrary to the POT financing hierarchy, they report that net equity issuance is more related to financing deficit than debt issuance.
Helwege and Wang (1996)	An analysis of small firms in the United States reports that external financing of small firms does not follow the POT.
Flannery and Ranjan (2006)	Using a partial adjustment model of leverage on United States firms supports the existence of the POT.
Seifert and Gonenc (2010)	Argue that the financing hierarchy of the POT is predominantly in markets with issues of asymmetric information and significant agency costs. Their analysis was based on emerging markets. This result is inclined to the proposition that firms' financial decisions are a function of the prevalent market conditions in which firms are operating.

3.2.2.1 G Contracting-cost theories

Contracting cost philosophy stems from the works of Myers (1977) on the under-investment hypothesis. Myers (1977)'s under-investment problem highlights that firms with higher leverage levels are most likely to give up investment opportunities due to the high risk of default. Prospects of default also increase the cost of equity, further exacerbating the underinvestment problem. Building from the under-investment model, the contracting-cost hypothesis predicts that firms whose values are mainly derived from intangible investments will use leverage conservatively to minimize the negative impact of the under-investment problem. On the other hand, large firms in their mature stage, with little or no investment opportunities, will go for more leverage. The prediction of high-growth firms contradicts the Pecking Order Theory which predicts that high-growth firms with low free cash-flow will have more leverage (Myers and Majluf 1984).

Related studies on contracting cost theories:

Barclay and Smith (1996), using market-to book ratios, for growth opportunities, confirm a statistically-significant negative relationship between leverage and growth opportunities. Abor and Biekpe (2005) report a significant positive relationship between growth opportunities and leverage, using growth in sales as a proxy for growth opportunities for Ghanaian firms. Adam posits that the market-to-book ratio reflects more information about growth opportunities. Frank and Goyal (2009) used the market-to book ratio as a proxy for growth opportunities and found a statistically-significant negative relationship between the four measures of leverage that they used and growth opportunities measured by the market to- book ratio. Their findings are in line with Barclay and Smith (1996), but contrary to Abor and Biekpe (2005) in Ghanaian firms. In line with Frank and Goyal, Ovtchinnikov (2010) also found a negative association with debt ratios and growth opportunities.

Table 3-2 Summary of related studies on contracting cost theories:

Barclay and Smith (1996)	Reports a significant negative relationship between leverage and growth opportunities using the **market** to book ratio as a proxy for growth opportunities.
Abor and Biekpe (2005)	In an analysis of Ghanaian firms using growth in sales as a proxy for growth opportunities, found a significant positive relationship between growth opportunities and leverage.
Adam and Goyal (2008)	Posit that the market-to-book-ratio reflects more information about growth opportunities.
Frank and Goyal (2009)	Found a statistically-significant negative relationship between the four measures of leverage they used, and growth opportunities measured by the market for book ratio.
Ovtchinnikov (2010)	Reports a significant negative association between debt ratios and growth opportunities.

3.2.2.1.H The Agency cost theory

The Agency Cost Theory is the main theory underlying this study. The agency theory is based on the problems emanating from the conflict of the interest formed by the separation of company ownership from management. Owners are regarded as principals and management as agents. Agents (management) are expected to act in the best interest of the owners of funds (principals). The introduction of debt into the capital structure of a firm complicates the relationship introducing yet another conflict from the three parties involved, namely, managers, shareholders and lenders (bond shareholders). Bondholders have a controlling interest in the firm from the position of extended credit and they want to protect their investment. Shareholders, as owners want to take on more risky projects to get higher returns on their investment. The bondholder-shareholder conflict and shareholder management conflict results in implementation costs, monitoring costs and bonding costs as shown in Figure 3-2 below. Monitoring costs result from preventing managers from perusing their own objectives and monitoring shareholders and the firm from taking on excessive risks projects under financial distress. Bonding costs are the effects of loan covenants on the firm's investment and the bondholders. Implementation costs are the costs associated with managers' execution of the firm's operations. Poor operational strategies destroy the value of shareholders. The figure below shows the costs associated with the agency relationship in investment and financing policy.

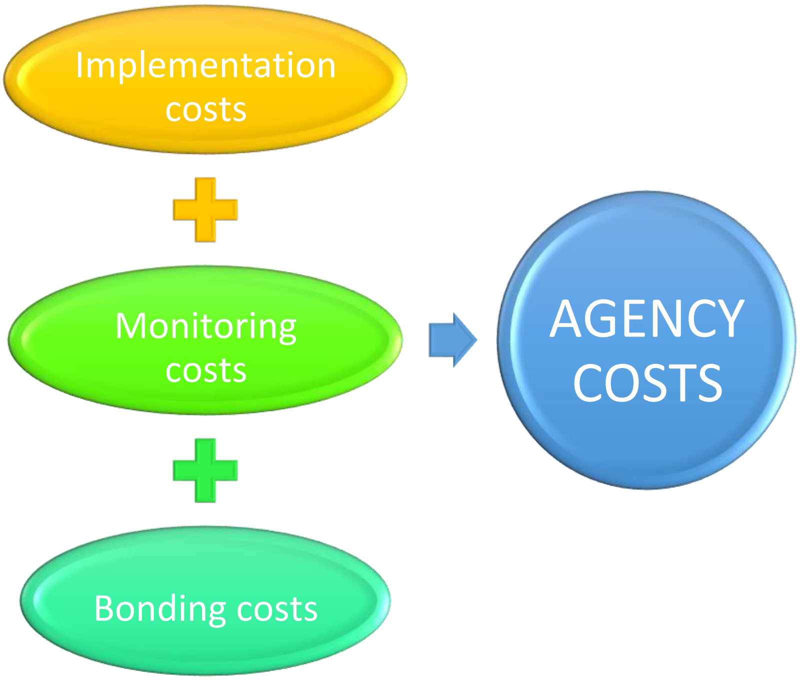


Figure 3-2 Agency costs

Source Jensen and Meckling (1976)

Breaking down the Agency cost of debt.

Managers have a mandate to maximize the value of shareholders in pursuit of value generation. They may be forced to engage in risky projects which they believe will be of value to existing shareholders. Bondholders, on the other hand, are more interested in the safety of their funds. Safer investments may, however, place restrictive covenants on the use of their money with the desire to reduce risk and protect their interest. Considering this, the firm might be forced to forgo some other risky investments that may amplify the returns to shareholders. The resulting costs are the agency cost of debt. The conflict is based on the fundamental difference in goals associated with shareholders, bondholders and management as executors. Jensen and Meckling (1976) posit that the conflict of interest among managers, shareholders and lenders (debt holders) leads to the agency problem and hence to agency related costs.

According to Jensen and Meckling (1976), the conflicts of interest that lead to agency costs are two-fold. First, the conflict of interest between managers and shareholders. Managers, as the appointed agents, may pursue the profits of the firm to their own personal benefit at the expense of shareholders. Secondly, a conflict of interest might arise between shareholder and creditors. In this scenario, debt may give shareholders the incentive to invest sub optionally. The conflict between shareholder and managers leads to the agency cost of equity and the conflict between shareholders and bondholders leads to the agency costs of debt. The agency costs of equity and agency costs of debt complicate the optimal investment policy of the firm which is central to firm performance (Leland, 1998).

Harris and Raviv (1991) argue that if the face-value of debt is less than the returns from an investment, benefits accrue to the shareholder. Conversely, if the investment yields negative returns, shareholders will enjoy limited liability by simply exercising their rights to withdraw and bondholders are left with a firm with a market value less than the debt extended.

In view of the agency-cost theory, if managers issue debt instead of equity they bind themselves to future cash-flow pay-outs. This will not be possible if they distribute cashflow in the form of dividends or any other risky investment. To protect bondholders, they make a promise to pay principal and interest. Failure to do so might cause the creditors to put the firm into bankruptcy. Considering this debt reduces the agency cost connected with free cash-flow by reducing the cash-flow at the disposal of the managers (Jensen and Meckling, 1976).Therefore, debt may prevent managers from investing in projects with negative net present values. However, on the other hand for those firms with profitable investment opportunities, debt may constrain investment due to less free cash-flow available after interest payments (Aivazian 2005). The agency-cost theory recognizes the benefits of leverage from tax shields, but, the theory stresses that debt involves more costs than benefits.

Predictions:

According to the agency-costs theory, firms with high profitability commit more of their earnings to servicing debt and, consequently, increase their credit-rating and boost their debt-capacity (Myers, 2001). In this regard, highly profitable firms, compared to investment opportunities, yield the benefits of debt, reducing the free cash flow problem (Jensen 1986). Considering this, the agency-costs theory predicts a positive relationship between leverage and profitability and a negative relationship between leverage and investment for firms with low growth opportunities. This theory predicts a negative relationship between growth opportunities and leverage with the argument that the under-investment problem is more pronounced for firms still in their growth stage and that they will become less leveraged (Frank and Goyal, 2007)

Myers (1977) posits that for those firms on the verge of bankruptcy, shareholders have no incentive to inject more equity finance even if there are positive net-present value projects because the benefits will accrue more to debt holders. This implies that high leverage may result in rejection of profitable investments.

Stulz (1990) argues that debt repayments may affect shareholders positively as managers are forced to pay out interest which reduces the over-investment problem. Interest payments commit a firm's cash flow and reduce the propensity to over-invest in unnecessary investments. On the other hand, debt payments may have a negative impact as firms may have to reject profitable investments leading to an under-investment problem.
Consequently, firms should strike a trade-off between the benefits and costs of debt.

Tests for the agency costs

Vilasuso and Minkler (2001) employed a dynamic capital-structure model and demonstrated that agency costs are associated with shifts in leverage. This finding implies that the higher the leverage, the higher the associated agency cost, indicating that an increase in leverage negatively affects the firm's operations. Harvey et al., (2004) found that the benefits of leverage are concentrated in firms with high expected-agency costs. Berger and Di Patti (2006) confirm that agency-costs predictions infer that leverage is positively associated with profit efficiency.

Debt financing and free cash-flow:

The conflict between managers and stockholders.

Jensen and Meckling (1976) emphasized that managers can act on their economic self-interest at the expense of the owners of the firm. Managers may conflict with shareholders because they may pursue their own interests, to mention a few large perks, power and empire building at the expense of owners' interests. This conflict can be reduced through share ownership and better compensation schemes to management. However, the alignment is almost imperfect. The availability of more free cash-flow accentuates potential conflict of interest between shareholders and management (Myers 1977). In free cash-flow theory, Jensen (1986b), the solution to avoid investments in projects below the cost of capital, unnecessary capital expenditures and organizational inefficiencies is increasing debt. An increase in debt forces a firm to pay-out cash in the form of interest payments. A firm is placed on a diet (Myers 2001) and hence unnecessary capital expenditures and inefficiencies will be corrected. Managers have to invest in projects that earn returns above the cost of debt.

The role of leverage is to force management to generate and pay out cash (Myers 2001). Debt financing will force management to maximize firm returns and minimize capital expenditure. Firms' cash flow will be committed to servicing debt and minimizing misuse of funds by management. However, this approach places a firm at higher risk if the general market is in a slowdown. High indebtedness increases the risk and cost of financial distress (Myers and Majluff 1984). Debt is valuable to firms that generally have more cash-flow (cash cows) and are more prone to over-investment.

Table 3-3 Studies on manager and equity holder conflict

Degryse and De Jong (2006)	They found that debt plays a significant disciplinary role for management agents' problems in Dutch non-financial publicly-traded firms.
Hart and Moore (1995)	Analysed the costs and benefits of leveraging and assuming empire-building tendencies on the part of management. They found that if a firm has little debt it is easier for management to invest in projects with negative NPV.
Jensen (1986)	The presence of free cash flow is the major source of agency problems where management can end up investing in negative NPV projects. Therefore, debt reduces the free cash-flow agency costs.

Conflicts between bondholders and shareholders

Free cash-flow creates agency problems between shareholders and management. The increase in debt financing to discipline management may, however, increase the financial distress costs and, consequently, accentuate the conflict of interest between bondholders and shareholders. When the firms' operations sit on the edge of collapse, incentives are diverted from maximizing the value of the firm from positive NPV projects towards shareholders and debt-holders thereby paving the way for their own interests and protection. Shareholders are keen to take on risky projects since the losses accrued fall to bondholders and, on the other hand, bondholders restrict the firm from any risky investment in order to protect their downside risk.

Action taken by shareholders in financial distress

a) Investment in high-risk projects/ risk shifting

Shareholders may engage in risk shifting when a company is close to collapse and liquidation. In anticipation of a turn-around, owners may be tempted to bet on high-risk projects for the last time (Jensen and Meckling 1976). In situations where the value of the assets of the company has fallen below the total value of equity and debt, shareholders will prefer very high-risk projects hoping for a return should the investment be successful since low-risk projects will yield low returns which will all accrue to bondholders. Therefore, higher leverage leads to higher agency costs. In times of financial distress debt-holders are desperate to protect their investment as they understand the investment shareholders. When a firm's assets are eroded, shareholders have nothing to lose and they may take higher risk bets to benefit from the potential of an upside whilst the downside risk is suffered by the bond holders. Losses are accounted for by the bond holders whilst shareholders score with profits.

b) Running off with the money

When the firm is heading towards collapse, equity holders may bolster their payouts through dividend-distribution, assets sales and spending lavishly, but this could force the firm into further difficulties. Shareholders are incentivised to increase their returns at the expense of debt-holders. In such situations, bondholders are left with less to recover in bankruptcy. Conflict arises as bondholders always try to prevent this from happening through loan covenants and monitoring, thereby affecting the firms' investment behaviour.

c) Restriction of investment by shareholders

Equity holders are not eager to invest further into a highly-leveraged firm which is close to bankruptcy. There will be no incentive to shareholders since all their returns will go to bondholders to cover their loans and, consequently, the shareholders are left with no benefits cutting back equity-financed investment.

d) Playing for time

Deterioration of the value of assets encourages bondholders to liquidate them as early as possible to avoid any further loses. Whilst, on the other hand, shareholders want to delay bankruptcy, hoping that an opportunity may arise that would increase the value of equity. Asquith and Wizman (1990) argue that levered buyout announcements trigger an average loss of 5.2 per cent in the market value of bonds without covenant protection. Alexander et al., (2000) found evidence that, at the announcement of a wealth-transfer event, common stock returns and junk bonds are negatively correlated. This shows the effect of contrasting interests and actions by shareholders and bondholders.

e) Changing the capital structure

An increase in debt ratio (leverage) in the firm's capital structure means a transfer of value from bondholders to the shareholders. The overall risk to bondholders will increase resulting in the loss in value of the bonds issued implying value transfer to shareholders.

Action by bondholders to protect themselves against shareholders' actions.

To protect themselves against actions which shareholders may take in transferring value to themselves, bondholders make use of loans and financial covenants. Loan covenants protect bondholders through the realization of assets or increases in interest rates once the loan agreements are breached.

Covenants that can be imposed by bondholders:

- Seeking permission from current bondholders to issue additional debt;
- Current bondholders to authorize any merger and acquisition deals;

- Limits on dividends. The firm will be given limits on the proportion of earnings they can pay out as dividends;
- Any disposition of major assets to be authorized by the debt holder;
- No guarantees or assets pledge to other firms; and
- The firm to comply with bondholders prescribed minimum working capital, interest coverage ratio, debt to equity proportions and maintenance of the certain minimum value of shareholders equity in the business.

Implications of bondholder-shareholder conflicts:

The bondholder-shareholder conflicts affect the firms' operation and investments. As firms take on more debt, investments are restricted. Bondholders will try to limit and monitor the investments that firms can take which leads to low investment. Firms may not be able to take on better investment opportunities as they arise. Firms that generate more cash-flow and are more prone to over-investment can benefit from leverage.

Table 3-4 Studies on equity and debt-holder conflicts

Phillips (1995)	Using four industries which experienced an increase in debt, Phillips found that leverage is negatively associated with **output**. Leverage commits a firm to debt-servi**ci**ng from part of their free cash flows and, therefore, they cut down on investment. Supporting the view that debt overhang induces firms to reject projects with positive NPV leading to underinvestment.
Myers (1977)	Firms' assets can be seen as a call option deriving value from the firms' future investments. The present value of the firm can be reduced by risky debt due to the sub-optional investment strategy. Therefore, in acting in the best interest of shareholders, managers may reject the project with positive NPV.
Brito and John (2002)	Re-evaluating the risk-shifting model from Jensen and Meckling (1976) they included growth opportunities. They suggest that a firm's growth opportunities may have eliminated the potential underinvestment problem and a reduction in the risk-shifting behaviour. They claim that growth-opportunities may also lead to risk-avoidance

Predictions of the Agency conflicts:

In a world with market imperfections, investment and financing decisions are interdependent (Morgado and Pindado, 2003). Informational asymmetries and agency costs may lead to under-investment or overinvestment problems. Under-investment arises when positive NPV projects are not undertaken and over-investment arises when projects with negative NPV are undertaken. Informational asymmetries among the stakeholders give rise to conflicts between management, shareholders and bondholders accentuating over and underinvestment (Myers 1977)

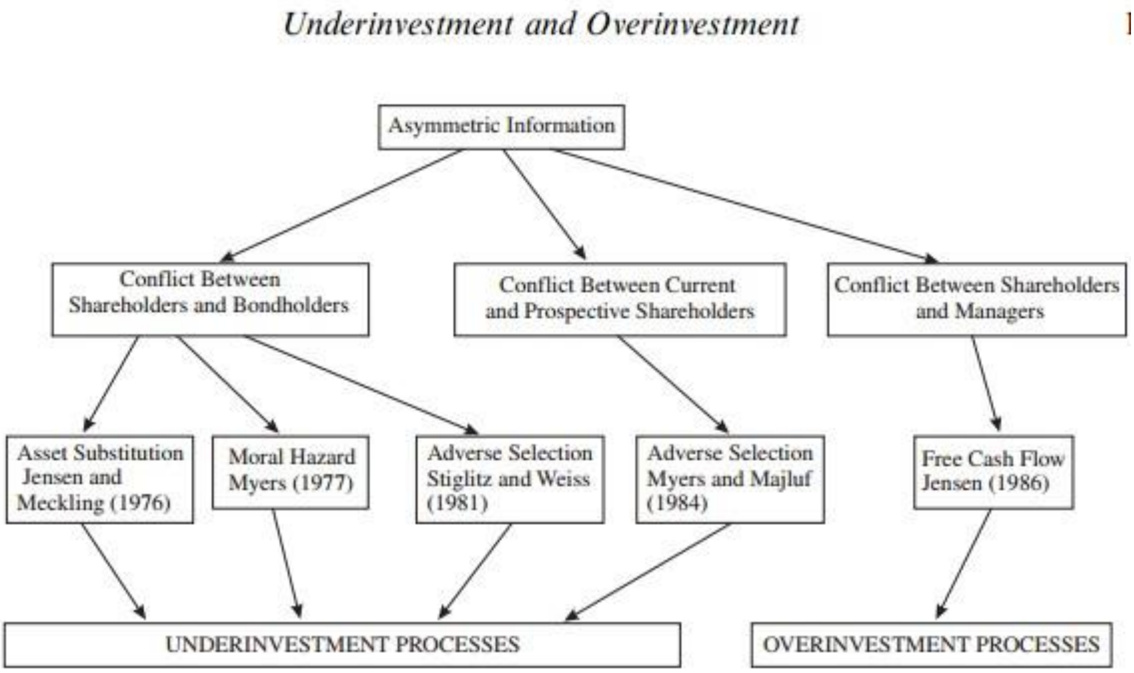


Figure 3-3.Informational asymmetries and conflicts of interests between the main stakeholders: The overinvestment and underinvestment flow

Source: Morgado and Pindado, (2003)

3.2.2.1 I Under-investment hypothesis:

The conflict between shareholders and bondholders, or the current and prospective shareholders, gives rise to under-investment. When firms are faced with financial distress, shareholders may be induced to invest in the riskier projects. Riskier projects are expected to produce higher returns that will accrue to shareholders and, on the other hand, if there are losses, they will be passed to bondholders. This gives rise to the asset-substitution problem (Jensen and Meckling, 1976). Given the impossibility of creating full contracts that protect bondholders from such asset-substitution problems from informational asymmetries, bondholders discount such costs and this result in higher interest rates and financing covenants and limiting conditions on investment which will, in turn, affect shareholders (Morgado and Pindado, 2003). The asset-substitution problem between bondholders and shareholders, in turn, leads to underinvestment.

3.2.2.1 J Asymmetric information and underinvestment

Informational asymmetry is a situation where the parties have different information and. one party is more informed than the other. Imperfect information results in inequality of authority. In financing and investment conflicts information asymmetries arise because shareholders have better information than bondholders (Myers, 1977). For sound investment decisions, accurate information is key. Imbalances in information between shareholders and bondholders lead to suboptimal investment. Managers as agents involved in the day-to-day operations of the firm have more information than shareholders and bondholders. Shareholders, as principals, have more information about the firm than bondholders.

Bondholders may place some restrictions on the firm's operations because they do not have enough information about the firm. Consequently, they protect themselves. Bond covenants restrict the firm from available investment opportunities. Information disparity in a firm causes financing and investment imbalances that may lead to the failure of the firm through adverse selection and moral hazards.

3.2.2.1.J Moral hazard and under-investment

Moral hazard is a scenario when one party in a transaction takes risk actions because the costs will be incurred by the other party (Darrough and Stoughton, 1986). Moral hazard may arise when the other party engages in a financial transaction that might be detrimental to the other. Moral hazards also arise because of asymmetric information which occurs when either party has more information concerning its intentions and actions that may be detrimental to the other party that may have to bear the adverse consequence because it does not have this information. Protection of one party from risk may also cause the other party to engage in risky activities that may also be detrimental to the other party. In relation to financing and investment, moral hazard occurs because firms make investment decisions subsequent to financing (Darrough and Stoughton, 1986). In the investment-financing decisions, the two conflicting parties are mainly shareholders and bondholders. Both parties have a controlling effect on the firm. More risk is born by bondholders. Shareholders may knowingly take on risky projects, careless decisions and investment (detrimental activities) knowing that the bondholders will bear the risk. Moral hazard also gives rise to the underinvestment problem through the conflict of interest between bondholders and shareholders. Since bondholders have more priority in the case of bankruptcy, they may appropriate a portion of the value created. Therefore, whenever the amount of debt issued is higher than the NPV of the project, shareholders have an incentive to abandon positive NPV projects (Myers 1977). Through loan covenants and other restrictions, bondholders may try to reduce such sub-optional investment policies.

3.2.2.1 K Adverse selection and under-investment

In economics, adverse selection refers to a development where the undesired outcome is obtained when the market participants have imperfect/different information (Ray and Dutta 2014). In relation to the investment policy, the participants are shareholders, managers and bondholders. Managers and shareholders have more information than bondholders. The uneven knowledge may lead to uneven decisions (Catalini et al., 2016) In relation to the investment policy the participants are shareholders`, managers and bondholders. Managers and shareholders have more information than bondholders. This uneven knowledge may lead to the making of uneven decisions the undesired outcome is suboptimal investment resulting from different and uneven information between bondholders and shareholders.

The under-investment problem from the conflict between shareholders and bondholders may also result from adverse selection (Morgado and Pindado, 2003). Bondholders may demand a higher premium when they do not have enough information to assess the quality of a firm's investment (Stiglitz and Weiss, 1981). Pre-contract informational asymmetries about the proposed investment might lead the firm to forgo some NPV projects thereby leading to under-investment. (Myers and Majluf, 1984). The prospective shareholders have no information concerning the firm's value to be generated by the project and they might raise the price of their funds. The existing shareholders with this price increase may lose more if the project is undertaken than if it were abandoned. The conflict between shareholders, bondholders and prospective and current shareholders may lead to underinvestment.

Prediction

The under-investment hypothesis predicts a negative relationship between debt and investment. However, the effects may be heterogeneous considering the firms' growth opportunities and level of cash-flow-generation capacity.

Over-investment hypothesis

The conflict between managers and shareholders gives rise to over-investment processes. In the presence of the information asymmetries in circumstances where the mechanisms used to avoid the conflict of interest between the shareholders and managers are not efficient, managers may undertake negative NPV projects using free cash-flow in pursuit of their own interests (Jensen 1986). Free cash-flow is excess cash after funding valuable projects. Therefore, by taking on negative NPV projects, managers are wasting cash-flow at the expense of pay-out to shareholders. Jensen (1986) and Stulz (1990) show that managers have an incentive to take on negative NPV projects (overinvest) due to the benefits associated with larger firms, thus pursuing their own interests.

Prediction

The overinvestment hypothesis predicts a negative relationship between leverage and investment. Shareholders may increase leverage to discipline management from undertaking unnecessary investments that destroy value (Myers 1977) thereby creating a negative association between leverage and investment.

3.2.2.3 Empirical studies

Fazzari et al., (1988), through the sensitivity of investment to cash-flow, found a strong dependency of investment on the availability of internally-generated funds which demonstrates the under- investment process by adverse selection (Morgado and Pindado, 2003). The positive association between cash flow and investment can also explain how the availability of free cash flow allows managers to invest in negative NPV projects. This need can be curbed if they have to raise external funds.

Vogt (1994) suggests that the positive relationship between cash flow and investment confirms the over-investment hypothesis for firms with limited investment opportunities. On the other hand, an under-investment problem is confirmed by a positive relationship between cash flow and investment for firms with valuable investment opportunities (high growth firms).

Lang et al., (1996a) found evidence supporting the over-investment hypothesis in the USA. He felt that leverage constrains investment only for firms with low growth opportunities. Adedeji (1998) found mixed evidence in the under-investment hypothesis theory studying the simultaneous interrelationship between investment, financing and dividend decisions. (De Miguel and Pindado, 2001) emphasise that, in the presence of asymmetric information, firms face under-investment or over-investment problems depending on the firms' debt and cash-flow levels. The Debt-overhang theory by Myers (1977) highlights that high debt results when rejecting projects with positive NPVs.

Harris and Raviv (1990) reported a positive relationship between leverage and investment for USA firms. Fama and French (2002) also found a positive relationship between leverage and investment. These findings are in support of the view that leverage is valuable to firms with growth prospects. On the other hand, in support of the under-investment hypothesis, McConnell and Servaes (1995) used cross-sectional data for USA firms and found a negative relationship between corporate value and leverage for firms with solid growth opportunities, and a positive relationship for firms with low-growth opportunities. Inclining to the overinvestment hypothesis, Lang et al., (1996b) used pooled regression across non-financial firms in their core and non-core businesses segments in the USA and found a negative relationship between leverage and investment but only for firms with weak growth opportunities. By separating firms into core and non-core businesses, they proved that leverage does not only proxy for growth opportunities, but it is also a significant determinant of investment.

Aivazian et al., (2005), using a fixed-effect estimator and an instrumental variables technique, found a negative relationship between leverage and investment to be stronger for low-growth firms, implying that leverage has less impact on investment in firms where the market recognises lucrative growth opportunities.

Some empirical evidence in developed economies indicates that leverage constrains investments more in high-growth companies, as indicated by the findings by Seoungpil et al., (2005) in the USA, Rasa et al., (2008a) in Baltic companies, and Yuan and Motohashib (2014) for Chinese firms. Denis et al., (1997) show a significant reduction in capital expenditure following an increase in leverage. Studies done on the relationship between leverage and investment, based on developed economies, are contradictory and inconclusive as to the effect of leverage on a firm's decisions. They have different implications for leverage on investment for high-growth and low-growth firms in different markets. In this regard, it is therefore, compelling to add to the paucity of literature and to reveal more on the impact of leverage on investment in high-growth and low-growth firms using African firms, which are less levered compared to those in developed economies.

Table 3-5 Summary of studies on the over-investment hypothesis

Myers (1977)	Their debt-overhang theory highlights that high debt results in rejection of projects with positive NPVs.
Fazzari et al., (1988)	Investigated the sensitivity of investment to cash-flow and found a strong dependency of investment on the availability of internally-generated funds. This demonstrates the under-investment process by adverse selection.
Harris and Raviv (1990)	Reported a positive relationship between leverage and investment for USA firms.
Vogt (1994)	In a study of USA firms, suggest[s] that the positive relationship between cash flows and investment confirms the over-investment hypothesis for firms with limited investment opportunities. On the other hand, an under-investment problem is confirmed by a positive relationship between cash-flow and investment for firms with valuable investment opportunities.
McConnell and Servaes (1995)	In support of the under-investment hypothesis, they used cross-sectional data for USA firms and found a negative relationship between corporate value and leverage for firms with solid growth opportunities, and a positive relationship for firms with low-growth opportunities.
Lang et al., (1996b)	Inclined to the over-investment hypothesis. They used pooled regression across non-financial firms in their

	core and non-core businesses segments in the USA and found a negative relationship between leverage and investment only for firms with weak growth opportunities.
Denis et al., (1997)	Found a negative relation between leverage and investment to be greater for high-growth than low growth firms.
Adedeji (1998)	In studying the simultaneous interrelation between investment, financing and the dividend decisions found mixed evidence on the under-investment hypothesis.
Pindado (2001)	Emphasizes that, depending on the firms' debt and cash-flow levels in the presence of asymmetric information, firms face under-investment or overinvestment problems.
Fama and French (2002)	Found evidence of a positive relationship between leverage and investment supporting the view that leverage is valuable to firms with more investment opportunities.
Artur (2003)	The positive association between cash-flow and investment can also explain that the availability of free cash flows allows manages to invest in negative NPV projects.
Aivazian et al., (2005)	Using a fixed-effect estimator and an instrumental variables technique, found a negative relationship between leverage and investment to be stronger for low-growth firms, implying that leverage has less impact on investment in firms with valuable growth opportunities
Seoungpil et al., (2005)	In the USA, they found a negative impact of leverage on investment is significantly greater for high q (high growth) than for low q segments and for non-core than for core segments. Among low growth firms, the positive relation between leverage and firm-value is
	significantly weaker in diversified firms than in focused firms.

Rasa et al., (2008a)	In Baltic companies, the constraining effect of debt was recorded only among the companies with high growth opportunities. The capital structure of companies with low-growth opportunities had no clear impact on investment.
Yuan and Motohashib (2014)	Chinese firms show a significant reduction in capital expenditures following an increase in leverage

Table 3-6 **Analysis of related studies on firm investment**

AUTHOR(S)	PURPOSE	METHOD	FINDINGS	GAP/IMPROVEMENT
Aivazian et al., (2005)	Impact of leverage on firm investment (**CANADIAN EVIDENCE**)	Panel data method estimated with the Fixed Effects and Instrumental variable approach to deal with the problem of endogeneity. Panel data to control heterogeneity among individual firms. Data obtained from Compustat files. The book value of total assets and book value of longterm debt were used as measures of leverage. Net investment used to measure firm investment**.**	Leverage is negatively-related to investment for Canadian firms. The negative effect is significantly stronger for firms with low-growth opportunities than those with high-growth opportunities. Pooling-regression method underestimates the impact of leverage on firms' investment.	The results were restricted to Canadian firms (developed). They cannot be generalised to developing economies because of different economic conditions. Improvements can be made on the decomposition of investments into tangible and intangible and analysing their effects on leverage. Test the impact in developing/emerging markets with different economic traits with the developed. The IV cannot handle the possible bidirectional relationship between leverage and investment. thus the

				GMM can be a handy tool to control for endogeneity and causality in both directions.

Ahn et al., (2006)	Leverage and investment in diversified firms (AMERICA)	Cross-sectional regressions. Tests the association between excess-leverage and industry-adjusted investment in individual segments. Data obtained from Compustat tapes. Two measures of firm level investment used – relative value added (RVA), and Relative investment (RINV) Leverage measured in book-value and market value as total debt. They compared each firm' leverage and	They found a negative impact of leverage on investment to be significantly greater for high Q (high growth) than for low Q segments and for non-core than for core segments Among low-growth firms, the positive relation between leverage and firm value is significantly weaker in diversified firms than in focused firms.	Investment at the business segment level was restricted to diversified firms only. Excludes firms with sales less than $ 20m which is a significant amount and attained by few in the developing economies. Therefore, the results cannot be directly applied to emerging markets since the firms excluded from the sample are the ones which may exhibit closer traits with firms in the developing economies. Most developing economies are driven by SMEs which exhibit total leverage levels. What levels of leverage constrain investment?

		imputed leverage (IMLEV)		Didn't consider systematic risk as Another possible independent factor influencing investment.
(Šarlija and Harc, 2012)	The impact of liquidity on leverage (CROATIA)	The Pearson correlation coefficient was applied to the test on the relationship of the ratios. Leverage and liquidity ratios were used.	There are statistically significant negative correlations between liquidity ratios and leverage ratios in Croatian firms.	Heterogeneity among firms not catered for.
Norvaišienė et al., (2015)	The impact of loan capital on the investment and growth of the Baltic companies	The method covers the analysis of scientific literature, the analysis of statistics, the comparative analysis and the multidimensional correlative analysis. Multi-dimensional analysis of correlation between the level of investment and such	In Baltic companies, the constraining effect of debt was recorded only among the companies with high-growth opportunities. The capital structure of companies with low growth opportunities had no clear impact on investment.	Contrary to the findings by Aivazian et al., (2003) and needs further research in a different economy to ascertain if the difference is due to differences in economic traits or otherwise.

		indicators as cash flow, debt ratio, the level of non-current debts, sales growth, growth opportunities were used Value p was used to check for reliability.		

Munoz (2012)	The relationship between investment and stock market liquidity (LATIN AMERICA)	Empirical strategy- panel data method on firms listed on the stock exchanges. PPE, total assets, inventory were used as measures of investment. Liquidity–trading volume was used as a measure of liquidity.	Higher trading volume and higher industry adjusted trading volumes are associated with higher firm investment. Liquidity has a positive relationship with investment which is stronger in firms with greater investment opportunities. Leverage has a negative relationship with investment Firms with higher leverage will require greater cash flow to pay interest and capital thereby reducing its capital to invest in new projects.	Only used trading volumes as a measure of liquidity which may not truly reflect the actual liquidity level of a firm. Liquidity ratios using the firms' fundamentals can be used to test for the robustness of the results. Developed economies evidence also to be explored.

Mehmet Aygun (2014)	"The Impact of Debt Structure on Firm Investments: Empirical Evidence from Turkey"	Pooling regression and correlation analysis	They found a significant positive relationship between corporate debt structure and investment.	The methodology adopted ignores unobservable firm individual effects and cannot control for endogeneity. The different relationships (positive) found implies that leverage has different implications for different economies depending on each economy's financial structure.
Franklin and Muthusamy et al (2011)	Firm investment decision and leverage for Indian pharmaceutical firms	Pooling Regression and fixed effects models	They found a positive relationship between debt and investment in large firms, an insignificant relationship in medium firms and a negative relationship for small firms.	The estimation techniques cannot handle endogeneity or possible bidirectional relationships. Leverage has different implications for firm sizes and, therefore, results cannot be generalised to African firms.
Jiming et al., (2010)	Debt financing on firm investment behaviour in China	Multiple linear regressions using the OLS	They found different results for a set of different growth opportunity firms and ownership in China. Firstly,	The methodology used is not robust in controlling for firm individual effects and endogeneity issues. Different relationships for

			they found a positive correlation between investment and debt financing for lowgrowth firms, a positive correlation for mid-growth firms and state-owned holding companies and a negative relationship for non-stateowned firms.	different growth opportunity firms and ownership indicate that the relationship may vary across economies.
Yuan (2012)	The impact of leverage on investment by major shareholders in China.	The author used a Panel model estimated with the Fixed-effects estimator and IV.	They found different relationships between debt and investment for the different shareholding structures.	Analysed the variation in the relationship from the perspective of shareholding structure in China. The FE estimator does not control for endogeneity, the IV technique suffers from weak instruments problem.

3.2.4 Determinants of investment

The investment-decision is a central pillar for the going concern of any firm. The proponents of the capital-structure theory, Modigliani and Miller (1958a) document that in a world with perfect capital markets, the investment-decision of a firm should depend largely on the firm's fundamental determinants of profits, cash-flow generation, capacity and its net worth. The implication of the irrelevance theory on the investment policy is that the financing structure is not an important determinant of investment in value creation. The firm's investment policy will largely be dependent on profitability. Highly profitable firms will invest more and firms that generate more cash flow should invest more.

The evolution of the capital-structure theory has challenged this position owing to the existence of imperfect markets. Theoretical and empirical literature building down the MM irrelevance theory has found that the financing decision also complicates the firms' investment decisions. Transaction costs and information asymmetries lead to incomplete and imperfect markets which then cause the financing decisions to have a bearing on the investment policy.

3.2.4.1 Leverage

The Modigliani and Miller (1958) irrelevance proposition, based on perfect markets, argues that financing does not affect the firm's investment policy and its value. Progressive-capital structure theory development indicates that, due to the presence of incomplete market accentuated by transaction costs and informational asymmetries, the financing mix of a firm has a considerable bearing on the firms' investment policy. Optional-investment financing is central to firm performance (Leland, 1998).

The agency-costs theory by Jensen and Meckling (1976) outlines that the introduction of debt into the capital structure of the firm complicates the investment policy because of the conflict of interest between managers and shareholders and, on the other hand, shareholders and bondholders. All parties, managers, shareholders and bondholders want to act in their own best interests, which contradicts and suffocates the firm's investment decisions. In an analysis of possible externalities of debt on optimal investment strategy, Myers (1977) found that the debt overhang reduces the incentives to shareholders to invest in positive NPV projects. Therefore, leverage can lead to under-investment for firms with low-growth opportunities. On the other hand, the conflict between managers and shareholders may give rise to over-investment for firms with limited investment opportunities.

For firms with more cashflow, managers may have a propensity to expand the firm in their own interest even in projects with negative NPV. This can be controlled by increasing leverage so that a firm’s cash-flow will be committed to debt servicing and this suggests a negative relationship between leverage and investment. The liquidity-effect also suggests that firms with more debt will invest less owing to less liquid cash available for other investment purposes after meeting interest payments (Aivazian et al., (2003).

Anderson and Prezas (1998) suggests a positive association between leverage and investment claiming that an increase in investment with financial leverage would lower financial risk and, ultimately, debt costs. DeAngelo and Masulis (1980) suggest that a negative relationship between leverage and investment would exist because the benefits of debt on tax would compete with the benefits of tax on capital investment. Implying a negative relationship, Ravid (1988) argues that a negative relationship between investment and leverage may exist due to an increase in financial risk and, consequently, bond-financing costs.

Empirical evidence

Using the pooling-regression technique for industrial firms in the US from 1970-1989, Lang et al., (1996a) found a strong negative association between investment and leverage for those firms with low-growth opportunities. This finding is in line with the over-investment hypothesis that leverage reduces the capacity to invest in negative NPV projects. However, Lang et al., (1996) used the pooling-ordinary least squares technique which cannot control for heterogeneity and endogeneity bias.

McConnell and Servaes (1995) found that, in US firms separated by growth opportunities, (measured by Tobin’s Q) leverage is negatively-corrected with firms’ value while firms with low-growth opportunities show a positive association between leverage and firm value. These findings are consistent with the over and under-investment hypothesis that indicates that leverage attenuates investment in negative NPV projects (over-investment) and induces under-investment thereby reducing firm value.

Aivazian et al., (2003), using the fixed-effects and the instrumental-variable technique in Canadian firms, found a negative association between investment and leverage. This supports the under-investment hypothesis. Firth et al., (2008) with a panel of China’s listed firms using the fixed-effects estimation to eliminate unobserved individual time-invariant effects, found that a negative relationship between leverage and investment was weaker for firms with low-growth opportunities than for those with high-growth.

Zarutskie (2006), in the US market, also found that firms at the growth stage borrow and invest less suggesting a negative relationship between leverage and investment. Ah et al., (2006) found that diversified firms tend to have higher leverage than focused firms and that they invest more than their focused counterparts. They indicated that leverage influences investment decisions. Diversified firms with more leverage can overcome the constraints of debt through liability-distribution by service managers.

Franklin John and Muthusamy (2011), by demarcating small, medium and large firms in India, and using the pooled-ordinary least squares, random effects and fixed-effects estimation techniques found that the positive relationship between leverage and investment is stronger in small firms and large firms and has an insignificant relationship for medium firms.

Yuan and Motohashib (2014) in Chinese firms, analysed the impact of leverage on investment in firms with different investment opportunities and different major shareholders. They found the negative relationship between leverage and investment to be stronger in firms with low-growth opportunities than average-growth firms thereby supporting the overinvestment hypothesis. Yuan and Motohashib (2014), following Aivazian et al., (2005) used the fixed-effects and instrumental-variables estimation techniques. The IV technique can control the endogeneity problem; However, it cannot handle the possible bi-directional relationship between investment and leverage. Hence the GMM becomes a handy tool.

*Table3-7 S***ummary of previous studies on leverage and investment**

Lang et al., (1996)	Supporting the over-investment hypothesis that leverage reduces the capacity to invest in negative NPV projects, they found a strong negative association between investment and leverage for those firms with low-growth opportunities using the pooling-regression technique for industrial firms in the US from 1970-1989.
Mc Connell and Servaes (1995)	Found that leverage is negatively corrected with firms' value for firms with high-growth opportunities and firms with low growth opportunities show a positive association between leverage and firm value. These findings are consistent with the over and under-investment hypothesis that leverage attenuates investment in negative NPV projects (over investment) and leverage induces under-investment reducing firm value.
Aivazian at al., (2003)	Document a negative association between investment and leverage in Canadian firms supporting the under-investment hypothesis.
Firth et al., (2008)	With a panel of China's listed firms, found a negative relationship between leverage and investment to be weaker for firms with low-growth opportunities than in high-growth firms.
Zarutskie (2006)	Found that firms at the growth stage borrow and invest less suggesting a negative relationship between leverage and investment for United States firms.
Ahn et al., (2006)	Indicate that diversified firms tend to have higher leverage than focused firms. Diversified firms invest more than their focused counterparts. They indicate that leverage influences investment decisions. Diversified firms with more leverage can overcome the constraints of debt through liability distribution by service managers.
Franklin John and Muthusamy (2011)	Contrary to many studies, they found a positive relationship between leverage and investment. The positive relationship to be stronger in small firms and large firms and an insignificant relationship for medium firms.
Yuan and Motohashib (2014)	They found a negative relationship between leverage and investment to be stronger in firms with low-growth opportunities than average-growth firms in China, supporting the over-investment hypothesis

Hypothesis:

Based on previous studies the following hypothesis is developed**.**

H_1: There is a negative relationship between leverage and investment**.**

H_2: There is a positive association between cash-flow and investment**.**

3.2.4.2 Cash-flow

Free cash-flow refers to available cash-flow after the financing of all value-creating projects have been discounted at the relevant cost of finance (Jensen ,1986). In a perfect capital market, internally-generated cash-flow and firms' level investment would not be associated (Modigliani and Miller 1950). In situations where firms need additional financing, they will simply raise this from external sources. If the firm has excess cashflow and it needs to support existing asset and financing new projects, it will also distribute the excess to the external markets. However, capital market imperfections and transactions costs impede this process.

In a paper on the agency cost of free cash-flow, Jensen (1986) emphasizes that the availability of substantial free cash-flow in excess of the level required to maintain existing assets and financing new projects induces conflicts of interests between shareholders and managers which may cause the over-investment problem. The overinvestment hypothesis suggests a positive relationship between cash-flow and investment (Stulz, 1990). The Pecking Order Theory by Myers and Majluf (1984) reveals that firms prefer internally-generated funds to finance their investment and growth so as to return value and ownership to existing shareholders. Therefore, firms that can generate more cash-flow are bound to invest more. The MM-irrelevant proposition suggests that a firm's investment policy should not depend on internally-generated funds.

Fazzari et al., (1988), Calomiris and Hubbard (1988) suggest that market imperfections may lead to a positive relationship between cash-flow and investment owing to the costs of external finances that create room for cash-flow generated internally in order to expand investment-opportunity feasibility. Lamont (1997) and Berger and Hann (2003) in the United States of America, found that a decrease in cash-flow is associated with a decrease in investment. This supports Jensen (1986) and Stulz's (1990) free cash-flow hypothesis that firms with more cash-flow tend to invest more and excess cash-flow may lead to an over-investment problem which suggests that low cash-flow is associated with lower investment.

Harford (1999), Opler et al., (1999) and Opler et al., (2001) support a positive relationship between cash-flow and investment. Harford (1999) used a sample of 487 takeover bids and found that firms with more cash-flow make more acquisition. Opler et al., (1999) found that companies with excess cash have high capital expenditures and invest more in acquisitions regardless of their investment opportunities.

Lang et al., (1996) confirm a positive relationship between cash flows and investment in US firms. Aivazian et al., (2005), Anh (2006), Franklin John and Muthusamy (2011), Franklin John (2011) and Firth et al., (2012) also found a positive relationship between internally-generated cash-flow and capital expenditures in imperfect markets.

Hypothesis:

H_1 : In imperfect capital markets, there is a positive association between internally generated cash-flow and investment**.**

H_2: There is a negative relationship between cash-flow and investment**.**

Cash-flow and financial constraints

In addition to empirical work, based on agency conflicts on the link between investment and cash-flow, there is a stream of research that examined the financing-constraints role. Fazzari et al., (1988), Hoshi et al., (1991), Fazzari and Petersen (1993), Whited (1992), Hubbard (1998) and Myers and Majluf (1984) indicate that for those firms that are forced to raise external financing, information asymmetries will increase the cost of financing and therefore, reduce investment flexibility. Responding to the lower cost of finance, such firms tend to invest more when there is internally-generated cash-flow.

Using panel data and the Euler equation Whited (1992), Fazzari et al., (1988), Hoshi et al., (1991) with Japanese firms' documents more sensitivity of investment to cash-flow for financially constrained firms such as highly-leveraged firms and those with low pay-out ratios, Kaplan and Zingales (2000) found that the investment sensitivity to cash-flow persists even for non-financially constrained firms. Richardson (2006) found evidence of overinvestment in the US publicly-traded firms for the period (1988-2002). Li (2004) found that the firms with more capital expenditures have low future-operating performance and the negative association increases in contemporaneous free cash-flow. Alti (2003) suggests that cash-flow may proxy for investment opportunities, therefore, the need to control investment opportunities using the market- to- book -ratio.

Collectively, empirical research suggests an agency and financial-constraint explanation on the positive relationship between cash flow and investment. However, the studies are based on the empirical analysis of firms in developed economies which pose a lot of heterogeneity with firms from developing economies.

Table 3-8 Summary of studies on cash flow and investment

Jensen (1986a)	Availability of internally-generated funds induces the propensity of firms to invest suggesting a positive relationship between investment and cash-flow
Stulz (1990)	In line with the over-investment hypothesis suggests a positive relationship between cash-flow and investment.
Myers and Majluf (1984)	Reveals that firms prefer internally-generated funds to finance their investment and growth to retain value and ownership to existing shareholders. Therefore, firms that can generate more cash-flow are bound to invest more
(Fazzari et al., 1988)	Suggests that due to market imperfections the higher costs of external finances create room for cash-flow generated internally to expand investment opportunity feasibility suggesting a positive relationship between cash-flow and investment.
Whited (1992);	Documents more sensitivity of investment to cash-flow for financially constrained firms such as highly-leveraged firms and those with low pay-out ratios
Lang et al., (1996)	Confirm a positive relationship between cash-flow and investment in US firms.

Lamount (1997)	With firms in the United States of America found that a decrease in cash flow is associated with decreased investment
Harford (1999)	Using a sample of 487 takeover bids in the USA Harford found that firms with more cash-flow make more acquisitions.
Opler et al., (1999)	Found that companies with excess cash-flow have high capital expenditures and invest more in acquisitions regardless of their investment opportunities.
Kaplan and Zingales (2000)	Found that the investment sensitivity to cash-flow persists even for non-financially constrained firms. Suggesting a positive association.
Firth Michel Yuan (2002)	Confirms a positive relationship between cash flows and firm investment in Chinese firms.
Berger and Haun (2003)	Supports the free cash-flow hypothesis that an increase in cashflow is associated with an increase in investment.
Li (2004)	Found that the firms with more capital expenditures have low future-operating performance and the negative association increases in contemporaneous free cash-flow.
Aivazian et al., (2005)	In Canadian firms also found a positive association between cash-flow and investment.
Franklin John (2011)	Also found a positive relationship between internally generated cash-flow and capital expenditure.

3.2.4.3 Investment / Growth opportunities

Growth opportunity can be defined as the ability of a firm to make a real investment at some future point that will have a positive NPV. According to Myers (1977), firms' growth prospects affect investment and capital-structure decisions. Firms with valuable growth opportunities invest more in capital expenditures. Investment opportunities are a significant determinant of investment and capital-structure decisions (Yuan and Motohashib, 2014).

The growth prospects that a firm possesses may be viewed as real options (Kester, 1984, Jensen and Ruback, 1983, Kester, 1986, Brennan and Schwartz, 1985, Stulz, 1982). More than 50 per cent of a firm's market value is accounted for by growth opportunities Kester (1984 and 1986).

Firms with market values more than their book values of assets may have some unmeasured assets. This implies that the market is overvaluing the firm (Lang et al., 1996). Possibly such firms will invest more in capital expenditure. Therefore, a positive relationship between Tobin's Q and investment is expected. In an imperfect market, growth opportunities affect both the investment and financing decisions. Myers (1977) outlines that firms that have more cash-flow and less growth opportunities should increase leverage to avoid the potential over-investment problem. Consequently, growth opportunities act as a bridge between investment and financing decisions.

Empirical studies

Aivazian et al., (2003) in Canadian firms, found a positive association between investment and growth opportunities. Umutlu (2010) and Ah et al., (2006), in the USA, also found a positive relationship between investment and growth opportunities.

Sajid et al., (2016), using the pooled-least squares analysis, empirically examined 30 listed firms from Pakistan and found a negative relationship between leverage and investment and a negative association between Tobin's Q (a proxy for growth opportunities) and investment. However, the estimation technique used does not cater for unobserved heterogeneity and endogeneity issues arising from measurement errors and the possibility that Tobin's Q can become an endogenous variable.

Aygun et al., (2014) examined the relationship between corporate debt structures and firm investment in firms in Turkey and found a positive relationship between debt and investment to be stronger for firms with high growth-opportunities. They also found a positive relationship between Cash-flow and investment as well as Tobin's Q and investment.

Chen and Zhao (2006), on analysing firms on Compustat suggest that firms with high growth-opportunities on average are more profitable and therefore, are offered lower borrowing costs so they can invest more from either internal or external funds. Myers (1977) suggests that growth opportunities are positively correlated with the costs of the underinvestment problems and firms with more growth opportunities are affected more by agency costs of debt. Sengupta and Dasgupta (2002) advocate that firms with better growth opportunities invest more to preserve their debt-capacity and financial slack or liquidity. Based on these studies, firms with high growth opportunities have more access to external finance because of their brighter prospects. Therefore, they tend to borrow more providing more cash-flow for investment purposes and create a positive relationship between growth opportunities and investment. However, on the other hand, as argued by the free cash-flow hypothesis, an increase in debt increases the agency costs of debt and this effect should be more pronounced in firms that borrow more consequently inducing under-investment.

Table 3-9 Summary of studies on growth opportunities and investment

Myers (1977)	Firms' growth prospects affect investment and capital structure decisions. Firms with valuable growth opportunities invest more in capital expenditures
Lang (1996).	Firms with market values more than their book values of assets are over-valued by the market and, possibly, such firms will invest more in capital expenditure, hence a positive relationship between Tobin's Q and investment is expected.
Aivazian et al., (2005)	Canadian firms found a positive association between investment and growth opportunities
Ahn (2006)	Ahn in the USA also found a positive relationship between investment and growth opportunities.
Muhammad Sajid (2016)	From Pakistan, firms found a negative association between Tobin's Q (a proxy for growth opportunities) and investment.
Mehmet Aygum (2014)	Aygum also found a positive relationship between Cash-flow and investment as well as between Tobin's Q and investment in examining the relationship between corporate debt structures and firm investment in Turkey's publicly-traded firms.
Chen and Zhao (2006)	Suggest that firms with high growth-opportunities on average are more profitable and therefore, are offered lower borrowing costs so that they can invest more from either internal or external funds.
Dasgupta and Sengupta (2002)	Advocate that firms with better growth opportunities invest more to preserve their debt-capacity and financial slack or liquidity.

Hypothesis

H_1 : Growth opportunities are positively related to investment**.**

H_2: There is a negative association between growth opportunities and investment.

3.2.4.4 Size

Considering investment decisions made by large and small firms, evidence suggests that informational problems are more pronounced in small firms (Weinberg, 1994) and that investment behaviour of firms is more sensitive to many factors in small firms. Large firms can absorb shocks. The information-asymmetry hypothesis reveals that if lenders do not have much information on costs, a firm may raise the costs of their funds to hedge themselves against any uncertainty. Increase in financing costs due to information asymmetries results in lack of financial capital for investment purposes for small firms suggesting a positive correlation between size and investment.

Small firms are normally faced with more growth opportunities and will need financing flexibility, while they have less available cash-flow and face more difficulties in accessing financing from the capital markets. Therefore, they may be unable to finance their investment opportunities (Byoun, 2008). On the other hand, large firms have better access to external financing due to the low risk associated with them which gives them financial flexibility in funding the NPV projects (Byoun, 2008). Firm size is proxied by sales in most empirical studies. Consequently, we expect a positive relationship between sales and investment.

Empirical studies such as that undertaken by Pandey (2001) found that firms with rapid growth in sales often expand their fixed-assets investment suggesting a positive relationship between sales and investment. Lang et al., (1996), using firms in the United States, Aivazian et al., (2005) with Canadian firms, also found a positive association between sales and firm investment. Yuan in Chinese firms also confirms a positive relationship between sales and firm-level investment. Contrary to these findings, Franklin John and Muthusamy, (2011) found sales to be negatively associated with investment.

Hypothesis

H_1 : There is a positive relationship between firm-size and investment**.**

H_2: Firm size and investment are negatively correlated.

3.2.4.5 Profitability

Firm-profitability is an important determinant of investment-decision as it reveals the efficiency of investments undertaken which will impact on the decision of future investments (Kannadhasan, 2014). According to the Pecking Order Theory, profitable firms depend more on internal cash flow to finance their investment needs. This would reduce informational asymmetries and high costs of external funding (Myers and Majluf 1984). The Pecking Order Theory predicts a positive relationship between profitability and investments. According to the trade-off theory of the capital structure, profitable firms are more likely to have more income to shield and, in turn, will enjoy more benefits from tax-shield advantage on debt (Huang and Song, 2004). Therefore, more income from tax shields enables these firms to invest more since they have abundance free cash-flow.

Myers (1984) posits that firms that can generate more earnings are more inclined to use their internally-generated cash to finance their investment needs. Therefore, they have a positive relationship between profitability and investment. If the significant portion of these earnings accounts for free cash-flow, the agency-costs theory, in line with information asymmetries, advocates for more debt for those firms with limited investment opportunities to reduce the over-investment problem (Jensen 1986). This may suggest a negative relationship between profitability and investment with those firms with limited growth prospects as the generated earnings would be used to service debt and, therefore, their low investments.

Fama and French (2002) discovered the consistency of the Pecking Order Theory where small-growth firms were inclined to use internal financing more than external financing in funding their investment needs. Indirectly, Booth et al., (2001) found that firms, which generate more earnings in developed nations, carry less debt when taking on investment opportunities. This finding implies a positive relationship between profitability and investment and an inverse impact of debt on investments.

Al-Ajmi et al., (2009) Omet and Mashharawe (2003) Al-Sakran (2001), in analysing the relationship between profitability and leverage, found results consistent with the peckingorder theory where firms would prefer surplus from their earnings to finance their investment needs.

Empirical studies on profitability

Xiong (2016), from a market micro-structure perspective, when analysing the relationship between liquidity and investment, found a positive relationship between profitability and investment in Chinese firms when using a panel-data regression. Using the pooled-ordinary least squares, fixed effects and the random-effects estimators on Indian listed firms, Franklin John and Muthusamy (2011) found a negative relationship between return on assets (a measure of profitability) and investment. In line with other studies, they found a positive relationship between growth opportunities, cash-flow and leverage on investment. Contrary to previous studies, sales were found to be negatively associated with investment. Sajid et al., (2016), in Pakistan, empirical evidence using the pooled-least squares analysis on 30 listed firms concurs that there is a positive relationship between profits and investment. High profit-generating firms will have freer cash-flow which can be used for investment purposes. Therefore, we expect a positive association between profitability and investment.

Hypothesis

H_1 : Firms that generate more profits have high capital expenditure.

H_2: There is an inverse relationship between profitability and investment.

3.2.5 Endogeneity Problem

Most empirical studies that directly and indirectly analysed the relationship between investment and leverage found a negative relationship between the two. However, it is crucial to take into consideration that investment decisions may also affect the firm's level of leverage. Firms faced with more investment opportunities, but with less internally generated cash-flow may decide to seek external financing through borrowing to finance their capital expenditures. This is the so-called endogeneity problem, or the reverse-causality problem. Causality may run in both directions implying correlation of the error-term and the explanatory variable. Another source of endogeneity in such an analysis are the measurement errors in the Q variables and omitted-variables bias (Munoz, 2012).

Many empirical studies did not consider the endogeneity problem in their analysis. Most studies such as Lang et al., (1996) used the pooled-ordinary least squares which is not able to control the endogeneity bias. Also, it does not take into consideration the time-invariant unobservable individual firm effects. Some studies used the fixed-effects estimator, although it considers the time-invariant heterogeneity thoroughly demeaning. However, it does not control for endogeneity. Aivazian et al., (2005) controlled for endogeneity, using the IV technique. Still this technique may suffer from weak instruments, or problems in identifying correct instruments and an inability to handle the reverse-causality problem.

In this analysis, we propose to employ a novel technique, which has not been used in any of the previous studies and which is robust in controlling for heterogeneity, simultaneity, bias, endogeneity and deals with the possible reverse causality.

3.2.6 Summary of leverage and investment literature

The Miller-Modigliani (1958) irrelevance proposition is based on an assumption of a perfect market. However, in the real-world, information asymmetry and an imperfect market are inevitable. The interactions of shareholders, managers and bondholders generate friction resulting from agency conflict and this friction induces incentives for both over-investment and under-investment. In view of the agency-cost theory, its founders, Jensen and Meckling (1976), proposed a trade-off between benefits (the discipline of managers) and agency costs in the context of increasing debt financing (as shareholders take on additional risk) (Zane, 2012). According to the agency-cost theory, leverage could have a negative impact on investment through two channels. Firstly, the debt-overhang hypothesis (Myers, 1977) Stulz, 1990) argues that leverage induces under-investment. High debt commitments increase the interest-payment burden and reduces the cash flow available for investments for companies with better investment prospects. Leverage-overhang reduces the incentive to invest in valuable investment opportunities since the benefits accrue to bondholders rather than fully to shareholders (Myers, 1977). In this respect, high-leveraged firms will have a lower capacity to exploit valuable investment opportunities compared to less -leveraged firms.

The liquidity-effect hypothesis also argues that, irrespective of growth opportunities, firms that are more committed to interest payments invest less. In contrast with these theories, we would expect high-growth firms to have lower leverage and a negative relationship between leverage and investment. According to the information-asymmetry hypothesis, managers would lower leverage when they expect valuable growth opportunities to be able to exploit such investments Therefore, low leverage could signal growth opportunities to the market, and this is referred to as the endogeneity problem (Aivazian et al., 2005). Lang et al., (1996b) found the effect of debt on growth for core and non-core business segments not to be significantly different across the segments, suggesting that leverage does not proxy only growth opportunities. Firms' corrective measures will always reduce the effect of underinvestment from debt-overhang since leverage could be lowered if growth prospects are recognised beforehand.

The over-investment theory relates to investment expenditure beyond the sustainable level to maintain assets in place and finance other upcoming positive-net present value projects (Franklin John and Muthusamy, 2011). Managers, who have the propensity to increase the scale of a firm, may over-invest even in projects with negative NPV thereby reducing shareholder value. Jensen (1986a) argues that debt can help reduce over-investment. The availability of free cash-flow restrains managers' abilities or gives them room to make such a policy. Therefore, increasing leverage through the issuance of debt commits cash-flow to debt servicing and reduces unworthy investments, suggesting that there is a negative relationship between leverage and investment for such firms. Jensen claims that the availability of growth prospects fundamentally controls whether or not debt will restrain over-investment. The argument in these theories is that leverage has the negative effect of causing under-investment in high-growth firms and a positive effect of restricting overinvestment in low-growth firms. However, too much debt can also lead to financial distress. Extensive empirical research has been done on capital-structure choice as well as on the relationship between leverage and firm value, and leverage and size, to mention a few, across the world. (Rajan and Zingales, 1995, Marsh, 1982, Gwatidzo and Ojah, 2009) Nevertheless, there is mixed empirical evidence regarding firm-investment policy in relation to capital structure. Very few studies have been done in analysing the relationship between leverage and investment in selected developed economies of Europe and America.

Harris and Raviv (1990) reported a positive relationship between leverage and investment for USA firms. Fama and French (2002) also found a positive relationship between leverage and investment. These findings are in support of the view that leverage is valuable to firms with growth prospects. On the other hand, in support of the under-investment hypothesis, McConnell and Servaes (1995) used cross-sectional data for USA firms and found a negative relationship between corporate value and leverage for firms with solid-growth opportunities, and a positive relationship for firms with low-growth opportunities. On the contrary, inclined to the over-investment hypothesis, Lang et al., (1996b) used pooled-regression across nonfinancial firms in their core and non-core businesses segments in the USA and found a negative relationship between leverage and investment only for firms with weak growth opportunities. By dividing firms into core and non-core businesses they proved that leverage does not only proxy for growth opportunities, but is a significant determinant of investment. Aivazian et al., (2005), using a fixed-effect estimator and an instrumental-variables technique, found that a negative relationship between leverage and investment was stronger for low-growth firms, implying that leverage has less impact on investment in firms where the market recognises lucrative growth opportunities.

Empirical evidence in developed economies indicates that leverage constrains investments more in high-growth companies, as indicated by the findings by Seoungpil et al., (2005) in the USA, Rasa et al., (2008a) in Baltic companies, and Yuan and Motohashib (2014) for Chinese firms. Denis et al., (1997) show a significant reduction in capital expenditures following an increase in leverage. Studies done on the relationship between leverage and investment, based on developed economies, are contrary and inconclusive as to the effect of leverage on a firm's decisions. They have different implications for leverage on investment for high-growth and low-growth firms in different markets. In this regard, it is compelling to add to the scanty literature and reveal more on the impact of leverage on investment in high-growth and low-growth firms using African firms, which are lowly-levered compared to those in developed economies. The next sections present the methodology used in this study

3.3 Methodology

Based on the theoretical framework outlined in the previous section, this study follows a positivist paradigm. According to Emory (1985), a study concerned with how one variable affects the other is causal and the one focusing on answering questions such as who, when what and how is descriptive. As stated in Chapter One, the objectives and questions which this study sought to answer include examining how the low (while rising) leverage levels of African firms are impacting on investment. In answering our research question a casual exploratory research was implemented to ascertain how firm investment was affected by leverage, stock markets and volatility of cash flow. An experimental design was also utilised in manipulating the data to ascertain the probable response of investment to different leverage levels in order to come up with a recommendation as to the best financing strategies to use.

3.3.1 Description of the population

The population of this study consists of firms currently listed on all the African stock exchanges reviewed in Chapter Two. This population comprises of 29 stock exchanges with almost 1800 listed firms in Africa for a period of 20 years from 1996 to 2015. Listed firms are selected intuitively because financial statement data about such firms are readily and publicly available on several databases therefore, the ease of access.

3.3.2 Sample construction

Sampling is done to standardise the data, enhance representativeness and minimise the probable errors. Cooper and Schindler (1998: 216) define a good sample as one which accurately represents the characteristics of the population accurately and which represents what it is intended to represent. However, most researchers have found that only rarely is there a perfect correlation between the sampling frame and the target population in which they are interested (Nguyen & Ramachandran, 2006: 196).

We considered firms listed on all African stock exchanges excluding financial firms. Listed firms were specifically selected because of the availability of reliable financial data. Financial firms were excluded because of the complexities in their capital-structure natures and because their capital structures are regulated (Akhtar and Oliver, 2009). Financial firms by their nature they are highly leveraged. Firms with at least five years reported-financial data were considered. Five years financial data allows for instrumentation and use of lags with the estimation methodology. Firms with more missing values were also excluded from the sample and delisted firms were accounted for to avoid survivorship bias. After the screening process, the sample comprised 815 from a total of 1800 firms in 22 out of 29 stock exchanges in Africa for a period of 20 years from 1996-2015. 985 firms were excluded due to substantial lack of data over the sample period.

3.3.3 Data and the variables

To explore the relationship between leverage and investment of African-listed firms during this period, the study employed an unbalanced panel data of 16300 observations after checking and screening for apparent coding errors and missing variables. Panel data enables observation of multiple phenomena over large periods of time and the ability to reduce collinearity in explanatory variables, thereby improving the efficiency of econometric estimates (Akhtar, 2005). Data were obtained from the Bloomberg financial database and the Johannesburg Stock Exchange (JSE). Regression estimations were done using the STATA software.

In statistics and econometrics, panel data refers to the multi-dimensional data frequently involving measurements over time and contain observation of multiple phenomena obtained over multiple time periods for the same firms. Panel data involve two dimensions: a cross-sectional dimension, N (815 firms across 22 stock markets), and a time-series dimension T (20 years 1996-2015).

Panel data sets for economic research possess several major advantages over conventional cross-sectional or time-series data-sets (Hsiao, 2014) as follows:

1. Panel data usually give the researcher a large number of data points (N T), increasing the degrees of freedom and reducing the co-linearity among explanatory variables – therefore, improving the efficiency of econometric estimates. However, it is a kind of phantasm- more data points do not necessarily imply more information (heterogeneity bias);

1. More importantly, longitudinal data allow a researcher to analyses several important economic questions that cannot be addressed using cross-sectional or time-series data sets; and
2. Panel data provides a means of resolving the magnitude of econometric problems that often arise in empirical studies and the presence of omitted (mis-measured or unobserved) variables that are correlated with explanatory variables. Panel data allows controlling for omitted (unobserved or mis-measured) variables.

3.3.3.1 The main explanatory variable

Leverage

Existing studies on capital-structure theory used varying measures of financial leverage. The widely-used measures of leverage are based on book values due to the availability of reliable reported data in the public domain. However, few studies have been done using market values. Chen and Strange (2005) used both market and book-value measures of leverage. The most commonly used measures of leverage in financial literature include, long-term debt to total assets, total-debt to total assets, total-debt to market value of total assets (Abor, 2005, Jason Kasozi, 2010, Aivazian et al., 2005, Booth et al., 2001, Ahn et al., 2006, Myers, 1984, Myers, 2001). Frank and Goyal (2003) additionally used the interest-coverage ratio in place of debt ratio.

Measuring leverage as either book-value or market-value has relative strengths and weaknesses. According to Chen and Strange (2005: 19) and Frank and Goyal (2003: 12), market-values are forward-looking although their estimates may be flawed and, therefore, inaccurate.

This study employed a broad measure of leverage based on book-values for the following reasons:

(i) Book-values are readily available from financial statements with the publicly available financial statements for listed firms which are prepared in a universal way for these firms;

(ii) These values are backward looking, that is, they account for what has already taken place (Frank & Goyal, 2003: 12). This is considered ideal for the purposes of this study. Market-values, although they are forward-looking, they are usually hard to estimate and could result in spurious correlations (Chen & Strange, 2005: 19); and

(iii) According to Graham and Harvey (2002: 232), financial managers focus more on book-values than market-values when designing their financial structure. Furthermore, firms are likely to be most concerned about book-value leverage ratios because bank-loan covenants are written in terms of book-value (Harvey, Lins & Roper, 2004:8).

According to Barke, the Director General of the European Commission, leverage could be expressed by any of the following formulations: Total Assets to debt (TA to D), debt to total assets (D to TA), debt to equity (D to EQ), total assets to equity (TA to EQ) or equity to total assets (EQ to TA). However, (Kahneman, 2011) shows how two expressions that are mathematically equivalent may lead to different decisions. This is explained by the denominator-neglect (a strong focus on the headline figure of a ratio neglecting what is in the denominator). Therefore, he highlights the importance of using the right framing when translating the reality into numbers. Kahneman's findings imply that debt should be in the numerator. Therefore, any expression which includes the debt in the denominator should be discarded.

Following previous studies, the widely acceptable ratios to measure leverage are debt to total assets (D to TA) and total assets to equity (TA to EQ). For the purposes of this study, debt to total assets (D to TA) was used as a measure of leverage as it reveals the multiplication effect of leverage better. Two different measures of financial leverage in line with the existing financial literature were used. These being total debt and long-term debt to total assets. Total debt incorporates both long-term and short-term debt. Long-term debt emphasizes the dominant role of long-term financing on investments (Aivazian et al., 2005).

$$leverage = \frac{Total\ debt}{Total\ assets}$$

And:

$$leverage = \frac{Long\ term\ debt}{Total\ assets}$$

3.3.3.2 The dependent variable

Investment

Following Lang et al., (1996), and Aivazian et al., (2003), firm-level investment was measured as relative investment defined as the amount of investment per one unit of fixed assets. The relative investment was calculated as the ratio of net-capital expenditure to net fixed assets, where net-capital expenditures are capital expenditures from the firm’s financial statements minus the reported depreciation expense. Net-fixed assets are fixed assets net of accumulated depreciation as given in the firm’s financial statements.

$$Investment = \frac{Net\ Investment}{Net\ fixed\ assets}$$

3.3.3.3. Other independent (Explanatory variables)

There are other variables that influence investment and cannot be totally ignored. Much of this analysis is concentrated on those factors that are reliably assigned and important for predicting investment levels according to the finance literature. Other extraneous variables that are not readily available or easily measurable on the available databases were excluded from the analysis and it was assumed that they remain constant.

By extensively analysing the relationship between investment and financial leverage, most studies also included other specific factors of companies having an influence on investment intensity, such as cash-flow, sales volumes, Tobin’s Q indicator, reflecting growth opportunities as explained below.

Firm investment may be affected by growth opportunities. To control for growth opportunities, we used the market-to-book-ratio given by Tobin’s Q. Tobin’s Q is defined as the market value of total assets of the firm divided by the book value of total assets and is a proxy for growth opportunities (Aivazian et al., 2003b). The market value of the firm will be computed as the sum of total liabilities, the value of the common stocks and the estimated preferred stocks.

$$\text{Tobin's Q}_{(t-1)} = \frac{Market\ value\ of\ total\ assets}{Book\ value\ of\ total\ assets}$$

Cash-flow is used to control for financial constraints and availability of funds. Cash-flow was measured as the sum of earnings before extraordinary items and depreciation. Operating cashflow was scaled by lagging net-fixed assets to control the size of the firm bias.

$$cashflow = \frac{cash\ flow}{Net - fixed\ assets\ _{(t-1)}}$$

Firm-level investment can be driven by the size of the firm. Sales used a proxy for size and are defined as net sales deflated by net-fixed assets.

$$sales = \frac{Netsales}{Net - fixed\ assets}$$

3.3.4 Model specification

The study adopted dynamic panel-data and multiple regression approaches to analyse the relationship between the dependent variable, investment and the explanatory variables mentioned above. According to Defusco, McLeavey, Pinto and Runkle, (2004: 442), and Cooper and Schindler (1998: 562), multiple-linear regression is a tool that allows us to determine the effect of more than one independent variable on a particular dependent variable and it is a good test for explaining causal theories.

The influence of specific corporate factors on investments is most frequently assessed through reduced-form investment formulation (Lang et al., 1996). The few studies that have been done on leverage and investment (Lang 1996, Aivazian et al., 2003, Ahn et al., 2005) estimated the standard-reduced form investment equation and used the pooled-regression fixed effects (FE) techniques for cross-sectional and time-series data and the results are rather ambivalent. However, these methods suffer from collinearity, endogeneity and unobservable individual effects problems. Employing a technique which addresses these issues will probably produce superior results. The standard-reduced form investment model is represented by:

$$\frac{I_{i,t}}{K_{i,t}} = \beta_0 + \beta_1 Lev_{i,t} + \sum \beta X_{i,t} + \varepsilon_{i,t} \qquad (3.1)$$

Where, $I_{i,\,t}$ is the net investment for firm i period t, $LEV_{i,ct-1}$ is lagged leverage; $X_{i,t-1}$ is a vector of lagged values of control variables (Cash-flow, sales and growth opportunities) scaled by total assets to remove the effect of size.

We extend the specification to a dynamic panel-data setting. Our dynamic model includes the lagged-investment variable as one of the explanatory variables. Given that investment trends are dynamic, current levels of investment are also driven by past investments, and a lagged investment variable captures previous investment trends. Firms generally want to smoothen their investment pattern. Therefore, their past behaviour influences current behaviour. Through lagging the investment variable, we help to examine the impact of previous investment trends on current investment levels. A lagged-dependent variable reduces autocorrelation that may arise from any mis-specification. Investment dynamics, over time, are captured, and the estimation method deals with endogeneity problems and Nickell-bias in fixed effects. A dynamic model also allows partial adjustment-mechanism modelling (Baum et al., 2001).

We consider a dynamic model, which caters for individual effects, as given by:

$$y_{i,\,t} = \gamma y_{i,t-1} + x_{it}\beta + \eta_i + \varepsilon_{i,t}\,;\ |\gamma| < 1 \qquad (3.2)$$

Where η_i is a fixed effect, β_i , parameter to be estimated, x_{it} is a vector of explanatory variables with k factors (k=1…,4). In our model, these are measures of leverage, cash-flow, size and growth opportunities. $\varepsilon_{i,t} \backsim N(0, \sigma^2_\varepsilon)$ is a random disturbance and assuming $\sigma^2_\varepsilon >$ $0, \in (\varepsilon_{i,t}, \varepsilon_{j,s}) = 0$

We extend equation 3.1 to a dynamic-panel fixed model by adding a lagged-investment variable as one of the independent variables, and a fixed-effects parameter to cater for individual firms' and a country's effects as shown by Judson and Owen (1999). Specifically, the model estimated takes the following form:

$$\frac{I_{i,t}}{K_{i,c,t}} = \alpha_0 + \left(\frac{I_{i,t}}{K_{i,c}}\right)_{t-1} \beta_1 Lev_{i,c,t} + \beta_2 \frac{CF_{i,c,t}}{K_{i,c,t}} + \beta_3 Q_{i,c,t} + \beta_2 \frac{SALE_{i,c,t}}{K_{i,c,t}} + \mu_{i,c} + \varepsilon_{i,t} \quad (3.3)$$

where, $I_{i,t}$ is net investment of firm $i,$ in country c, at period t; $K_{i,c,t}$ is net fixed assets; $CF_{i,c,t}$ is cash flow; $Q_{i,c,t}$ is Tobin's Q; $Lev_{i,c,t}$ is leverage; $SALE_{i,c,t}$ stands for net sales; $\mu_{i,c}$ is time invariant unobservable specific effects and $\varepsilon_{i,t}$ is the error term. The variables are standardised by scaling with net-fixed assets.

3.3.5 Growth opportunities and the role of leverage

Even though most empirical studies in developed economies argue that leverage constrains investment, they report different implications for high-growth against low-growth firms. Myers (1977) posits that leverage could have a negative effect on investment because of an agency problem between shareholders and bondholders. The theories of Jensen (1986), Stulz (1990), Lang et al., (1996) and Grossman and Hart (1982) also suggest a negative relationship between leverage and investment only for firms with no or little growth opportunities. Empirical studies by Aivazian (2003) concur pointing out that the negative relationship is stronger for firms with low growth opportunities. However, Seoungpil et al., (2005), and Rasa et al., (2008b) found that the constraining effect of leverage on investment is stronger in firms with high growth opportunities.

Although most empirical evidence documents an inverse relationship between investment and leverage in developed economies, they have different implications for high-growth versus low-growth firms. To examine the differences in the impact of leverage for high versus low-growth opportunity firms, the following specification was used, extending from equation (3), to include a dummy variable for high and low growth firms to interact with leverage and examine the effects of growth opportunities. A dummy variable D, representing the growth opportunities of the firm, was added to interact with leverage. The dummy variable is equal to one (1) for firms with Tobin's Q ratio greater than one (1) representing high-growth firms and zero otherwise (D=1 for Q>1 and D=0 for Q<1). A significant and negative co-efficient would represent that the effect of leverage on investment is heterogeneous by growth opportunities.

To examine the differences in the influence of leverage for high versus low-growth opportunity firms, the following specification was used:

$$\frac{I_{i,t}}{K_{i,c,t}} = \alpha_i + \left(\frac{I_{i,t}}{K_{i,c}}\right)_{t-1} + \eta Lev_{i,c,t} + \gamma D_{i,c,t} * Lev_{i,c,t} + \beta\frac{CF_{i,c,t}}{K_{i,c,t}} + \delta Q_{i,c,t} + \varphi\frac{SALE_{i,c,t}}{K_{i,c,t}} + \mu_{c,t} + \varepsilon_{i,t} \tag{3.4}$$

Where D is a dummy variable, which is equal to 1, if Tobin's Q>1, and 0 otherwise. D*LEV has been added to the regression. Therefore, for firms with Q>1, the co-efficient for leverage will be $\eta + \gamma$ and, for firms with Q≤1, it will beη.

The values of γ were estimated signs observed to predict the strength and direction of the relationship. The range of the point estimates of γ also give the impact of leverage on investment and its intensity. The other estimated co-efficients were compared with those in regressions of equation 3-3.

Lagged values of (relative) leverage are used in the above models to mitigate simultaneity bias to fully address the simultaneity issues and omitted variable-bias in respect of leverage, and also measurement errors in respect of the proxies for growth, equations (3) and (4) will be estimated using the difference and system GMM technique to address the endogeneity issues.

3.3.6 Estimation technique

Justification of the choice of the estimation technique:

Several econometric problems may arise from estimating our models using traditional estimation methodologies:

1) The leverage flow variables in $LEV_{i,c,t}$ are assumed to be endogenous. Causality may run in both directions – from leverage to investment and vice versa and these regressors may be correlated with the error-term;

2) Time-invariant firm and country characteristics fixed effects such as demographics and geography might be correlated with the explanatory variables. The fixed effects are confined to the error term in equation (3), which comprises the observation specific errors *eit* and unobserved country-specific effects $\mu_{i,c}$;

3) The inclusion of the lagged dependent variable $\left(\frac{I_{i,t}}{K_{i,c}}\right)_{t-1}$ gives rise to auto correlation; and

4) The sample has a large firm dimension N=1800 and a relatively short time dimension T=20.

Previous studies including Lang et al., (1996) assumed non-unobservable individual effects and used a pooling-regression to estimate the investment equation. The pooling method is inefficient given that μ_i is not directly observable and it correlates with other explanatory variables (Antoniou et al., 2008), even if we take first differences of the variables to eliminate the time-invariant fixed effects given below:

$$\frac{\Delta I_{i,t}}{K_{i,c,t}} = \Delta\alpha_0 + \Delta\left(\frac{I_{i,t}}{K_{i,c}}\right)_{t-1} \beta_1 \Delta Lev_{i,c,t} + \beta_2 \Delta \frac{CF_{i,c,t}}{K_{i,c,t}} + \beta_3 \Delta Q_{i,c,t} + \beta_2 \Delta \frac{SALE_{i,c,t}}{K_{i,c,t}} + \mu_{i,c} + \Delta\varepsilon_{i,t} \qquad (3.5)$$

Ordinary List Squares (OLS) will still be inefficient due to the correlation of $\Delta I_{i,t}$ given by $(I_{i,t} - I_{i,t-1})$and $\Delta_{\ i,t}$ from $(e_{i,t} - e_{i,t-1}).I_{i,t-1}$ is correlated with the fixed effects in the error term this gives rise to dynamic-panel bias (Nickel 1981). The correlation between the regressor and the idiosyncratic term violates the necessary assumption for the OLS to be consistent. The inconsistency inflates the co-efficients. There is also high heterogeneity across firms, noting that when we extended to a panel of many countries, heterogeneity is inevitable. Aivazian et al., (2005) used the fixed-effects estimator which can overcome the inconsistency of the OLS technique. However, the fixed effects cannot control for endogeneity problems that arises from the measurement errors and endogenous-control variables. The lag of the depended variable of investment violates strict exogeneity introducing endogeneity. The first difference and fixed-effects estimators are based on the strict exogeneity assumption. Therefore, they are not consistent and efficient. Aivazian et al., (2005) controlled for possible endogeneity using the IV technique. Nevertheless, the Anderson and Hsiao (1982) IV technique might not be efficient since it does not use all the available moment conditions and the selection of suitable instruments may be difficult and biased. Muñoz (2013) highlights that the endogeneity problem arises from possible measurement errors, omitted variables, possible bi-directional causation between leverage and investment, and the likelihood that Tobin's Q can be an endogenous variable. This results in the explanatory variables being correlated with the error term.

The introduction of a lagged investment variable as an explanatory variable in equation 3.3 introduces auto-correlation with the error term and a dynamic bias that cannot be controlled by the IV and the traditional techniques. In such a model, there is a need to introduce stochastic variation into such a model given endogenous explanatory variables, the presence of heteroscedasticity and serial correlation from idiosyncratic disturbances are beyond fixed effects. The system GMM attests to it being the suitable technique in such conditions (Roodman, 2006a).

3.3.7 Generalised methods of moments (GMM)

GMM in econometrics is a generic method for parameter estimation in statistical models. It is usually applied in semi-parametric models where the parameter of interest is finite dimensional and where the data-distribution function shape may not be known therefore, the maximum likelihood estimation is not applicable. The order condition for identification would be where there are more equations than there are parameters.

The different GMM and the System GMM estimators developed by Holtz-Eakin, Newey and Rosen (1988), Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998) are general estimators designed for scenarios with:

a) Few time periods (T) and many observations (N).;
b) Linear functional relationship;
c) Dependent variable that is dynamic, depending on its past realisations;
d) Explanatory regressors that are not strictly exogenous that is with the possibility of correlation with past and current realisations of the error term;
e) Fixed individual effects; and
f) Heteroskedasticity and autocorrelation.

3.3.7.1 Mechanics of the GMM

Considering a first-order autoregressive panel data model given by:

$$y_{it} = \alpha y_{i,t-1} + u_{i,t}, \qquad i = 1, \dots N;\ t = 2, \dots, T, \qquad (3.6)$$

$$u_{i,t,} = \eta_i + \nu_{i,t,}$$

Where $\ \ and\ \nu_{i,t,}$are assumed to have an error components structure with**:**

$$\mathbf{E}(\ _{i}) = \mathbf{0},\ \ \boldsymbol{E}(\nu_{i,t,}) = \mathbf{0},\ \ \boldsymbol{E}(\eta_i\nu_{i,t}\ ) = \mathbf{0},\quad \boldsymbol{i} = \mathbf{1}\ \dots, \boldsymbol{N}\!: \boldsymbol{t} = \mathbf{2}, \dots, \boldsymbol{T} \qquad (\mathbf{3.7})$$

$$\boldsymbol{E}(\eta_i\nu_{i,t}\ ) = \mathbf{0},\quad \boldsymbol{i} = \mathbf{1}\ \dots, \boldsymbol{N}\!: \boldsymbol{t} \neq \boldsymbol{s}, \qquad (\mathbf{3.8})$$

The initial conditions satisfying;

$$\boldsymbol{E}(\eta_i\nu_{i,t}\ ) = \mathbf{0},\quad \boldsymbol{i} = \mathbf{1}\ \dots, \boldsymbol{N}\!: \boldsymbol{t} = \mathbf{2}, \dots, \boldsymbol{T} \qquad (\mathbf{3.9})$$

With these assumptions, the following (T-1)(T-2)/2 linear moment conditions are valid

$$E(y_i^{t-2}\Delta u_{i,t}\ ) = 0 \qquad t = 3, \dots, T \qquad (3.10)$$

Where $\ =(y_{i,1}\ ,y_{i,2} \dots, y_{i,t-2}\ )$ and $\Delta u_{i,t} = u_{i,t} - u_{i,t-1} = \Delta y_{i,t} - \alpha\Delta y_{i,t-1}$

Defining

$$Z_{di} = \begin{bmatrix} y_{i1} & 0 & 0 & \cdots & 0 & \cdots & 0 \\ 0 & y_{i1} & y_{i2} & \cdots & 0 & \cdots & 0 \\ . & . & . & \cdots & . & \cdots & . \\ 0 & 0 & 0 & \cdots & y_{i1} & \cdots & y_{iT-2} \end{bmatrix};\ \Delta u_i = \begin{bmatrix} \Delta u_{i3} \\ \Delta u_{i4} \\ \vdots \\ \Delta u_{iT} \end{bmatrix},$$

Moment conditions in equation 2.10 can be more compactly expressed as;

$$E(Z_{d}{}'_{,i}\Delta u_i) = 0 \qquad (3.11)$$

As given by Arellano and Bond (1991) the GMM estimation for α will be given by:

$$\hat{\alpha}_d = \frac{\Delta y_{-1}' Z_d W_N^{-1} Z_d' \Delta y}{\Delta y_{-1}' Z_d W_N^{-1} Z_d' \Delta y_{-1}}$$

Where $\Delta y = (\Delta y_1', \Delta y_2' \ldots \Delta y_N')$, $\Delta y_i = (\Delta y_{i3,} \Delta y_{i4}, \ldots \Delta y_{iT})$, Δy_{-1} the lagged version of Δy, $Z_d = (Z_d{}'_1, Z_d{}'_2, \ldots, Z_{dN}')$ and W_N a weight matrix determining the efficiency properties of the GMM estimator.

$\hat{\alpha}_d$ is the differenced model of the GMM estimator reference to as the Difference GMM and moment conditions $E(y_i^{t-2} \Delta u_{i,t}) = 0 \quad t = 3, \ldots, T$ and $E(Z_d{}'_{,i} \Delta u_i) = 0$ are the difference moment conditions.

Blundell and Bond (1998) from the initial condition exploit additional moment conditions that:

$$\boldsymbol{E}(\ _i \Delta y_{i2}) = \mathbf{0} \qquad \mathbf{(3.12)}$$

This holds given that the process is mean stationary:

$$y_{i1} = \frac{\eta_i}{1 - \alpha} + \ _i \qquad (3.13)$$

With $E(\ _i) = E(\ _i \eta_i) = 0$ if $\mathbf{E}(\ _i) = \mathbf{0}$, $\boldsymbol{E}(\nu_{i,t,}) = \mathbf{0}$, $\boldsymbol{E}(\eta_i \nu_{i,t}) = \mathbf{0}$, $\boldsymbol{E}(\eta_i \nu_{i,t}) = 0$ and hold then the following (T-1)(T-2)/2 moment conditions are valid:

$$E(u_{it} \Delta y_i^{t-1}) = 0 \qquad t = 3, \ldots, T \qquad (3.14)$$

Where $\Delta y_i^{t-1} = (\Delta y_{i2,} \Delta y_{i3,}, \ldots, \Delta y_{it-1,})$ defining

$$Z_{li} = \begin{bmatrix} \Delta y_{i2} & 0 & 0 & \cdots & 0 & \cdots & 0 \\ 0 & \Delta y_{i2} & \Delta y_{i3} & \cdots & 0 & \cdots & 0 \\ . & . & . & \cdots & . & \cdots & . \\ 0 & 0 & 0 & \cdots & \Delta y_{i2} & \cdots & \Delta y_{iT-1} \end{bmatrix}; \; u_i = \begin{bmatrix} u_{i3} \\ u_{i4} \\ \vdots \\ u_{iT} \end{bmatrix}$$

Moments conditions $E(u_{it}\Delta y_i^{t-1}) = 0$ $\quad t = 3, \ldots,$ can be expressed as;

$$E(Z_{li}{}' u_i) = 0 \qquad (3.15)$$

The GMM estimator based on these conditions is given by;

$$\widehat{\alpha_l} = \frac{\Delta y_{-1}' Z_l W_N^{-1} Z_l' \Delta y}{\Delta y_{-1}' Z_l W_N^{-1} Z_l' \Delta y_{-1}}$$

Where $\hat{\alpha}_l$ is referred to as the Level GMM estimator, and $E(u_{it}\Delta y_i^{t-1}) = 0$

$and\ E(Z_{li}{}' u_i) = 0$ are the lev moment conditions.

The linear moment conditions full set under assumptions $\mathbf{E}(\ _i) = \mathbf{0}$, $\boldsymbol{E}(\nu_{i,t,}) = \mathbf{0}$, $\boldsymbol{E}(\eta_i \nu_{i,t}\ )$, $\boldsymbol{E}(\eta_i \nu_{i,t}\ ) = 0$, $E(\eta_i \nu_{i,t}\ ) and\ E(\ _i \Delta y_{i2}) = 0$ is expressed as:

$$E(y_i^{t-2}\Delta u_i) = 0 \quad t = 3, \ldots, T \qquad (3.16)$$

$$E(Z_{si}{}' p_i) = 0 \qquad (3.17)$$

$$Z_{si} = \begin{bmatrix} Z_{di} & 0 & \cdots & 0 \\ 0 & \Delta y_{i2} & & 0 \\ . & . & \ddots & . \\ 0 & 0 & \cdots & \Delta y_{iT} \end{bmatrix};\ p_i = \begin{bmatrix} \Delta u_i \\ u_i \end{bmatrix}$$

Where;

The GMM estimator based on these conditions is given by:

$$\widehat{\alpha_d} = \frac{q'_{-1} Z_s W_N^{-1} Z'_s q}{q'_{-1} Z_s W_N^{-1} Z'_s q_{-1}}$$

$with\ q_i = (\Delta y_i', y_i')'$ this gives the system GMM estimator as given by Blundell and Bond (1988). The moment conditions $E(y_i^{t-2} \Delta u_i) = 0 \quad t = 3, \dots, T \quad and\ E(Z_{si}' p_i) = 0$ are the system moment conditions.

At the heart of difference GMM to work out endogeneity is through data transformation to remove the fixed effects. The Arellano-Bond estimation transforms all regressors by differencing and uses the GMM this is called the difference GMM. On the other hand, is to instrument $I_{i,t}$ and other endogenous variables with uncorrelated variables with the fixed effects. The Blundell and Bond estimator augments the difference GMM with an additional assumption of no correlation on the first differences of instrumental variables and the fixed effects allowing for the introduction of more instruments and improving efficiency in system GMM.

System GMM enhances efficiency by employing additional instruments of the lagged first difference variable ($Investment_{t-1}$). This solves the problem of weak instruments with difference GMM. The technique instruments levels equations with first differenced instruments and instruments differenced equations with levels instruments generating a system of equations. Firm-specific effects are eliminated by taking first differences.

More specifically for this estimation from equation 2.3, we are considering a model of the form:

$$I_{it} = \beta_0 I_{i,t-1} + \beta_1 Lev_{it} + \beta_2 X_{i,t} + u_{i,t} \qquad (3.18)$$

Leverage (Lev_{it}) is assumed to be endogenous because of the possible bi-directional relationship between leverage and investment, and causality may run in both directions. The system GMM technique, in addition to exogenous instruments, uses level and lagged endogenous variables and makes endogenous variables predetermined and not correlated with the error term. Estimation of the model in first differences and levels using differenced lagged regressors to instrument levels equation controls for individual heterogeneity. Variations among firms are also partially retained (Antoniou et al., 2008).

$u_{i,t}$ in equation 3.18 consists of country's unobservable effects v_i and specific errors $e_{i,t}$

$$u_{i,t} = v_i + e_{i,t} \qquad (3.19)$$

GMM uses first difference to transform equation 2.18, to

$$\Delta I_{it} = \beta_0 \Delta I_{i,t-1} + \beta_1 \Delta Lev_{it} + \beta_2 \Delta X_{i,t} + \Delta u_{i,t} \qquad (3.20)$$

The country-fixed effect does not vary over time and, by differencing the regressors, it is removed, thus equation 3.19 becomes:

$$\Delta u_{i,t} = \Delta v_i + \Delta e_{i,t} \qquad (3.21)$$

Which follows;

$$u_{i,t} - u_{i,t-1} = (v_i - v_i) + (e_{i,t} - e_{i,t-1}) = e_{i,t} - e_{i,t-1} \qquad (3.22)$$

Assuming independent and serially-uncorrelated error terms across firms.

$$[E(\mu_{i,t}\mu_{i,\tau}) = 0 \; for \; \tau \neq t]$$

Initial conditions satisfy:

$$E\ [({}^{I}/K_i)\ \mu_{i,t}] = 0\ for\ t > 2$$

The presence of $I_{i,t-1}$ (lagged investment) is a source of autocorrelation, which is controlled by instrumentation with past levels and differenced instruments in system GMM. T should be > 2 for differencing to be applicable, the number of available instruments increases with T, in this case where T=20 a valid instrument for $I_{i\,20} - I_{i,19} = I_{i,19}$. System GMM uses the levels equation together with the AB type orthogonality conditions to obtain a system of equations in levels and the other differenced. The second equation provides additional instruments and increases efficiency (Blundell and Bond, 1998). The two-step system GMM estimator uses one-step residuals to construct asymptotically optimal weighting matrices, hence yielding efficiency rather than one-step estimators.

The instrument matrix for the 20-year period is given by:$Z = [Z_1{}^0, \cdots Z_n{}^0]^0$ where:

$$Z_i = \begin{bmatrix} I_{i,1} & \mathbf{O} & \cdots & \mathbf{O} \\ \mathbf{O} & I_{i,1} & & \mathbf{O} \\ & \vdots & \ddots & \vdots \\ \mathbf{O} & \mathbf{O} & \cdots & I_{i,1} I_{i,18} \end{bmatrix}$$

The two-step system GMM technique developed by Blundell and Bond (1998) was employed to estimate the model. The utilisation of the orthogonal conditions on the variance covariance capacitates control for the correlation of errors over time, heteroscedasticity in firms, simultaneity, and measurement errors (Antoniou et al., 2008), and the ability to address the problems of endogeneity from the relation between leverage and growth opportunities through instrumentation of the system of equations at levels and at first differences. Under these considerations, Blundell and Bond establish that the system-GMM estimator becomes a handy tool.

3.3.8 Econometric issues in corporate finance regressions:

3.3.8.1 Multicollinearity

Step-wise and multiple regressions are complicated by the presence of multicollinearity. This condition arises when high inter-correlations exist among the predictors or explanatory variables affecting the estimation of partial regression coefficients and increasing the number of standard errors (DeFusco et al., 2004: 473; Cooper & Schindler, 1998: 564 and Maholtra, 1998: 577). This study tested for multicollinearity using a coefficients Table housing collinearity statistic to investigate for standard errors. All measures should be within normal bounds to suggest the non-existence of multicollinearity among the independent variables.

3.3.8.2 Heteroskedasity

Heteroskedasticity occurs when the calculated error variance correlates with values of the independent variables, thereby affecting statistical inference (DeFusco et al., 2004: 465). This study, by using a large sample and panel data according to Berry and Feldman (1985:74), countered for heteroskedasticity.

The estimation technique used the two-step version of the system-GMM developed by Blundell and Bond (1998) which also have the capacity to control for the correlation of errors over time, heteroskedasticity across firms, simultaneity, and measurement errors due to the utilisation of orthogonal conditions on the variance-covariance matrix (Antoniou et al., 2008). In the presence of these considerations, Blundell and Bond (1998) established that the system-GMM estimator becomes more useful in reducing the finite- sample biases associated with the differenced GMM estimator.

3.3.8.3 Endogeneity issues

Lagged values of (relative) leverage are used in the above models to mitigate simultaneity bias, to fully address the simultaneity issues and omitted variable bias in respect of leverage, and also measurement errors in respect of the proxies for growth. The models were estimated using the 2-step Generalised Method of Moments (GMM) technique which addresses the endogeneity issues.

3.3.9 Additional tests

We also performed additional tests to ascertain whether the findings are affected by the inclusion of distressed firms, and financially constrained and unconstrained firms. In practice, distressed firms are not able to service their debts and finance operations. Therefore, additional investment is unlikely if the firm is in such a situation. This situation may cause a negative relationship between leverage and investment. Therefore, we need to ascertain if our results are not influenced by distressed firms.

3.3.9.1 Testing for distressed firms

Following Ahn and Denis (2004), distressed firms are defined as those firms with interest coverage of less than 1. The main regressions were re-estimated after separating distressed firms from non-distressed firms to examine whether distressed firms are influencing the results. We also added a dummy variable for financial distress to interact with leverage. The dummy variable is equal to one for firms with interest-coverage ratio greater than one and zero otherwise. (D=1 for ICR >1 and D=0 for ICR<1)

To examine the differences on the influence of leverage for financial constraints the following specification was used.

$$\frac{I_{i,c,t}}{K_{i,ct}} = \left(\frac{I_{i,c}}{K_{i,c}}\right)_{t-1} + \alpha_i + \eta LEV_{i,c,t} + \gamma \vartheta_{i,,c,t} * LEV + \beta \frac{CF_{i,c,t}}{K_{i,c,t}} + \delta Q_{i,c,t-1} + \varphi \frac{SALE_{i,c,t}}{K_{i,c,t}} + \mu_{c,t} + \varepsilon_{i,c,t} \quad (3.23)$$

Where, ϑ is a dummy variable which is equal to 1 if ICR>1, and 0 otherwise.ϑ*LEV has been added to the regression. Hence, for firms with ICR>1, the coefficient for leverage will be $\eta + \gamma$ and, for firms with Q≤1, it will beη.

3.3.10 Data analysis procedure

The descriptive statistics and trend analysis of both the dependent and independent variables for the study sample over the period under study, uses measures of central tendency (mean, percentiles, maximum values, minimum values and standard deviation) in order to describe the general characteristic and trend of the variables under study. The study also used Pearson's product-moment correlation techniques to investigate whether there is any correlation between the dependent and independent variables.

Trend analysis and linear graphs of these variables were used to depict the development of investment, leverage cash-flow in Africa and to provide preliminary information about the expected outcomes. The regression models were estimated in STATA software to ascertain the relationship of our variables of interest.

3.4. Empirical results

3.4.1 Descriptive statistics

Table 3.10 reports descriptive statistics for financial data of sample firms. Inspection of the data reveals high volatility of investment in Africa as depicted by a very high standard deviation (4.94) relative to the mean (0.372). The analysis of the data also reveals that leverage levels in African firms are still very low, with an average of 9 percent long-term debt relative to total assets as compared to developed nations' levels above 30 percent (Atkins, 2015). Higher standard deviations of the measure of investment show that African firms are not consistent in their investments and there are a lot of uncertainties. This can be possibly explained by lack of funding, poor investments or lack of lower investment opportunities for these firms. Low debt ratios compared to developed economies implies that African firms use less leverage and more equity-financing in their capital structures. This could be attributed to high sovereign risk. African governments have a high-country risk since no firm can borrow at a rate lower than its government on the international market. Consequently, it may be expensive for these firms to borrow because of lower creditworthiness.

The average long-term debt to total assets ratio is 9 per cent, while the total debt to total assets ratio stands at 19 per cent, the percentage long-term debt to total debt is 44.4 per cent over the sample period, and the remaining 56 per cent accounts for short-term and mediumterm debt and this indicates a significant reliance on medium- and short-term debt in African firms. This could be due to lack of long-term finances in African financial markets because of many uncertainties creditors may be reluctant and unwilling to extend credit on a longterm basis. Many economies in Africa are unstable coupled with a series of crises. Therefore, short-term credit will be the best alternative for lenders.

Table 3-10 Descriptive statistics for investment, leverage and control variables

Variable	Variable construction	Mean	25%	Median	75%	Std. Dev.
Investment	$\frac{Net\ Investment}{Net\ fixed\ assets}$	0.3724	0.0545	0.15	0.3032	4.9422
Long-term debt to total assets	$\frac{Long\ term\ debt}{Total\ Assets}$	0.0922	0.0000	0.0305	0.1317	0.1561
Total debt to total assets	$\frac{Total\ debt}{Total\ Assets}$	0.1889	0.0229	0.1364	0.289	0.2327
Cash flow to fixed assets	$\frac{EBITDA}{Net\ fixed\ assets}$	0.6812	0.0668	0.2668	0.6203	17.3460
Sales to fixed assets	$\frac{Net\ sales}{Net\ fixed\ assets}$	9.3831	1.2966	2.9725	7.305	49.1219
Tobin's Q	$\frac{Market\ value\ of\ total\ assets}{Bok\ value\ of\ total\ assets}$	1.5830	0.9469	1.2542	1.8392	32.6755
Long-term to total debt	$\frac{Long\ term\ debt}{Total\ debt}$	0.4443	0.0624	0.4513	0.7535	0.3524

Source: Author's calculations based on data obtained from Bloomberg online database

The Table shows summary statistics for 875 non-financial African-listed firms from 1996 to 2015. High standard deviation (4.94) relative to the mean (0.37) reveals high volatility on investments in African firms. An average long-term debt ratio of 0.09 shows that African firms are low-levered. The percentage of longterm debt to total debt also reveals that African firms depend more on short-term and medium-term debt. An average Tobin's Q above 1 indicates a high market expectation of growth opportunities for African firms. There is also highest variability in cash flow and sales as shown by high standard deviation for African- listed firms.

Moreover, the sample middling Tobin's Q of 1.58, implies that, on average, most African firms are regarded as high-growth firms because of the better prospects-expectations by the market, which reflects high market expectations of strong growth opportunities in African firms. This can also be explained by the fact that most African firms are still in their emerging and establishment stage. African firms are younger than firms in the developed economies like the USA and Europe. There is also high variability in sales levels and cash-flow as shown by the highest standard deviations. This can be explained by too much uncertainty and business cycle volatilities in most African nations.

Table 3-11 Leverage relative to Investment

Variable		Mean	Std.Dev	min	Max
% Long-term to total debt		0.4815	0.0435	0.3738	0.5374
% Long-term debt to investment		0.3040	0.1272	0.0593	0.5361
% Total debt to investment		0.6388	0.2795	0.1145	1.2042

Source: Author's calculations based on data obtained from Bloomberg online database.

The ratio of total debt to investment shows that 64 per cent of debt on average is invested in long-term assets. Medium- and short-term debt form the major source of funds for investment purposes in African firms. There is higher variation in total debt to investment compared to long-term debt investment suggesting that African firms maintain their leverage levels in the long run with little adjustment.

Table 3-11 shows that, on average, the ratio of total debt to investment is 0.64 suggesting that, on average, 64 per cent of total debt finance is invested in long-term assets, 30 per cent of total debt finances is in the form of long-term debt and short-term and medium-term debt accounts for 34 per cent of total debt finances for investment. This signifies that more investment is financed through short- and medium-term debt. There is higher variation in the total debt to investment ratio with a relative standard deviation of 0.44 (0.2795/0.6388), compared to long-term debt to investment ratio with a relative standard deviation of 0.40. This suggests that African firms maintain their leverage levels in the long run with little adjustment.

3.4.2 Trend analysis

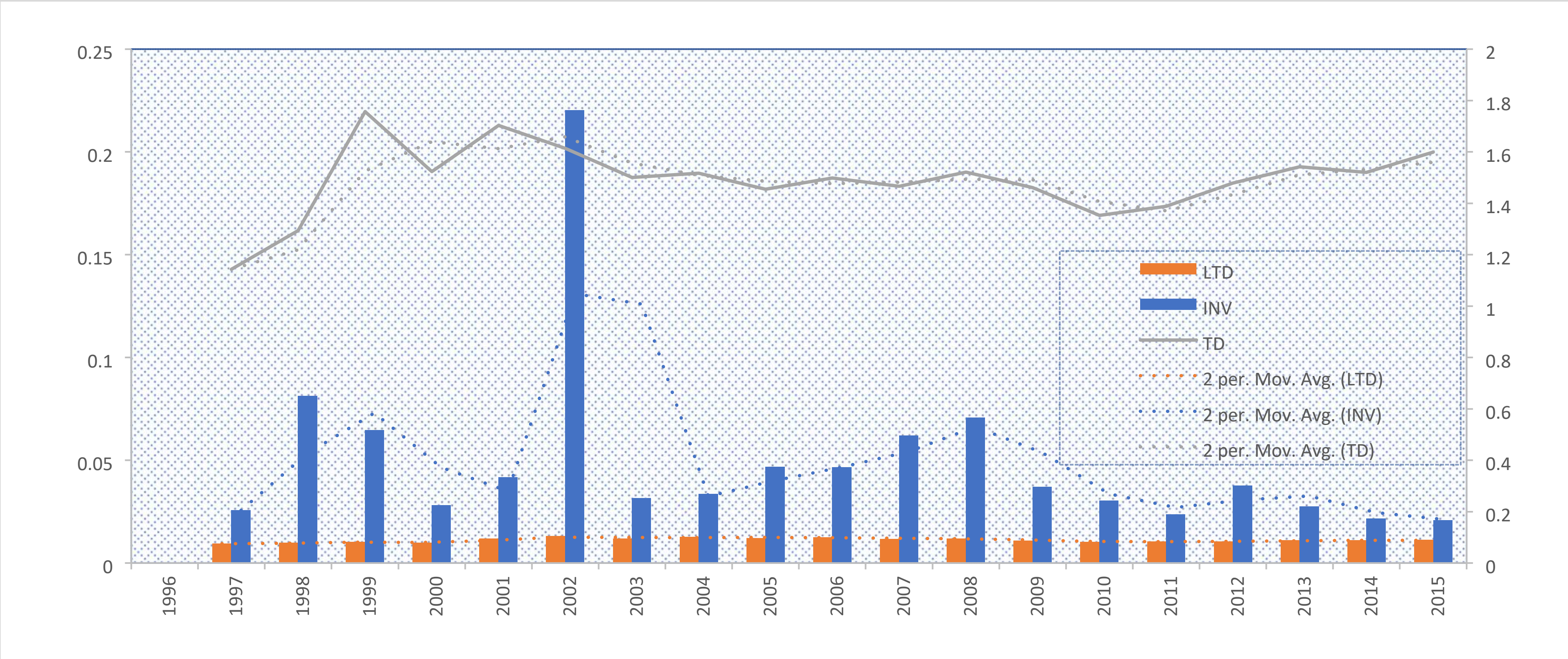


Figure 3-4 Investment and debt ratio trends in Africa

Source: Author's calculations based on data obtained from Bloomberg online database.

Figure 3-4: investment and debt ratio trends in non-financial firms in Africa from 1996 to 2015. The figure shows high variation and a trending decline in investment levels. There is a notable increase in total debt in the current decade from 2010 onwards, suggesting an increase in leverage levels.

Figure 3-4 depicts leverage and investment trends in Africa from 1996 to 2015. The graph shows that there is significant variation in investment levels over the years, and the two-year moving average trend line superimposed on investment reveals a general decline in investment levels over time. This trend is in line with the 2014 UN Economic Development Report in Africa (UNCTAD, 2014), which reported economic stagnation and a notable decline in investment levels in the current decade from 2008 through 2015. The long-term debt ratio is more stable over the sample period as shown by the graph, implying that African firms maintain their debt-to-equity positions over the long run without much capital structure adjustment. From Figure 3-4, a notable increase in total debt from 2010 to 2016 can be observed. This increase concurs with Souza et al., (2015) in Moody's GCR research, which documents an increase in African firms' leverage. An increase in total debt with long-term debt being more stable, suggests that there is an increase in short- and medium-term borrowing to finance investment in African firms.

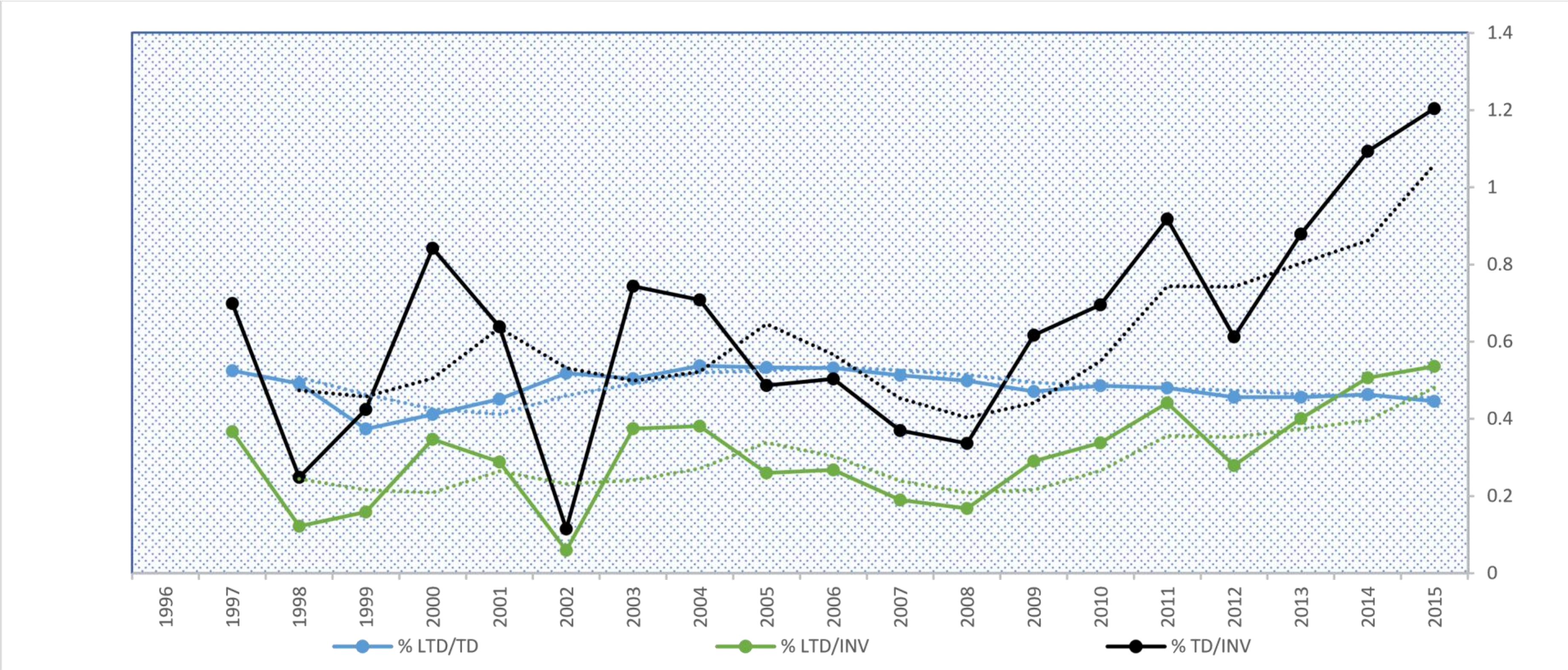


Figure 3-5 Leverage to investment trends

Source: Author's calculations based on data obtained from Bloomberg online database.
Figure 7 shows high fluctuation of leverage to investment ratios. The increase in leverage to investment ratios is also evidence for an increase in leverage levels.

Figure 3-5 shows that there is high variability of leverage to investment ratio. The leverage to investment ratio is measured as leverage divided by investment and leverage is measured as a ratio of long-term debt and total debt to total assets. There is high volatility with a trending increase as shown by the three-year moving average trend in leverage to investment ratios. The increase in this ratio means that leverage is increasing more than investment or investment is decreasing relative to leverage levels and this indicates that African firms are borrowing more than they are investing.

Figure 3-4 showed an increase in total debt and a decline in investment levels and this explains the increase in leverage to investment ratio. Figure 3-5 also indicates a trending decline in long-term debt to total debt ratio and this implies an increase in short-term and medium-term debt as a source of financing relative to long-term. There is higher volatility in the ratio of total debt to investment than on long-term debt to investment and this is evidence of the dominant role of long-term finances as a source of investment funds in Africa.

3.4.2.1 Financing Firm growth in Africa

We examined how firms finance their growth in Africa. Asset growth can be financed through internal retained earnings or external financing. Firms can source external capital through debt and equity. To show the contribution of equity and debt in total assets-growth for the sample period 1996 to 2016, the financing of the growth in the firms' balance sheets was dived into equity and debt expressed as a fraction of total assets. Following Whittington et al., (1997), the contribution of each financing source is calculated as follows:

$$Financing\ source\ contribution = \frac{\sum_{i+1}^{N}(\Delta\ in\ financing\ source)}{\sum_{i+1}^{N}(\Delta\ in\ Total\ assets)}$$

Where: financing source = debt/equity. And Δ represents the change from one period to another.

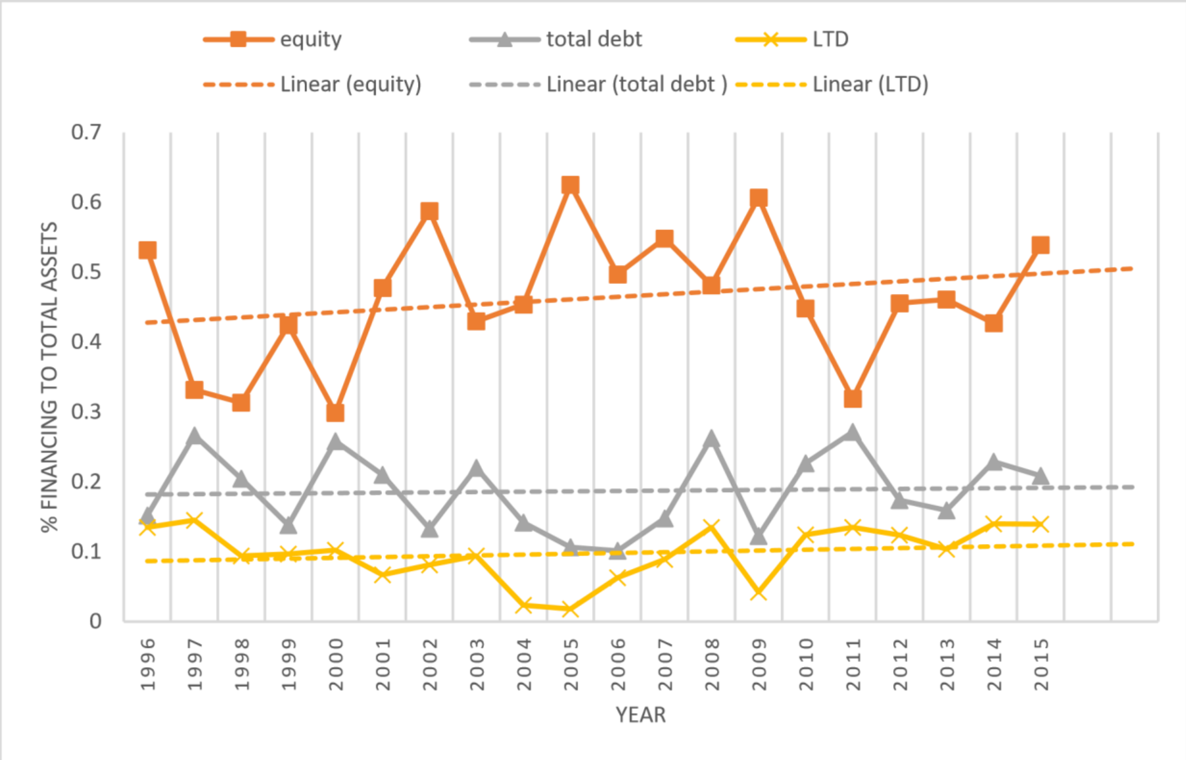


Figure 3-6 Percentage financing to total assets

Source: Bloomberg and author calculations

The average change in equity to change in total assets is 0.4737 with a standard deviation of 1.2195 and the change in debt to change in total assets is 0.1885 with a 0.9046 SD. As shown in the Figure 3-6 above, the growth in total assets in African firms is mainly financed through equity rather than debt. From 1996 to 2015, equity financing has been oscillating between 30 per cent and 60 per cent whereas debt is below 30 per cent with an average of 18.85 per cent for the sample period. This shows that African firms use less leverage in financing their balance sheets. There is, however, a small increase in the level of leverage being used by African firms and the major concern from the low debt-use and the increase in debt is could this mean an improvement in investment and growth. The figure below shows the proportion of equity and debt financing by African firms.

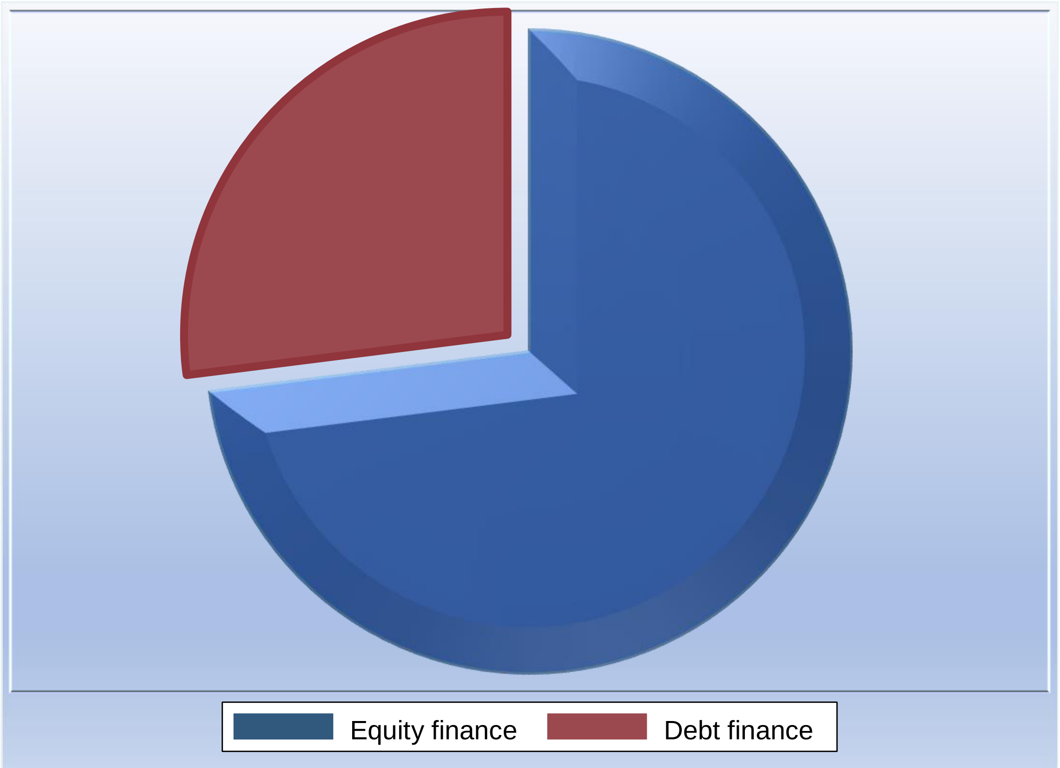


Figure 3-7 proportion of debt and equity by African firms

Source: Constructed for the thesis based on data from Bloomberg.

As shown on figure 3-7 above, African firms on average finance their operations and investments with more than 70 per cent equity whereas their counterparts in the developed nations have higher debt ratios of up to 70 per cent. In general, most African firms use leverage conservatively compared to developed nations' standards.

3.4.3 Correlation analysis

Table 3-12 reports a correlation matrix of the explanatory variables and investment. Correlations are included to check for multi-collinearity among explanatory variables. Multi-collinearity is a situation where explanatory variable in a multiple regression are highly correlated. This may create the effect of causing skewed or misleading findings. Correlation of more than 80 per cent between two independent variables results in a multicollinearity problem (Islam, 2012). For all the explanatory variables, correlations are less than 0.3, suggesting that multi-collinearity is not a problem in this analysis. Concurring with previous studies, the correlation matrix depicts a statistically significant negative correlation between investment and the two leverage measures (total debt and long-term debt to total assets). High debt ratios lead to lower average investment in African firms. The negative correlation between debt ratios and investment is in line with the Agency-cost theory prediction. Myers (1977) indicates that debt-overhang leads to the underinvestment problem therefore, creating a negative association between debt and investment.

Table 3-12 also shows a statistically-significant positive correlation between investment and cash flows. Firms that generate more cash-flow invest more. In line with financial theory, investment has a statistically-significant positive relationship with sales and growth opportunities. The correlation matrix shows that leverage correlates negatively with cashflow. Firms that generate more cash-flow borrow less as they can finance their operations with internally-generated funds therefore, their low debt ratios. Leverage is also negatively correlated with sales and growth opportunities. Firms that have higher sales revenues have less leverage. In the same argument, high-growth firms borrow less as they sustain investment opportunities from internally-generated funds and higher sales revenues. High growth firms also lower their leverage so as to be able to exploit any investment opportunities as they arise. There is also a statistically-significant positive correlation between sales and cash-flow. Firms that have higher sales revenues will unlock more operating cash-flow. Growth opportunities are positively correlated with sales and cashflow. High-growth firms in Africa generate more sales and cash-flow. This is in line with financial theory and our expectation is that high-growth firms have more investment opportunities therefore, they tend to invest more. Higher investments will be associated with an increase in sales revenues and cash flow generation capacity.

Table 3-12Correlation of explanatory variables

	INVESTMENT	LTD/TA	LTD/TA	CASH FLOW	SALES	Tobin's Q
INVESTMENT	1					
LTD/TA	-0.0630* 0.0000	1				
TD/TA	-0.0762* 0.0000	0.7491* 0.0000	1			
CASH FLOW	0.2396* 0.0000	0.1310* 0.0000	-0.1746* 0.0000	1		
SALES	0.2729* 0.0000	-0.1824* 0.0000	0.1189* 0.0000	0.3813* 0.0000	1	
Tobin's Q	0.1869* 0.0000	-0.0863* 0.0000	-0.1463* 0.0000	0.1760* 0.0000	0.0529* 0.0000	1

Source: Author's calculations based on data obtained from Bloomberg online database

***** $p<0.01$ significant at 1% level,** $p<0.05$ significance at 5 % level, * $p<0.1$ significance at 10% level The Table shows a correlation matrix for the variables of interest. LTD/TA is the ratio of long-term debt to total assets, TD/TA is total debt to total assets, CASH FLOW is cash flow from operations lagged by net fixed assets, Sales is sales scaled by lagged net fixed assets, Tobin's Q, measures growth opportunities. The correlation among explanatory variables is less than 0.3 suggesting multi-collinearity is not a problem in this analysis*

3.4.4 Econometric analysis

3.4.4.1 The Impact of Leverage on Investment

Table 3-13 presents the regression output of the investment model (equation 2.3). We used two methodologies to estimate our model: the difference GMM and the two-step system GMM with orthogonal options since we have unbalanced panel data. Two measures of leverage were used the long-term debt and total debt to total assets. The two estimation techniques and the two leverage measures give the four models shown in the Table. The signs of the coefficients of the explanatory variables give the direction of the relationship between the respective independent variable and investment and the response variable. The Table also shows model specification tests, the autocorrelation and the Hansen-Sargan instruments-identification tests below the coefficient estimates.

Table 3-13 Dynamic panel-data GMM-estimation leverage and investment

	leverage= [LTD: TA]		leverage= [TD: TA]	
	Diff GMM	***SYS GMM***	***Diff GMM***	***SYS GMM***
L.investment	-0.00485***	-0.00170***	-0.00531***	-0.00253***
	(-0.000503)	(-0.000345)	(-0.000782)	(-0.000259)
Leverage	-0.395***	-0.414***	-0.686***	-0.262***
	(-0.00336)	(-0.00254)	(-0.00713)	(-0.00187)
CF	0.113***	0.108***	0.108***	0.108***
	(-0.00156)	(-0.00101)	(-0.00251)	(-0.000534)
Sales	0.00173***	0.00180***	0.00401***	0.00114***
	(-0.000128)	(-0.000068)	(-0.000223)	(-0.0000299)
Tobin's Q	0.159***	0.171***	0.123***	0.178***
	(-0.000994)	(-0.000474)	(-0.00175)	(-0.000294)
Observations	5,063	5,708	5,063	5,708
Number of id	627	645	627	645
Groups	627	645	627	645
Instruments	201	257	157	297
AR (2)	0.73	0.68	0.75	0.68
Hansen/ Sargan test	0.22	0.68	0.98	0.97

This Table shows the regression outputs of leverage on investment for African firms using two methodologies: the difference and system GMM. Standard errors are given in parentheses. The two measures of leverage are long-term debt (LTD: TA) and total debt (TD: TA), CF is cash flow scaled by net fixed assets, Sales are sales scaled by lagged net fixed assets, and Tobin Q is a proxy for growth opportunities measured as market – to book- ratio, and L. Investment is the lagged dependent variable. The AR (2) tests for auto-correlation, and the Sargan test tests for overidentification of instruments. The results show a negative relationship between leverage and investment for both measures of leverage and estimation methods.
***** p<0.01 significant at 1% level,** p<0.05 significance at 5 % level, * p<0.1 significance at 10% level*

The results provide evidence that there is a negative relationship between the current leverage and investment in African firms. The co-efficients of long-term debt and total debt relative to total assets are significant and negative at a one per cent level. We are ninety-nine per cent confident that the current leverage is having a significant adverse effect on investment in African firms. In other words, African firms that have more debt in their capital structure in financing their investments and day-to-day operations have lower investment ratios or they invest less compared to firms that use less debt. In addition, the increase in debt levels of African firms is resulting in the reduction in investment levels or is not enough for these firms to enjoy fully the benefits of leverage. The negative relationship was obtained in all four models and robust for the two estimation techniques the difference and system GMM and the two leverage measures used long-term and total debt to total assets. The negative relationship between leverage and investment in African firms is inconsistent with the expectation for African firms. African firms use leverage conservatively, are still young and have more investment opportunities. The expectation was that an increase in leverage should boost the financing of more investments for most growth firms in Africa. However, the empirical results show that the current leverage is actually constraining investment in these firms. The negative association between leverage and investment in African firms with lower leverage levels indicates that leverage constrains investment even for lower leverage firms. Previous studies conducted in developed economies on the relationship between leverage and investment mainly used the OLS and the fixed-effects models that have limitations in controlling for unobservable individual effects, endogeneity and collinearity. Using a more efficient and robust estimation technique in the presence of endogeneity and heterogeneity biases we also found a negative relationship between leverage and investment in a different market. This suggests that leverage largely constrains investment.

3.4.4.2 Economic Impact of regression results

Table 3-13 shows the economic impact of leverage and other explanatory variables, cash flow, growth opportunities, sales growth on investment. The results on the Table show what impact one standard deviation change on the explanatory variables will have on investment the dependent variable for all the four models. The economic impact is calculated as follows:

$$Economic\ impact = \frac{SD_{EXPLANATORY\ VAR} \times Regression\ Coefficient}{SD_{DEPENDENT\ VAR}}$$

Where: $SD_{EXPLANATORY\ VAR}$ is the standard deviation of the explanatory variable.

$SD_{DEPENDENT\ VAR}$ is the standard deviation of the dependent variable (investment).

Table 3-14 Economic impacts of the regression estimates.

	LEVERAGE = LTD: TA		**LEVERAGE = TD: TA**	
VARIABLE	**Diff GMM**	**SYS GMM**	**DIFF GMM**	**SYS GMM**
L.INVESTMENT	-0.0047	-0.0017	-0.0054	-0.0026
LTD: TA	-0.0124	-0.0131		
TD: TA			-0.03230	-0.0123
CASH FLOW	0.3965	0.3789	0.3789	0.3789
SALES	0.0172	0.0179	0.0399	0.0113
TOBIN'S Q	1.0510	1.1304	0.8131	1.1767

Source: Authors calculations based on regression results.

The co-efficients shown in Table 3-13 of the two measures of leverage estimated the range from -0.26 to -0.69 for the two estimation techniques and measures of leverage. The economic implication shown in Table 3-14 is that one standard deviation change in leverage will result in a 0.0124 per cent to 0.0323 per cent decrease in investment for the four models. The range of the impact values of investment on all the four models (0.0124 to 0.0323 %) per one standard deviation change in leverage shows that, for a given percentage increase in leverage, there is a smaller corresponding decline in investment among African firms. One standard deviation change in cash-flow results in 0.3789 to 0.3965 per cent change in investment.

These figures show that investment is more sensitive to cash flow compared to leverage as there is higher percentage change in cash flow than in leverage. For sales growth, one standard deviation change in sales leads to a 0.0113 to 0.0399 percentage change in investment for the four models and the two measures of leverage. Above all, with respect to investment opportunities, there is an interesting observation. One standard deviation change in growth opportunities results in a range of 1.1304 and 1.1767 per cent increase in investment for the long-term and total-debt-to-total-assets under system GMM respectively. The results from Table 3-14 show that investment in African firms is more sensitive to growth opportunities than leverage, cash-flow and sales growth as shown by higher percentage changes per one standard deviation. This implies that, for a given change in growth opportunities, investment changes with a greater magnitude. In other words, for a given increase in growth opportunities, investment increases by a higher magnitude. This is in line with our expectation for African firms, which are still young and in their growth stage and that they have more investment prospects and that they should invest more.

The findings are inclined to the agency-costs theory that the increase in leverage in the capital structure of the firm complicates the investment policy through the conflict of interests between managers and shareholders and, on the other hand, shareholders and bondholders. Both Shareholders and bondholders want to act in their own best interests which contradicts and suffocates the firm's investment decisions (Jensen and Meckling 1976). The negative association between investment and leverage is in line with Myers (1977) who found that debt overhang reduces the incentives of shareholders to invest in positive net-present value projects in an analysis of possible externalities of debt on optimal investment strategy. Therefore, leverage leads to under-investment for firms with low growth opportunities. On the other hand, the conflict between managers and shareholders gives rise to over-investment for firms with limited investment opportunities (Myers 1977).

The results concur with Lang et al., (1996) who used the pooling-regression method in industrial firms in the United States of America, Aivazian et al., (2003), using the fixed effects and the instrumental-variable technique in Canadian firms also found a negative association between investment and leverage in support of the under-investment hypothesis. Firth et al., (2008), with a panel of China's listed firms and using the fixed-effects estimation to eliminate unobserved individual time-invariant effects, found a negative relationship between leverage and investment. Zarutskie (2006), in the United States market, also found that firms at the growth stage borrow and invest less suggesting a negative relationship between leverage and investment. Ahn et al., (2006) found that diversified firms tend to have higher leverage than focused firms and diversified firms invest more than their focused counterparts. They indicate that leverage influences investment decisions. Yuan and Motohashib (2014), in Chinese firms, report a negative relationship between leverage and investment. However, on the other hand, our findings are contrary to Franklin John and Muthusamy (2011) who by demarcating small, medium and large firms in India and using the pooled-ordinary least squares, random effects and fixed-effects estimation techniques, found a positive relationship between leverage and investment.

Using a panel of African listed non-financial firms and a novel-dynamic panel model estimated with the GMM estimation technique which has not been used in the previous studies. We also found a significant negative relationship between the current leverage and investment in African firms. This implies that higher debt is associated with a decline in investment and firms with no debt invest more due to low financing costs and agency constraints. Previous studies that have concentrated on developed economies where firm's leverage levels are generally high, using African firms with low leverage levels, the negative relationship is confirmed. This may suggest that African firms' leverage levels are too low for them to enjoy the full benefits of debt (underutilisation of the debt capacity).

The negative relationship between leverage and investment for firms with high leverage in the developed economies and low-leveraged firms in Africa also suggest that leverage constrains investment in all extremes for both high-leveraged firms and those that use leverage conservatively. The implication is contrary to the capital-structure theories that advocate the tax advantages of debt. An increase in leverage to exploit the tax advantage will be offset by the costs associated with debt issues and the covenants imposed by the bondholders and commitment to debt-servicing thereby reducing the ability to take on investment opportunities as they arise.

This empirical analysis from the dynamic GMM estimation shows that the current leverage levels of African firms are constraining investment. The trend analysis of African firms shows that leverage levels are on an upward trend and that investment is low. This shows that the negative effects of debt (bonding costs, restrictive covenants) outweigh the positive benefits they derive from the use of leverage to invest. This may be explained by the nature of African financial systems that are associated with the limited financing available and that very few financial players can extend credit, as well as shallow debt capital markets leading to an increase in financing costs which discourages investment. The recommendation, therefore, is for African firms to make use of internally-generated funds to finance their investments. For the long term ,African economies policy-makers must consider revitalising and advancing the debt-capital markets and the financial-system competitiveness through financial liberalisation which can be harmonised into the global financial system and, thereby, provide efficient financing for investment.

3.4.4.3 Lagged Investment

The coefficient of the lagged dependent variable is significant and negative. Consistent with dynamic stability, the lagged investment coefficient is less than one. The significant negative-lagged variable implies lack of persistence in African firms' investment behaviour and firms that invest cannot sustain the same investment trend should rather lower their capital expenditures. The rate of convergence given by 1- α, where α is the coefficient of the lagged dependent variable, in all four models, is almost one, implying that African firms adjust their investment-behaviour completely and instantly to any deviation in past investment levels. In other words, there is an instant reflection of the effect of the past investment decisions on current firm-investment in African firms. A negative association indicates that a period of higher investment is followed by a period of lower investment in African firms. In other words, firms that have higher capital expenditures in the current period will invest less in the next period, and those firms with low investment levels will invest more in the next period. This could be explained by the lack of finances in the period following a significant investment which could sustain more investment opportunities among African firms. In addition, the negative association between previous investment levels and the current level may signal longer pay-back periods on investment African firms undertake. The longer the payback period, the more the likelihood that capital will be tied up in the current project, thereby reducing the capacity for funding the next projects. The negative relationship can also imply less profitability, inefficiency and low cash-flow generation on investments undertaken by African firms which reduces the capacity for future investments. This shows that previous investment levels are a significant determinant of the future investments a firm undertakes.

3.4.4.4 Cash flow and Investment

Consistent with financial theory, the availability of internal funds proxied by cash flow has a significant positive impact on investment. The co-efficient of cash flow (CF) is significant and positive at 99 per cent confidence-level. This means that firms that generate more-cash flows invest more. Our results concur with Almeida and Campello (2007), Franklin John

(2011), Aivazian et al., (2005) in Canadian firms, Berger and Haun (2003) in the United States, Firth, Michel Yuan (2002 with Chinese firms, Kaplan and Zingales (2000) in the United States. African firms which generate more cash flow invest more in fixed assets. The positive relationship between cash-flow and investment reflects the financial constraints that African firms face. As documented by Fazzari et al., (1988) cash-flow allows greater investment for firms that are restricted from foreign credit. Bond et al., (2003) and Munoz et al., (2013) found a significant negative relationship between cash-flow and earnings before interest and tax (EBIT), indicating that cash flow is related to financial constraints. Firms that have a higher cash flow are less financially-constrained and tend to invest more.

The positive association between cash-flow and investment is inclined to the risk management theories that suggest that, should firms maintain smooth cash flow value creation should result (Froot et al., 1993b), According to the risk-management theories, external financing, through debt and equity issuance, attracts higher costs. Therefore, firms that can smoothen their cash-flow can finance their investment needs with less friction and reduce the costs of external financing and, therefore, add value to the firm. Minton and Scharand (1999) also confirm that cash-flow volatility increases the need for external financing and increases the cost associated with this thereby affecting a firm's investment policy. Our findings are consistent with Myers and Majluf (1984) who indicate that information asymmetries will increase the cost of financing for those firms that raise external financing and, consequently, reduce investment flexibility. Therefore, responding to the lower cost of finance, such firms tend to invest more in externally-generated finance than when they rely on internally-generated cash flow This, therefore, suggests a positive relationship between cash flow and investment.

The positive association between cash flow and investment can also explain that the availability of free cash flow allows managers to invest in negative NPV projects. This behaviour can be curbed if they must raise external funds. Vogt (1994) suggests that the positive relationship between cash flow and investment confirms the over-investment hypothesis for firms with limited investment opportunities. On the other hand, an underinvestment problem is confirmed by a positive relationship between cash flow and investment for firms with valuable investment opportunities (high-growth firms).

3.4.4.5 Firm size and Investment

Firm size, as measured by sales growth, also has a positive impact on firm investment. As firms generate more sales and expand they tend to invest more. Firms that generate more sales and have higher growth prospects, invest more in capital expenditures and have a positive growth in fixed assets. Capital expenditure and fixed assets growth increase with the increase in sales, growth opportunities and liquidity and decrease with an increase in leverage. These findings are consistent with Aivazian et al., (2005), Munoz, (2013) and Polk and Sapienza (2009).

The positive association between firm size and investment is consistent with the information asymmetry hypothesis which reveals that, if lenders do not have much information on a firm, they may raise the costs of their funds to hedge themselves against any uncertainty and this results in higher financing costs for smaller firms. Increase in financing costs, due to information asymmetries, results in lack of financial capital for investment purposes in small firms and this suggests a positive correlation between size and investment. The positive relationship between investment and firm size can also be explained by the fact that small firms are normally faced with more growth opportunities and will need financing flexibility while they have less cash flow available and face more difficulties in accessing financing from the capital markets. Therefore, they may be unable to finance their investment opportunities (Byoun, 2008). On the other hand, large firms have better access to external financing due to the low risk associated with them which gives them financial flexibility in funding their investment Byoun (2008). Therefore, large firms tend to have higher investment ratios.

The findings of this study on African firms are consistent with Pandey (2001) who indicates that firms with rapid growth in sales as a proxy for size often expand their fixed assets investment suggesting a positive relationship between sales and investment. Lang et al., (1996), using firms in the United States, Aivazian et al., (2005) with Canadian firms, Yuan and Motohashib (2014) in Chinese firms also confirm a positive relationship between sales and firm-level investment. On the contrary, Franklin John and Muthusamy (2011) found sales to be negatively associated with investment. In line with most empirical studies, the conclusion is that there is a positive relationship between size and firm-investment. As firms grow bigger they also expand their investment-base in fixed assets to support their size.

3.4.4.6 Growth Opportunities and Investment

Consistent with Myers' (1977) prediction, investment opportunities, as measured by Tobin's Q, have a significant positive impact on investment as shown by the significant positive coefficient of Tobin's Q at 1 per cent significance level. Firms with more investment opportunities have high capital expenditures. High-growth firms have higher investment ratios implying higher investment levels compared to low-growth firms.

The positive relationship between investment and growth opportunities in African nonfinancial firms is in line with many empirical studies in the developed economies. Aivazian et al., (2005) in Canadian firms, found a positive association between investment and growth opportunities. (Umutlu, 2010), Ahn et al., (2006) in the USA, also found a positive relationship between investment and growth opportunities. (Umutlu, 2010), examined the relationship between corporate debt structures and firm investment in Turkey and found a positive relationship between growth opportunities and investment. Chen and Zhao (2006) on Compustat firms suggest that firms with high-growth opportunities on average are more profitable and, therefore, they are offered lower borrowing costs and they can invest more from either internal or external funds. Myers (1977) suggests that growth opportunities are positively correlated with the costs of the underinvestment problems. (Sengupta and Dasgupta, 2002) advocate that firms with better growth opportunities invest more to preserve their debt-capacity and financial slack or liquidity.

On the other hand, the results are contrary to (Sajid et al., 2016) who found a negative relationship between investment and Tobin's Q (a proxy for growth opportunities) in Pakistani firms using the pooled-least squares analysis on 30 listed firms. However, the estimation technique used does not cater for unobserved heterogeneity and endogeneity issues arising from measurement errors and the possibility that Tobin's Q can become an endogenous variable.

Consistent with many empirical studies from developed economies, we conclude a positive association between growth opportunities and investment for African firms. Firms with higher growth opportunities invest more in fixed assets. Firms with more growth opportunities are more active in research and development and are more profitable than low growth firms. Therefore, they can access financing from financial institutions for investment purposes. The positive relationship between growth opportunities and investment can also be explained by the fact that African firms, on average, are still young and emerging. Consequently, they have more investment opportunities and are, therefore, a target for foreign investors through mergers, acquisitions and divestitures. Therefore, more funding is available which leads to higher investment ratios.

3.5 Model specification tests

Testing the legitimacy of instruments and model specification is crucial in dynamic panel data analysis to ensure reliable estimations. The GMM-estimation technique is consistent in the absence of second-order serial correlation in error terms. The presence of the lagged investment variable as one of the explanatory variables introduces auto-correlation into the model. Therefore, an auto-correlation of order one (AR (1) is expected. The serial correlation AR (2) test proposed by Arellano and Bond (1991) was used to test for serial correlation. The models passed the AR (2) test of no serial auto-correlation as shown by a non-significant p-value of AR (2) indicating the absence of auto-correlation of order 2. All the models also passed the over-identification of instruments test shown by a non-significant Hansen-Sargan test indicating that the model is not over-identified. The co-efficient of the lagged-dependent variable is also less than 1, which is consistent with dynamic stability. Although unit-root is not a problem with a GMM estimation due to differencing and use of lags, a stable-lagged dependent variable of less than one also suggests the absence of unit root. These attest to the correct specification of the model.

3.6 Investment and leverage for African firms versus South Africa

Our sample consists of all non-financial firms listed across African stock exchanges. Out of the 878 firms included in the sample, almost 30 per cent are South African firms. This is quite a big number that can also affect our results. South Africa is classified as an emerging market and its financial structures are more developed than other developing markets and other African countries.

Table 3-15shows that on average, South African firms' leverage is higher than the continental average. South African firms' long-term debt to total assets averages 15 per cent compared to 9 per cent for the continent as a whole and 8 per cent for the rest of the continent exclusive of SA firms. The total-debt-to-total-assets has an average of 25 per cent for South African firms compared to 18,8 per cent for all African firms. These figures indicate that South African firms are using more leverage relative to other African countries. This is due to South Africa's advanced financial market.

On the same note, investment levels for South African firms are very high with an average 7.8 ratio of capital expenditures-to-net-fixed-assets compared to 0.37 for the rest of the continent. This also shows that South African firms account for a larger proportion of investment ratio. To check the robustness of our results for African firms, we repeated the regressions of Equation 3, excluding South Africa and we also analysed South Africa on its own to check if this most-advanced economy was not influencing our results.

Table 3-15 Leverage and Investment averages for all African firms versus South Africa

	All African firms		**Excluding SA**		**South Africa**	
Variable	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
Investment	0.3724	4.9422	0.272132	1.788119	7.831899	0.547004
Long-term debt to total assets	0.0922	0.1561	0.088624	0.157378	0.153342	0.099043
Total debt to total assets	0.1889	0.2327	0.19478	0.223044	0.249874	0.177713
Cash flow to fixed assets	0.6812	17.3460	0.472952	5.126828	28.30785	1.060633
Sales to fixed assets	9.3831	49.1219	6.712313	54.49658	35.43886	14.72933
Tobin's Q	2.1130	32.6755	1.671015	2.786816	54.86164	2.922873

Source: Author's calculations based on data obtained from Bloomberg online database.

Table 16 confirms higher leverage levels for South African firms as compared to the continental average. Long-term debt to total assets averages 0.15 compared to 0.09 for the continent as a whole and 0.08 for the rest of the continent excluding South Africa. Investment levels for South African firms are very high with an average of 7.8 ratio of capital expenditures to net fixed assets compared to 0.37 for the rest of the continent, and this also shows that South African firms are accounting for a larger proportion in our investment ratio.

Table 3-16 Dynamic panel estimation of leverage on Investment excluding South Africa

	leverage= [LTD: TA]		leverage= [TD: TA]	
	Diff GMM	*SYS GMM*	*Diff GMM*	*SYS GMM*
L.investment	-0.0785***	0.0639***	-0.163***	0.0066***
	(-0.00975)	-0.0162	(-0.00574)	(-0.0016)
Leverage	-0.421***	-0.229***	-0.632***	-0.780***
	(-0.0959)	-0.0657	(-0.0682)	(-0.0131)
CF	0.141***	0.122***	0.149***	0.165***
	(-0.00565)	(-0.00399)	(-0.00328)	(-0.00142)
Sales	0.0685***	0.0261***	0.0283***	0.0106***
	(-0.00239)	(-0.00152)	(-0.000581)	(-0.00015)
Tobin's Q	0.0699***	0.0275***	0.253***	0.256***
	(-0.0106)	(-0.00501)	(-0.00971)	(-0.00166)
Observations	2,928	3,383	2,928	3,383
Number of id	441	455	441	455
AR(2)	0.232	0.149	0.48	0.36
Sargan Test	0.99	1	0.99	0.65
Hansen test	0.47	0.448	0.5	0.545

Source: Author's calculations based on data obtained from Bloomberg online database

This table shows regression results of leverage on investment for all African firms excluding South Africa using two methodologies: the difference and system GMM. The two measures of leverage are long-term debt (LTD: TA) and total debt (TD: TA), CF is cash flows scaled by net fixed assets, Sales are sales scaled by lagged net fixed assets and Tobin Q is a proxy for growth opportunities measured as market-to-book ratio, L.investment is the lagged dependent variable. The AR (2) tests for autocorrelation, and the Sargan test tests for overidentification of instruments. We exclude South Africa to check if our results are not being influenced by this biggest economy in Africa. The results confirm the negative relationship between leverage and investment. Standard errors in parentheses

**** p<0.01 significant at 1% level,** p<0.05 significance at 5 % level, * p<0.1 significance at 10% level*

Table 3-16 shows the regression output for African firms, excluding South Africa. As South Africa is the most advanced economy in Africa and it accounts for almost 30 per cent of the firms included in the sample of 21 stock exchanges, this may have the capacity to influence the results. The results reveal that the negative impact of leverage is maintained in the absence of South African firms, suggesting that our results are robust, and they are not influenced by anyone large economy. We also performed the analysis for South African firms only. The results are shown in Table 3-17 and we also found a significant negative relationship between current leverage and investment for South African firms. Our results are robust in all tested situations, suggesting a significant negative relationship between investment and leverage in African firms.

The constraining effect of leverage on investment is evidence of the important role of capital structure in a firm's investment policy. The results support the theory that agency problems between shareholders and bondholders may cause leverage to have a constraining impact on investment (Myers, 1977). Managers may give up on some positive NPV projects due to debt overhang. Based on agency conflict between shareholders and managers, the theories of Jensen (1986), Stulz (1990) and Grossman and Hart (1982) also suggest a negative relation between leverage and investment, arguing that firms with free cash-flow, but low growth opportunities may underinvest and firms with no growth opportunities may take on projects with negative net-current-value (over-invest). However, over-investment will come back adversely to the manager in the long-run.

Table 3-17 Dynamic panel data estimation for South African firms

	leverage= [LTD: TA]		leverage= [TD: TA]	
	Diff GMM	***SYS GMM***	***Diff GMM***	***SYS GMM***
L.investment	0.00547***	-0.00211***	-0.00124***	-0.00299***
	(-0.00000492)	(-0.0000117)	(-0.000184)	(-0.0000199)
Leverage	-0.875***	-0.537***	-0.528***	-0.636***
	(-0.0000258)	(-0.000177)	(-0.000783)	(-0.000135)
CF	0.0989***	0.0950***	0.0981***	0.0950***
	(-0.0000361)	(-0.0000456)	(-0.000551)	(-0.0000625)
Sales	0.00132***	0.00179***	0.0008***	0.00194***
	(-0.00000775)	(-0.00000226)	(-0.000253)	(-0.00000408)
Tobin's Q	0.173***	0.183***	0.227***	0.214***
	(-0.0000203)	(-0.0000282)	(-0.000307)	(-0.0000304)
Observations	2,135	2,325	2,135	2,325
Number of id	186	190	186	190
AR (2)	0.45	0.38	0.4	0.38
Sargan test	0.29	0.43	0.2	0.58
Hansen test	0.68	0.99	0.27	0.8

Source: Author's calculations based on sample data

The shows regression results of leverage on investment for South African firms only, using two methodologies: the difference and system GMM. The two measures of leverage are long-term debt (LTD: TA) and total debt (TD: TA), CF is cash flow scaled by net fixed assets, Sales are sales scaled by lagged net fixed assets and Tobin Q is a proxy for growth opportunities measured as market to book ratio, L.investment is the lagged dependent variable. The AR (2) tests for autocorrelation, and the Sargan test tests for overidentification of instruments. The results reveal a negative relationship between leverage and investment for South African firms. Standard errors are given in parentheses

**** p<0.01 significant at 1% level,** p<0.05 significance at 5 % level, * p<0.1 significance at 10% level*

3.7 Growth opportunities and the role of leverage

The empirical analysis shows that the current leverage levels of African firms are having a significant negative impact on investment. The results concur with most empirical studies in developed economies that found that there is a negative relationship between leverage and investment. Previous studies in developed markets reveal that leverage constrains investment. However, they report different implications for high-growth as against low growth firms. The over- and under-investment theory of leverage also suggests a negative relationship between leverage and investment, but only for firms with little or no growth opportunities. Recent empirical studies, such as Aivazian et al., (2005), found the inverse relationship to be stronger for low-growth opportunity firms. However, Seoungpil et al., (2005) and Rasa et al., (2008a) found the constraining effect of leverage on investment to be stronger with regard to high-growth opportunities firms.

To examine the variances of the impact of leverage on high- and low-growth opportunity firms, we follow Aivazian et al., (2005). Extending from equation (3.3) to include a dummy variable for high- and low-growth firms to interact with leverage the following specification will be used to examine the effects of growth opportunities.

$$\frac{I_{i,c,t}}{K_{i,ct}} = \left(\frac{I_{i,c}}{K_{i,c}}\right)_{t-1} + \alpha_0 + \beta_1 LEV_{i,c,t} + \beta_2 D_{i,,c,t} * LEV + \beta_3 \frac{CF_{i,c,t}}{K_{i,c,t}} + \beta_4 Q_{i,c,t-1} + \beta_5 \frac{SALE_{i,c,t}}{K_{i,c,t}} + \mu_{i,c} + \varepsilon_{i,c,t} \quad (3.24)$$

Where, D is a dummy variable = 1 if Tobin's Q>1, and 0 otherwise. D*LEV has been added to the regression. Hence, for firms with Q>1, the coefficient for leverage will be $\beta_1 + \beta_2$ and for firms with $Q \leq 1$, it will be β_1.

Table 3-18 shows the regression output for high-growth firms. The coefficient of β_2 is significant and positive ranging from 0.351 for long-term debt and 0.112 for total debt both under system GMM. As indicated by Table 3-19 the coefficients for high-growth firms under system GMM will be -0.169 (-0.526+0.351) for long-term debt and -0.151 for total debt versus -0.526 and -0.263 for low-growth firms.

The results suggest that leverage has a greater constraining effect on investment for firms with low- or no-growth opportunities than for high-growth firms in Africa. In other words, the adverse effects of leverage affect more firms with no growth opportunities than firms with valuable investment opportunities. This implies that borrowing is more detrimental to those firms with no investment opportunities. This makes sense as firms with no investment opportunities because, as they borrow, interest expenses increase the costs, yet there is little return coming from the investment. These findings concur with Aivazian (2005) using Canadian evidence and Lang (1996) using American evidence. Using African firms, we also found evidence supporting the theory that leverage is a tool for disciplining firms with no growth opportunities to avoid overinvestment.

Managers may have the propensity to increase the scale of the firm through overinvestment even in projects that destroys shareholder value. Jensen (1986) argues that debt can help reduce overinvestment. The availability of free cash-flow restrains managers' abilities or gives them room to make such policy. Therefore, increasing leverage through the issuance of debt commits cash flow to debt-servicing and reduces unworthy investments, suggesting a negative relationship between leverage and investment in such firms. Jensen claims that the availability of growth-prospects fundamentally controls whether debt will restrain overinvestment. Our results are in line with this theory and we found the negative effect of leverage to be greater in low-growth firms.

Table3-18 Dynamic panel-data estimation for high-growth firms

	leverage= [LTD: TA]		leverage= [TD: TA]	
	Diff GMM	***SYS GMM***	***Diff GMM***	***SYS GMM***
L.investment	-0.00439***	0.000935***	-0.0675***	0.0497***
	(-0.000443)	(-0.000149)	(-0.00434)	(-0.000988)
Leverage	-0.693***	-0.526***	-0.854***	-0.263***
	(-0.0634)	(-0.0119)	(-0.0183)	(-0.00214)
D* lev	1.106***	0.351***	0.480***	0.112***
	(-0.0633)	(-0.0117)	(-0.0116)	(-0.00169)
CF	0.109***	0.107***	0.00435**	0.0877***
	(-0.00159)	(-0.000394)	(-0.00199)	(-0.0004)
Sales	0.00171***	0.00166***	0.00998***	0.000148***
	(-0.000122)	-2.38E-05	(-0.000234)	(-0.000015)
Tobin's Q	0.236***	0.178***	0.105***	0.120***
	(-0.000932)	(-0.000279)	(-0.00303)	(-0.000628)
Observations	4,987	5,630	5,063	5,708
Number of id	621	643	627	645
AR (2)	0.761	0.65	0.516	0.3
Sargan Test	0.252	0.7	0.99	0.98
Hansen test	0.221	0.49	0.23	0.075

Source: Author's calculations

Table 3-18 regression results of leverage on investment for high-growth firms. High-growth firms are firms with Q > 1, D=1 if Q>1 and 0 otherwise. The two measures of leverage are long-term debt (LTD: TA) and total debt (TD: TA), CF is cash flows scaled by net fixed assets, Sale is sales scaled by lagged net fixed assets and Tobin Q is a proxy for growth opportunities measured as a market to book ratio. The AR (2) tests for autocorrelation, and the Sargan test tests for overidentification of instruments. The impact of leverage is stronger for firms with low-growth opportunities.
**** p<0.01 significant at 1% level, ** p<0.05 significance at 5 % level * p<0.1 significance at 10% level.*

Table 3-19 Coefficients of leverage for high- and low-growth firms

	Coefficient	Long-term debt	Total debt
High-growth firms	$\beta_1 + \beta_2$	-0.169	-0.151
Low-growth firms	β_1	-0.526	-0.263

Source: Author's calculations

Table3-19 the coefficients for high- growth firms from system GMM estimation will be -0.169 (-0.526+0.351) for long-term debt and -0.151 for total debt versus -0.526 and -0.263 for low-growth firms, suggesting a higher negative impact of leverage on investment for low-growth firms.

Financing policy has a considerable bearing on investment levels. African firms should consider adopting a residual payout policy to avail more internal funds in financing investment needs. This would enable maintenance of low debt levels to reduce the bondholder share holder conflict and avail more cash-flow for investment requirements. Low debt will ease pressure on cash flow commitments to interest payments and other debt covenants and the firm can take on investment opportunities freely as they arise. The two GMM estimation techniques, the difference GMM and system GMM, and two different measures of leverage, the long-term debt and total debt as ratios of total assets to examine the impact of leverage on investment were used. Confirming previous studies in developed economies, it was found that a negative relationship between leverage and investment in African firms. In light of growth opportunities, the analysis revealed that the negative impact of leverage is greater for firms with low-growth opportunities than high-growth firms. Leverage levels in African firms are rising from their historically low levels. It has been shown that this is having a negative impact on investment and the negative effect is more pronounced for low-growth firms.

Considering that leverage is constraining investment in African firms, they should consider relying more on internally-generated funds more than issuing debt to expand operations. The negative effects of leverage may also be attributed to high financing costs which outweigh the returns from restricted investment opportunities for such firms. In light of this, financial policy-makers must consider broadening the financing options to lower the borrowing costs in these economies for firms to enjoy the full benefits of leverage. For high-growth firms, lowering payout policy may help to improve the percentage of retained earnings. More commitment to interest payments suppresses the freedom to invest in arising opportunities due to loan covenants and interest expenses. On the other hand, for firms with low-growth opportunities, high payout policies reduce the free-cash-flow at the disposal of managers and lowers the shareholder and manager conflicts. Taking on more debt to discipline managers from over-investing is also costly to shareholders as it doesn't add any value, but it suppresses investment distribution of dividends. But, perhaps it would be the best direction to take as shareholders may invest in other profitable avenues which the firm does not have.

3.8 Additional tests

The results of this study are robust with the two different methodologies used and the different measures of leverage. Additional tests were also performed to ascertain whether or not the findings are affected by the inclusion of distressed firms, and financially constrained and unconstrained firms. Distressed firms are not able to service their debts and finance operations. Therefore, additional investment is unlikely if the firm is in such a situation. This situation may cause a negative relationship between leverage and investment. Therefore, there is a need to ascertain if the results are not influenced by distressed firms.

3.8.1 Testing for distressed firms

Following Ahn and Denis (2004), distressed firms are defined as those firms with interest coverage of less than 1. The main regressions were re-estimated after separating distressed firms from non-distressed firms to examine whether or not distressed firms are influencing the results. Table 3-20 shows the regression results for non-distressed firms. The negative impact of leverage on investment is maintained for non-constrained firms, suggesting that the results are not controlled by financially-constrained and troubled firms. The negative relationship is robust for stable and financially strong and sound firms that are actively able to service their debt and make investments.

Table 3-20 Dynamic panel data estimation distressed and non-distressed firms

	leverage= [LTD: TA]		leverage= [TD: TA]	
	Diff GMM	***SYS GMM***	***Diff GMM***	***SYS GMM***
L.investment	-0.00430***	-0.00792***	-0.00361***	-0.00575***
	(-0.000318)	(-0.00131)	(-0.000301)	(-0.0000727)
Distressed	-0.181***	-0.759***	-1.008***	-0.974***
	(-0.0152)	(-0.0325)	(-0.0206)	(-0.00813)
Non-distressed	-0.572***	0.107***	-0.0563***	-0.0513***
	(-0.0152)	(-0.0305)	(-0.0202)	(-0.00817)
CF	0.112***	0.108***	0.110***	0.106***
	(-0.000963)	(-0.000915)	(-0.00128)	(-0.000244)
Sales	0.00490***	0.000826***	0.00458***	0.00134***
	(-0.000098)	(-0.0000173)	(-0.0000972)	(-0.00000684)
Tobin's Q	0.0650***	0.176***	0.0785***	0.261***
	(-0.000715)	(-0.00113)	(-0.000729)	(-0.000128)
Observations	4,417	5,025	4,417	5,025
Number of id	583	608	583	608
AR(2)	0.85	0.81	0.96	0.97
Sargan Test	0.95	0.15	0.17	0.36
Hansen test	0.42	0.366	0.56	0.3

Source: Author's calculations based on Bloomberg financial data.

*The table shows regression results of leverage on investment for distressed and non-distressed firms, where Distressed represents leverage for distressed firms. The AR (2) is the AB test for autocorrelation and the Sargan test tests overidentification of instruments. Standard errors are given in parentheses. A negative relationship between leverage and investment is maintained even for non-distressed firms. Standard errors in parenthesis *** p<0.01, ** p<0.05, * p<0.1.*

Experimental analysis

3.9 Response of Investment to changes in leverage levels

The analysis shows that the current conservative use of leverage by African firms is constraining investment. To ascertain the best investment-financing strategy for African firms, a scenario analysis was carried out to examine the response of investment if African firms reduce or increase leverage from the current levels. Following previous studies to reduce leverage, use was made of the square root of the mean of the ratio of long-term and total liabilities to total assets $\left(\sqrt{LTD/_{TA}}\right)$, a proxy for reducing the current debt levels. This enabled the study to predict the response of investment if African firms are to cut their current low leverage levels. To examine the effect of an increase in leverage following Kwenda (2017), Jaisinghani and Kanjilal (2017) use was made of the square of the ratio of liabilities to total assets $(LTD/_{TA})^2$, a proxy for increasing the current debt levels. The square of leverage enables the study to test the impact of higher leverage levels on investment if African firms are to increase their current debt levels and to test the possible nonlinear relationship between the level of leverage and firm investment. A change in sign on the square of leverage suggests a decrease in the negative impact if African firms increase leverage. On the other hand, a negative sign suggests an intensification of the negative effect (Martínez-Sola et al., 2013). The analysis also examines the response of investment from a further increase in leverage to the cube of long term debt to total assets $(LTD/_{TA})^3$. The models are estimated with the two-step system GMM which controls for unobservable heterogeneity and potential endogeneity problems.

Table 3-21 shows the dynamic-panel regression results on the response of investment to changes in leverage levels in African firms. The table shows three scenarios Case 1, reducing leverage to examine the effect of even lower leverage levels on investment. Case 2, increasing leverage by squaring to ascertain the probable impact of an increase in leverage on firm investment and Case 3, a further increase in leverage by finding the cube of the mean of leverage to determine the response of investment if African firms are to further increase their leverage levels. For robustness two measures of leverage were used: long-term debt to total assets and total debt to total assets. Two models are reported for each case for the two measures of leverage used: Long-term debt and total-debt-to-total-assets for the three scenarios, making a total of six models. The current leverage and the new leverage levels are both reported in each case. Model 5 and 6 shows the dynamic two-step estimation results for the three leverage levels, current, square and cube.

Table 3-21 Scenario analysis of the response of investment to different leverage levels

	Case 1		Case 2		Case 3	
	LTD	TD	LTD	TD	LTD	TD
	(1)	(2)	(3)	(4)	(5)	(6)
L.INVESTMENT	0.17600***	0.1870***	0.1830***	0.1780***	0.1950***	0.1780***
	(0.0000522)	(0.002810)	(0.006050)	(0.012700)	(0.004230)	(0.000021)
CF	0.03400***	0.0471***	0.0553***	0.0616***	0.0421***	0.0109***
	(0.0000109)	(0.000831)	(0.002060)	(0.002740)	(0.001610)	(0.000088)
Sale	0.02410***	0.0093***	0.0114***	0.0212***	0.0105***	0.0258***
	(0.0000492)	(0.000119)	(0.000490)	(0.000673)	(0.000273)	(0.000109)
Tobin's Q	0.02810***	0.0357***	0.0306***	0.0226***	0.0298***	0.0280***
	(0.0000062)	(0.001360)	(0.003070)	(0.003920)	(0.001630)	(0.000085)
LTD&TD/TA OBS	-0.14400***	-0.06030**	-0.564***	-0.552***	-0.677***	-0.5470***
	(0.0000073)	(0.025800)	(0.096200)	(0.12300)	(0.095900)	(0.000474)
LTD&TD/TA ROOT	-0.04100***	-0.1180***				
	(0.0000419)	(0.018000)				
$(\mathbf{LTD}\ \&\ TD/TA)^2$			1.0050***	0.7820***	2.9540***	2.0340***
			(0.312000)	(0.26900)	(0.725000)	(0.00233)
$(\mathbf{LTD}\ \&\ TD/TA)^3$					-5.618***	-2.9920***
					(1.04740)	(0.003270)
Observations	4,117	4,117	4,117	4,117	4,117	4,117
Number of id	579	579	579	579	579	579
Instruments	531	384	269	164	321	532
AR (2)	0.322	0.231	0.248	0.284	0.217	0.345
Sargan/Hansen	0.419	0.195	0.373	0.231	0.347	0.426

This table shows the dynamic regression results on the effect of changes in leverage on firm investment. LTD &TD/TA OBS is the observed leverage levels, LTD-TD root is the square root of current leverage $(LTD\ \&\ TD/TA)^2$ *is the square of leverage* $(LTD\ \&\ TD/TA)^3$ *is leverage cubed. Other control variables as defined before.*

3.9.1 Case 1 Reducing Leverage

Case 1 Model 1and 2 on Table 3-21shows the regression estimation results of the response of investment following a reduction in leverage using the square root of the mean of leverage. As shown in the table the coefficients of leverage from both Model 1 (long-term debt) and model 2 (total debt) are negative and statistically significant at 1 per cent level. This shows that at low levels of leverage there is also a statistically significant negative relationship between firm investment and leverage as shown by a negative sign on the coefficient of the square root of leverage (LTD & TD/TA ROOT), suggesting that even lower leverage levels are likely to constrain investment in Africa. This also implies that debt-financing constrains investment more if underutilized. This may be because of the underutilisation of the interest tax shield (Kraus and Litzenberger, 1973) and the effect of the agency costs of debt (Jensen and Meckling,1976). Lenders require protection from probable default risk, regardless of high or low leverage. For example, restrictive covenants will always be attached to loans which then affects the firm's investment policy negatively. Therefore, less leverage which does not exploit the full benefits of the tax shield will be costly to the firm's investment strategy since they will be restricted anyway. This suggests that even if African firms are to lower their leverage, they will probably constrain investment. The other control variables, cash flow, sales and growth opportunities have the expected positive signs.

3.9.2 Case 2 Increasing Leverage

Case 2, Models 3 and 4 of Table 3-21 shows the estimation results from increasing leverage by squaring the two leverage measures long-term debt and total debt. Two measures of leverage long-term and total debt were used in current levels and in squares to ascertain the effect of increasing leverage. As shown in Table 3-21 the coefficients of LTD&TD/TA OBS (current leverage) and $(LTD \ \& \ TD/TA)^{2}$ are statistically significant. Consistent with our previous estimations, the coefficients of LTD and TD (current leverage levels) are negative. Increasing the current leverage levels by squaring leverage measures, the coefficients (LTD $\& TD/TA)^{2}$becomes positive, suggesting that if African countries are to increase their current leverage levels they are most likely to boost their investment as shown by the positive impact of the two measures of leverage LTD^{2} and TD^{2}on investment. This shows that the negative effect of leverage on investment in African firms may reduce with an increase in current leverage levels. Full exploitation of leverage and interest tax shields on debt reduces the negative impact of agency costs of debt suggested by Jensen (1986) to a certain turning point. The statistically significant coefficient of $(LTD\ \&\ TD/TA)^2$ also implies a nonlinear relationship between leverage and investment, suggesting the existence of turning points on the impact of leverage on investment (Kwenda, 2017). The change in sign from negative to positive with an increase in leverage shows that Africa firms can increase their leverage to fully exploit and enjoy the benefits of debt financing to a certain optimal point**.**

3.9.3 Case 3 further increase in leverage

Increasing leverage by squaring total debt and long-term debt results has a positive effect on investment. However, a substantial increase in leverage level in case three byraising leverage to $(LTD\ \&\ TD/TA)^3$ results in a change in sign to negative as shown by model 5 and 6. This indicates that the negative impact of leverage on investment intensifies with a substantial increase in leverage. These results suggest that increasing leverage will boost firm investment to a certain break-point after which any further increases in leverage will constrain investment. Concurring with Miller (1977) on the trade-off theory of capital structure, this indicates that too much debt will also constrain investment as the benefits from interest tax shield will be outweighed by the insolvency cost (Kraus and Litzenberger, 1973). These results from African evidence indicate that underutilised debt capacity constrains investment and over-use of debt also has a negative impact on investment suggesting the existence of an optimal leverage level which can boost investment, if exploited. Our results are inconsistent with Myers (2001) who asserts that there is no optimal financing mix and there is no reason to expect one.

Firms in developed nations are highly levered Studies that have been done there, reveal that the high leverage levels are constraining investment (Ahn et al., 2006, Aivazian et al., 2005, Franklin John and Muthusamy, 2011). On the contrary, African firms use leverage conservatively. However, the low leverage levels are also constraining investment. Reducing leverage by finding the square root of the current leverage level, we also found a negative response on investment. This probably suggests that African firms are underutilising the power of leverage. This suggests that debt-financing also constrains investment if underutilised. Increasing leverage by squaring (Model 3 and 4), we show that the negative effect of leverage on investment reduces as shown by a statistically-significant positive sign of the square of leverage suggesting that African firms can boost their investment through an increase in leverage to a certain level.

Model 5 and 6 shows all the cases, the coefficient of current leverage (LTD & TD/TA OBS) is significant and negative, increasing leverage to (LTD & TD/TA) [2] investment responded positively and a further increase in leverage to (LTD & TD/TA) [3] like the current leverage also yields a negative correlation with investment. This suggests that these firms still have the capacity to increase their leverage, which may boost their investment. On the contrary, too much leverage will also constrain investment as shown by the negative coefficient of (LTD & TD/TA) [3]. Our results show that African firms are still below the capacity-utilisation of debt, and developed nations are over-utilising debt which probably explains the same negative effect of leverage obtained in these economies with substantial different levels of leverage**.**

To test the consistency of the estimators, we employed the Arellano and Bond AR (2) to test the absence of second-order autocorrelation in residuals. The Hansen test for overidentification of restrictions was used to test the absence of the correlation between the error term and the instruments. As shown in the table both the AR (2) test and the Hansen test are insignificant for all the six models suggesting correct identification of our models**.**

3.9.4 Leverage turning points

By adding the square of leverage to the base investment model (equation 3.3), we are assuming that the relationship between leverage and investment wears off at some point.
Adding leverage squared to equation 3.3 becomes:

$$\frac{I_{i,c,t}}{K_{i,ct}} = \alpha_0 + \left(\frac{I_{i,c}}{K_{i,c}}\right)_{t-1} + \beta_1 LEV_{i,c,t} + \beta_2 LEV^2{}_{i,c,t} + \beta_3 \frac{CF_{i,c,t}}{K_{i,c,t}} + \beta_4 Q_{i,c,t} + \beta_5 \frac{SALE_{i,c,t}}{K_{i,c,t}} + \mu_{i,c} + \varepsilon_{i,c,t} \qquad eq\ 3.25$$

Our estimation results in case two for models 3 and 4 can be expressed as:

$$\boldsymbol{Y = 0.183 - 0.564x + 1.005\,x^2 + 0.0553CF + 0.0114Sales + 0.0306Q \qquad eq\ 3.26}$$

$$\boldsymbol{Y = 0.178 - 0.5552x + 0.7820\,x^2 + 0.0616CF + 0.0212Sales + 0.0226Q \qquad eq\ 3.27}$$

Where Y is investment our dependent variable, x is leverage (measured as a ratio of long-term and total debt to total assets), CF is cash flow scaled by net fixed assets and Q is Tobin's Q measuring growth opportunities.

To estimate the points where our relationship changes the signs following Itô (1957) and Abel (1983) on modelling optimal investment under uncertainty, we take a partial

derivative of our model with respect to x (leverage), at turning points $\frac{\Delta y}{\Delta x}$ will be equal to zero (Fattouh et al., 2008).

Taking the partial derivative with respect to x (w.r.t) yields,

Model 3 eq 3.26:

$$\frac{\delta y}{\delta x} = (\mathbf{0.183 - 0.564}\boldsymbol{x} + \mathbf{1.005}\ \boldsymbol{x}^2 + \mathbf{0.0553}\boldsymbol{CF} + \mathbf{0.0114}\boldsymbol{Sales} + \mathbf{0.0306}\boldsymbol{Q})\boldsymbol{dx}$$

$$\frac{\delta y}{\delta x} = -0.564 + 2 * 0.1.005x$$

$$\frac{\delta y}{\delta x} = -0.564 + 2.01x$$

Setting $\frac{\delta y}{\delta x} = 0$ →and solving for x gives the turning point of the relationship (Fattouh et al., 2008).

$$\frac{\delta y}{\delta x} = 0 = -0.552 + 2.01x$$

$$x = 0.28059$$

Model 4 eq 3.27: Total debt to total assets;

$$\frac{\delta y}{\delta x} = (\mathbf{0.178 - 0.552}\boldsymbol{x} + \mathbf{0.7820}\ \boldsymbol{x}^2 + \mathbf{0.0616}\boldsymbol{CF} + \mathbf{0.0212}\boldsymbol{Sales} + \mathbf{0.0226}\boldsymbol{Q})\boldsymbol{dx}$$

$$\frac{\delta y}{\delta x} = -0.552 + 0.782 * 2x$$

Setting $\frac{\delta y}{\delta x} = 0$:

$$\frac{\delta y}{\delta x} = 0 = -0.552 + 0.782 * 2x$$

$$x = 0.352$$

The first derivative ($f'(x)$) of our models is greater than zero indicating that our investment function increases as x increases and the turning point will be a maximum point (Itô, 1957). The maximum point suggests that the relationship changes direction from positive to negative after the turning point (Abel, 1983). At the turning point of our investment, model x (leverage) takes the values of 0.2806 and 0.352, suggesting that an increase in leverage beyond 0.352, for total debt will have a negative impact on investment.

By adding the cube of leverage to the base investment model (equation 3.3), we are assuming a cubic relationship between leverage and investment that wears off at some point from negative to positive and negative. Adding leverage cubed to equation 3.3 becomes:

$$\frac{I_{i,c,t}}{K_{i,ct}} = \alpha_0 + \left(\frac{I_{i,c}}{K_{i,c}}\right)_{t-1} + \beta_1 LEV_{i,c,t} + \beta_2 LEV^2{}_{i,c,t} + \beta_3 LEV^3{}_{i,c,t} + \beta_4 \frac{CF_{i,c,t}}{K_{i,c,t}} + \beta_4 Q_{i,c,t} + \beta_5 \frac{SALE_{i,c,t}}{K_{i,c,t}} + \mu_{i,c} + \varepsilon_{i,c,t} \qquad eq\ 3.28$$

Our estimation results in case two for model 6 eq 3.28 total debt can be expressed as:

$$\boldsymbol{Y = 0.178 - 0.5470x + 2.0340\,x^2 - 2.992x^3 + 0.0109CF + 0.0258Sales + 0.0280Q} \qquad \boldsymbol{eq\ 3.29}$$

Where the dependent variable Y is investment, x is leverage (measured as a ratio of total debt to total assets), CF is cash flow scaled by net fixed assets and Q is Tobin's Q measuring growth opportunities.

Taking the partial derivative with respect to x (w.r.t) yields,

$$\frac{\delta y}{\delta x} = (\,\boldsymbol{0.178 - 0.5470x + 2.0340\,x^2 - 2.992x^3 + 0.0109CF + 0.0258Sales + 0.0280Q})\boldsymbol{dx}$$

It follows that:

$$\frac{\delta y}{\delta x} = -0.5470 + 4.068x - 8.976\boldsymbol{x^2}$$

Setting $\frac{\delta y}{\delta x} = 0$ →and solving for x gives the turning point of the relationship (Fattouh et al., 2008).
Thus;

$$\frac{\delta y}{\delta x} = 0 = -0.5470 + 4.068x - 8.976\boldsymbol{x^2}$$

Using the quadratic formulae;

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

X takes no real solutions; x= 0.2266 $\pm$ 0.098i suggesting that the graph does not cut the x-axis.

Our descriptive statistics shows mean values of 0.0922 and 0.1889 for long-term and total debt to total assets respectively. The turning points from our model using total debt as a measure of leverage imply that African firms can increase their leverage levels up to 0.35 to enjoy the full benefits of debt before constraining investment. This implies that from approximately 0.35 any benefit of leverage wears off and any addition in leverage will have a negative impact on investment. The turning point is lower than the average of developed economies which is above 50 per cent debt which is constraining investment as shown by the studies by (Aivazian et al., 2005, Ahn et al., 2006). The turning points are as a result of the benefits and costs associated with leverage. Underutilised debt capacity constrains investment. The results from our experimental analysis suggest that considering an increase in leverage in African firms will boost investments up to the breakpoint, after which any further increases in debt will be a negative externality to firm investment. The positive and negative effects of leverage suggest that the relationship between leverage and firm investment is non-monotonic. The turning points may be unattainable or may fall within a certain range which pose challenges financial planners face in trying to identify an optimal capital mix that maximises firm value (Kwenda, 2017). If firms rely more on internal financing, they are not faced with an optimal financing dilemma.

3.10 Summary and conclusions

This study provides novel evidence on the relationship between leverage and investment based on African firms. There is structural and behavioural heterogeneity between firms in developing and developed economies. Therefore, analysing African firms on their own is valuable. Our analysis employed a new approach, the dynamic panel model and the system GMM which controls for the problem of endogeneity in the relationship between leverage and investment which has not been used in previous studies. This study also allows a comparison of the effect of leverage on investment on highly-levered firms in the developed economies and the lowly-levered firms in Africa. There is overwhelming evidence verifying that a) African firms use leverage conservatively, and b) the leverage levels in African firms are increasing, and, in analyzing this peculiar market, it was found that there was a constraining effect of leverage on investment. These results suggest that a negative relationship exists for both highly-levered and lowly-levered firms. Our experimental analysis through increasing leverage by squaring shows that the constraining effect of leverage reduces with an increase in leverage to an optimal point. The negative effect of leverage on investment was found to be greatest for firms with little or no growth opportunities.

Our findings are inclined to the over-investment and under-investment hypothesis of the agency-costs theory. The results are robust for the two techniques of the GMM used and the different measures of leverage. African firms do not have access to cheaper debt financing due to shallow debt markets, few financial institutions willing to extend credit, high-risk premiums, therefore, they should consider internal growth, lower their payout policies and increase their earning-retention to finance their investments with internally-generated funds. Maintaining low debt levels reduces interest-payment commitments and loan covenants from debt holders (shareholder-bondholder conflict). This will avail more free cash flow and it will enable the firm to take on investment opportunities freely as they arise. For firms with no growth opportunities, owners should consider high payout policies to enable alternative investments in other profitable projects by shareholders. The next section presents the effects of investment tangibility on leverage.

CHAPTER 4

Investment tangibility and leverage

4.0 Introduction

This section covers the second objective which sought to determine how leverage is controlled by the tangible and intangible investments African firms undertake. The focus here is to examine how the type of investment opportunities a firm undertakes affect leverage. Tangible investments are assets which are the backbone of a firm, which are in physical existence, depreciable and which constitute the bulk of the firm's capital expenditure. These include, but are not limited to plant, property and equipment (Rodov and Leliaert, 2002). While intangible investments are non-physical assets of a firm with a useful life over one year (Young, 1998). Intangible assets are crucial for the company's future worth and growth prospects and vary depending on the firm's nature of business. Asset structure is one of the significant determinants of a firm's leverage. Firms with more physical assets tend to have higher debt ratios since they can access loans from financial institutions guaranteed by the physical assets (Calabrese, 2011, Harris and Raviv, 1990, Frank and Goyal, 2008, Harris and Raviv, 1991, Parsons and Titman, 2009). Lim et al., (2016) indicate that collateral is not the only benefit for assets to support debt, but firms can generate cash and profits through the existence of viable assets. Tangible and non-tangible investments fuel growth in the firm's assets (Long et al., 1985). Previous studies on asset structure influence on leverage focused mainly on tangible investments, but none of the studies to our knowledge have yet analysed the effect of the non-tangible investment on African markets. Following this gap, this research extends previous research by decomposing investment into tangibles and nontangibles and sheds light on their effect on leverage in Africa.

This chapter is structured as follows; Section 4.1 provides a conceptual framework and brief literature on tangible and intangible investment and firm leverage. Section 4.2 details the methodology adopted by the study. In this section, we focus more on new variables introduced in this chapter. Section 4.3 provides the trend analysis, Section 4.4 presents and discusses the results and Section 4.5 concludes the discussion on leverage and the role of investment tangibility.

4.1 leverage and asset structure

Lately, financial theory development has witnessed a shift from the traditional taxbankruptcy cost argument as a major determinant of leverage, towards the agency cost. It is argued that agency problems may lead to under or over-investment (Myers, 1977). In times of financial distress, shareholders may be induced to take on risk projects with the expectation of higher returns that will accrue to the owners. However, any losses from such risky investment accrue more to bondholders as shareholders can simply walk away if there is nothing left for the firm. In this regard shareholders may abandon projects that have an NPV less than the debt issued since all the benefits from the investment will accrue in full to the bondholders. This gives rise to under-investment and asset substitution (Myers, 1977). Jensen and Meckling (1976) document that, with outstanding risky debt, the investment policy of a firm is not fixed. Bondholders may demand a higher premium and impose restrictive covenants on the firm's investments to protect their interests. Firms will, therefore, be limited to the investments and physical assets they can purchase. However, on the other hand, bondholders may not accurately track non-tangible investments. The Black and Scholes (1973) asset-substitution problem also reveals that firms can shift from observable to intangible investment, which makes it possible for firms to increase leverage without the consent of bondholders through intangible assets. However, Myers (1977) posits that, in nature, all investments are discretionary and thus agency problems may arise. Owners may put in place debt contracts to reduce the effect of underinvestment which may be effective only if investment is observable. Therefore, investment type must have an effect on the level of leverage.

In their study on the investment patterns and financial leverage in the USA market, Long and Malitz (1985) analysed an investment-related agency problem and found that firms with higher proportions of tangible investment opportunities can support more debt than firms facing firm-specific or intangible investments. In accordance to the underinvestment hypothesis, shareholders can increase their wealth if bondholders could not antedate shareholders underinvestment actions. Given that the firms investments are tangible, bondholders would be able to approximate the investment opportunity set. Consequently, they can anticipate low investment and pay the true debt value. Long and Malitz, (1985) in line with the underinvestment theory, argue that owners will bear a loss if bondholders precisely forestall underinvestment. In this regard, it is beneficial to owners to ensure monitoring of the investment decision. The negative effect of debt can therefore, be eliminated either explicitly, when the monitoring is from bondholders through loan covenants, or implicitly by the capital markets. Long and Malitz (1985) claim that firms with tangible investments may sustain more financial leverage since bondholders can estimate the underinvestment and thus observe and monitor the firm's investment decisions. However, they indicate that, for firms with firm-specific or intangible investments, bondholders may not be able to estimate the potential underinvestment or the investment opportunities. Therefore, they will assume the worst. Bondholders are unable to monitor the investment policy of the firm if they cannot estimate the underinvestment. Consequently, the explicit capital market and bonding covenants monitoring effectives is reduced. The market will limit leverage for such firms since they can-not be effectively monitored.

With respect to the asset-substitution hypothesis, the increase in firm-risk may result in the increase of shareholders wealth while decreasing the value of bondholders. Investing in riskier investments may increase the value of equity since riskier projects offer higher returns that will enable the firm to pay its obligations and, at the same time, accumulate some value to shareholders (Myers, 1977). Given that bondholders could not forestall investment substitution, they may assume the firm will choose the original investment. In such a scenario the price paid for debt will be more than it's actual value and the overpayment would be transferred to owners. However, the amount paid for debt in rational capital markets is equal to its expected intrinsic value. If bondholders suspect that the owners might shift to more risky investments, debt will sell at a lower value in the capital markets. For firms with tangible investments, bondholders can easily estimate shareholders' motivations to substitute riskier investment and observe their contribution to the risk of the firm. Bondholders can easily anticipate asset substitution for firms with tangible investments. On the other hand, for firms with intangible investments, it is easier for shareholders to increase the risk of the firm. Additionally, neither the capital markets nor bondholders can monitor intangible investments since the effect of increasing risk in such investments is not easy to predict (Long (1985)). Therefore, firms with proportionately higher intangible assets are expected to support less debt than those with more tangible investments. On the other hand, through the use of intangible assets, firms can increase leverage without the knowledge of bondholders through a shift from tangible to intangible investment (Black and Scholes, 1973.

Empirical studies on theories of capital structure largely illustrate the relevance of assets structure in determining the level of leverage of a firm (Ellili and Farouk, 2011). Harris and Raviv (1991) argue that the liquidation value of a firm is increased largely by the presence of tangible investments. Firms with higher liquidation values can support more debt. This is explained by the fact that tangible assets are used as collateral for bondholders in bankruptcy situations. On the same note, in times of financial distress, the cheapest source of finances for a firm are asset sales (Morellec, 2001). Moreover, Mann and Sanyal (2010) contend that firms can finance their continued operation through assets sales without seeking external finances. These studies largely emphasise the dominant role of investment tangibility on the firm's capital structure suggesting that firms with more tangible investments are more likely to have higher debt ratios, implying a positive relationship between tangible assets and leverage and a negative correlation between tangibility and leverage for firms with more intangible investments.

Köksal et al., (2013) used asset tangibility to proxy asset type in Turkey's firms in investigating the capital structure determinants. They found a positive relationship between long-term debt and assets tangibility and a negative relationship between short-term debt and assets tangibility. Daskalakis and Thanou (2010), in Greek firms, found a negative relationship between asset structure and debt ratios. They argued that firms generating relatively higher internal cash-flow tend to avoid the use of debt. Their findings imply that firms that use less debt are those relying more on tangible assets than those with intangible assets. In investigating the capital structure of Italian, Greek and Portuguese firms, Daskalakis and Psillaki (2008) argue that financial distress-costs depend heavily on the asset-structure employed by a firm. Their analysis suggests that firms with more tangible assets have less financial distress costs than firms with more intangible assets. Consequently, firms with less tangible assets should have lower leverage. On the other hand, Lim et al., (2016) contend that more tangible assets are an indication of a stable foundation of return, which enables a firm to generate more cash flow internally and discourages external financing. In this regard, the negative correlation between leverage and asset structure indicate that firms rely more on internal funds largely generated by the use of tangible assets as predicted by the Perking Order Theory. Daskalakis et al., (2008) argue that the negative relationship between leverage and assets structure is possibly explained by the fact that firms employing more tangible assets have a stable source of return providing them more internally-generated cash flow, therefore, reducing the need for external financing.

In exploiting variation in the salability of tangible assets on the relationship between debt and firm asset structure, Campello and Giambona (2011) argued that for firms facing credit frictions, tangible asset re-deployability is the main determining factor of firm leverage. Their analysis show that asset structure drives a firms' debt to equity mix to the degree that they are re-deployable. La Rocca et al. (2009)in examining firm's financial choices through business life cycle concluded that the intensity of a positive relationship between debt and tangibility varies across the life cycle of a firm. They show that as the firm grows and matures, reliance on tangible assets for collateral on debt finances decreases but still significant. Degryse et al. (2012) found evidence supporting the positive association between collateral and long debt. Bas et al. (2009) examined small firm's capital structure determinants and concur with the maturity matching principle that long-term assets are financed by long term debt implying that the increase in assets tangibility is associated with an increase in long term debt this suggest a negative relationship between assets structure and short-term debt, firms with more physical assets borrow less on short-term basis.

Heyman et al., (2008), in examining the capital structure determinants in Belgium small firms, hypothesized a positive association between debt and the proportion of tangible assets. They found evidence that firms seek to match their asset and liability maturities, implying that firms with fewer physical assets tend to have lower leverage, showing that debt ratio increases with the tangibility of assets. Deari (2009) analyzed capital-structure determinants in Macedonian-listed and small to medium firms consistent with the Pecking Order Theory. They report a negative association between leverage and tangibility for both listed and unlisted firms. Their conclusion indicates that lenders also use other criteria. For example, goodwill, to evaluate firms and not only the tangible assets tangibility. This finding shows the importance of intangible assets (goodwill) on the firm's credit-worthiness and leverage levels. Song (2005), in Swedish firms, found a positive relationship between tangibility and long-term debt ratios consistent with the principle of maturity-matching.

However, Ogrean and Herciu (2012) stresses that a firm can only be competitive if its management mixes intangible and assets efficiently and effectively. Thus, through the use of a diverse mixture of assets by allocating different importance coefficients to intangible and tangible assets, firms can get the same level of competitiveness.

Although many studies concur that tangible investments enable firms to support more leverage, there is no general consensus on the effect of intangible investment on leverage. According to Lim et al., (2016) the value of intangible assets is highly sensitive to ownership but they are not widely preferred as collateral which favors equity-financing more than debt, resulting in a negative relationship between leverage and intangible assets. On the other hand, debt can be supported by intangibles that can generate substantial cash flow leading to a positive relationship between debt and intangible investment (Jarboe and Ellis, 2010). Some studies indicate a shift in view from the intangible investment as a major contributor to a firm's future growth opportunities and therefore, an ability to support debt. Loumioti (2012) postulates that lenders have more innovative strategies to finance, valuing and leveraging on liquid and re-deployable intangible assets which makes them acceptable as collateral and that this may suggest a shift in the hypothesized relationship between leverage and intangible investments. Most studies empirically examined the effect of tangible investments on leverage while neglecting the effect of intangible investment. Despite the focus on tangible investment, these studies are concentrated in developed nations with higher debt levels. This study, therefore, sought to analyse African firms with low leverage with respect to investment tangibility and leverage.

4.2 Empirical approach

4.2.1 Data and the variables

The sample comprises firms previously defined in Chapter Three. All other control variables used in this chapter remain as previously defined and, here, the focus is mainly on the new variables introduced for this section.

4.2.1 Variables

Leverage

Leverage is the dependent variable. The study employed broader measures of leverage based on book values. Two definitions of leverage were used, long-term debt to total assets and total-debt to total assets, as previously defined in the preceding chapter.

Investment

Firm level investment is the main explanatory variable. Three different measures of investment were used, namely capital expenditures, advertising and research and development (R&D). Following Long (1985) to capture the flow of funds into alternative investments, the firms' reported research and development (R&D) and advertising expenditures were used as proxies for firm-specific, intangible investments for which there are readily available data. Expansionary/tangible investments were measured by firms' reported capital expenditures (Munoz 2012). Firm-level expansionary/tangible investment was also measured as net capital expenditure. Following empirical studies (Lang et al., 1996, Aivazian et al., 2003) firm-level investment is defined as relative investment which is the amount of investment per-one-unit of fixed assets. Investment is measured as net capital expenditure, calculated as capital expenditure minus depreciation.

a) **Expansionary/Tangible investment (Net capital expenditures)**

$$Investment\ (capex) = \frac{Net\ capex}{fixedassets}$$

Generally, capital expenditures are a function of the speed of a firm's growth. High-growth firms are expected to have higher net-capital expenditures than low-growth firms. Constrained firms may have negative net-capital expenditures since they will be disposing more fixed assets.

b) **Intangible investment**

(i) Advertising

$$Adverting = \frac{Advertising\ expense}{fixedassets}$$

(ii) Research and development

$$R\&D = \frac{R\&D\ expense}{fixedassets}$$

4.2.2 Other Explanatory Variables

Other external variables influence leverage and cannot be totally ignored. Much of this analysis is concentrated on those factors that are reliably assigned and important for predicting investment levels according to the finance literature. Typical explanatory variables as used in the finance literature of firm investment were used as control variables. The variables incorporated are; (i) Tobin's Q ratio which represents firm's investment opportunities as measured by market to book assets. (ii) availability of internal funds proxied by cash flow. Cash flow can also represent part of the financial constraints that a firm might face (Muñoz, 2012a). The variables were measured as in section two. (iii) Earnings before interest and tax (EBIT) (iv) Depreciation and (v) Beta.

a) Beta

Traditional finance literature assumes that financial and operating risk are offsetting decisions, implying that firms with lower financial leverage experience greater operating risk (Long et al., 1985). In light of this, to separate the effects of investment choice on financial leverage, the study included asset beta as a measure of operating risk. The firms' Beta is assumed to capture all its asset or business-risk. The firms' equity beta was computed first using the geometric average of returns. The beta was unlevered following the Hamada (1972) and Rubenstein (1973) formulation to get the asset beta as follows:

$$\beta_{ASSETS} = \beta_{EQUITY}\left[\frac{1}{1 + \left((1 - t)\frac{D}{E}\right)}\right]$$

Where D is debt, E is equity, t is the tax rate.

The unlevered beta was used as an independent variable to capture the firms' operating risk.

b) Depreciation and EBIT

Depreciation and EBIT were taken as reported on the firms' income statement and scaled by total assets to do away with the effect of size.

$$EBIT = \frac{EBIT}{Total\ assets}$$

$$Depreciation = \frac{Depreciation\ expense}{Totalassets}$$

4.3 Model estimation

The focus is on investment that is long-term in nature. Therefore, leverage was measured as the book-value of long-term debt. Book-values were used for easy accessibility of data.

4.3.1 Model specification

Leverage specifications of capital structure models are in line with Frank and Goyal (2009) and Hovakimian and Li (2011) and can be expressed as;

$$Lev_{i,t} = \alpha + \beta\chi_{it} + \varepsilon_{i,t} \quad \text{---------------------}(4.1)$$

Where: Lev = leverage and χ_{it} a vector of firm specific factors that determine leverage.

To neutralise a firm's business risk, Long et al., (1985) created equal beta portfolios and used the pooled regression technique which is inefficient in panel data. Using the OLS is not appropriate given the probable existence of endogeneity in the relationship between leverage and investment. Furthermore, OLS does not capture for individual firms and countries effects. This study extended the long, (1999)'s formulation to a dynamic panel data model to control for unobservable, time-invariant features of the firms and countries. To take into account the partial adjustment process of firm leverage, Equation (4.1) was extended into a general dynamic panel data model with fixed effects as specified by Flannery and Rangan (2006) of the form;

$$Lev_{i,t} = \beta_0 Lev_{i,t-1} + \alpha_i + \beta\chi_{it} + \lambda_t + \varepsilon_{i,t} \cdot \text{-----------} (4.2)$$

Where the (cross-sectional dimension) $i = 1, \ldots, N$ and (time dimension) t = 1,…,T.α_i and λ_t are the (unobserved) individual and time-specific effects, Following Flannery and Rangan (2006), χ encompasses earnings before interest and taxes (EBIT), market to book (MTB), depreciation (DPRN), capital expenditure (CAPEX) an indicator for positive research and development (R&D) expenses, scaled by total assets (TA). $_{i,t}$the error (idiosyncratic) term with E($_{i,t}$)= 0, and E($_{i,t\ j,s}$)= δ^2 if j= i and t= s, and E($_{i,t\ j,s}$)= 0 otherwise.

Specifically, the model estimated is:

$$Lev_{i,,ct} = \beta_0 Lev_{i,c,t-1} + \beta_1\left(\frac{advertising}{TA}\right) + \beta_2\left(\frac{R\&D}{TA}\right) + \beta_3\left(\frac{CAPEX}{TA}\right) + \beta_3(unleveredbeta) + \beta\chi_{it} + \lambda_i + \varepsilon_{i,t} \text{-----------} (4.3)$$

R&D is research and development, CAPEX are the firm's capital expenditures, TA represents total assets, λ_i unobservable, time-invariant features of the firms and countries χ_{it} captures other explanatory variables which explain leverage as given in theory
(Earnings before interest and tax (EBIT), Market to book (MTB), Depreciation (DPRN) scaled by total assets for standardisation.

4.3.2 Estimation technique

The model was estimated using the system GMM technique. Given the partial adjustment of leverage, independent variables that are not strictly exogenous (correlated with past and/ current realisations), fixed individual and country effects, autocorrelation and heteroscedasticity within individual firms, the system GMM performs superior in the presence of these factors (Blundell-Bond, 1998). The estimator arguments Arellano and Bond (difference GMM) by making an additional assumption that first differences of instrumenting variables are uncorrelated with the fixed effects. This follows the introduction of more instruments which improve efficiency. The estimation builds as a system of two equations the original equation and the transformed one (Roodman, 2006b).

4.3.3Additional Test

An additional test for robustness of results was done by examining the effect of standard variables suggested by other scholars on the power of the model. These determinants include investment-related tax shield and the availability of internal funds measured by operating cash flow (CF). Investment-related tax shield include depreciation and investment tax credit (DeAngelo and Masulis: 1980). Depreciation-tax shield was computed as depreciation expense times the corporate marginal tax rate plus the change in deferred taxes. The total investment-related was then calculated as the sum of the depreciation tax-shield and the investment tax credit.

4.4 Empirical results

4.4.1 Trend analysis

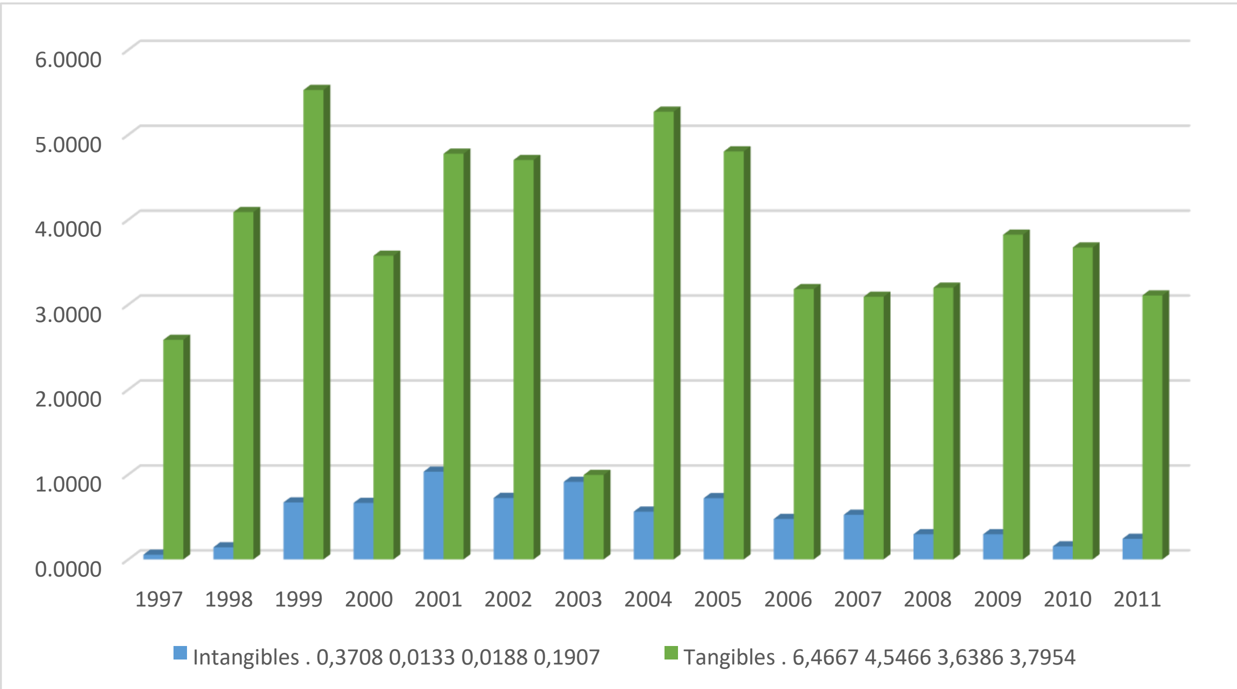


Figure 4-1 Tangible and Intangible Investment trends *Source: Own calculation based on sample data.*

Figure 4-1 and Figure 4-2 show the distribution of tangible and intangible investment of African firms for the sample period. The graph shows that African firms invest more in tangible assets than intangible assets. There is a notable small increase in intangible assets from 1997 to 2001. This might be attributed to globalisation which led to more investments in the development of unique bands and comparative competitiveness in most African economies during this period. From 2002 to 2011 there is a noteworthy decline in intangible investments. African firms invest more in tangible assets possibly as a way of constructing a shield against uncertainties. Tangible assets can store value and can be used as collateral in sourcing external financing. Lim et al. (2016) contends that more tangible assets are an indication of a stable foundation of return, which enables a firm to generate more cash-flow internally and discourages external financing. The growth in physical investment among African firms may probably be guided by the need to have a stable generation of cash-flow from the use of physical investments. The growth and value in tangible and physical investment may also show that African firms are still aligned to old technologies and machinery and slow adoption of smart technologies.

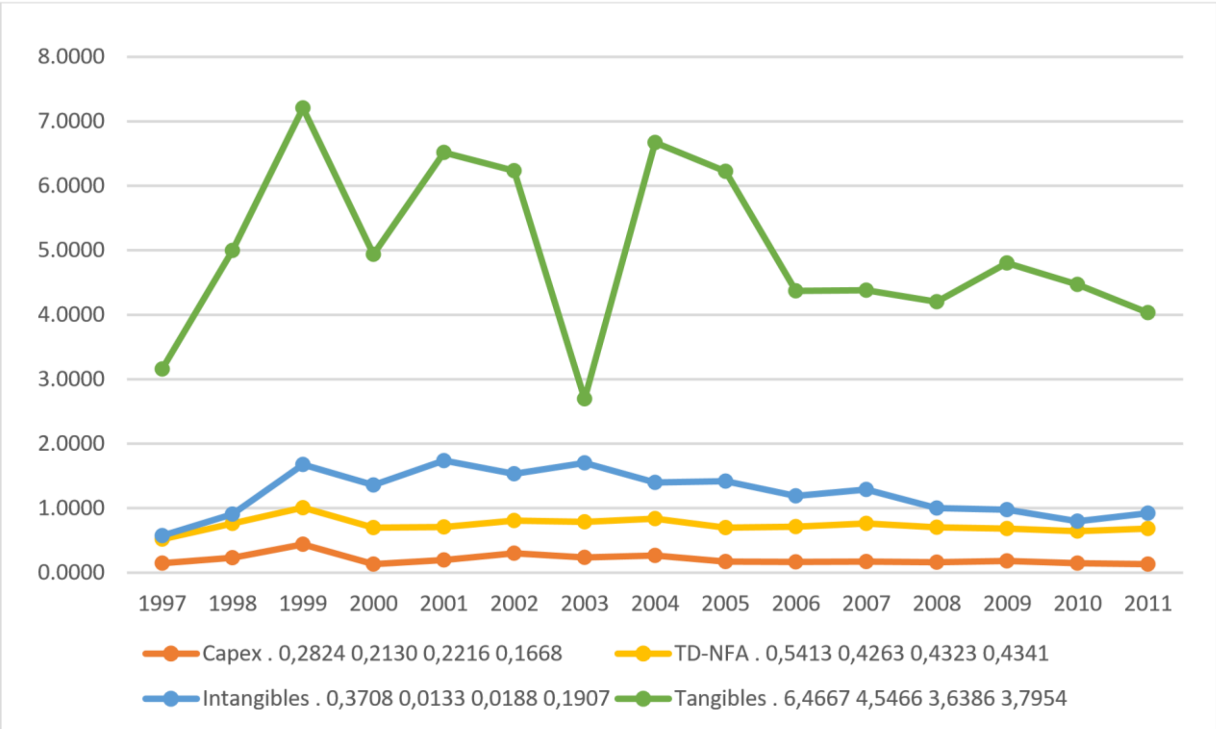


Figure 4-2 leverage and investment trends

Source: Raw data

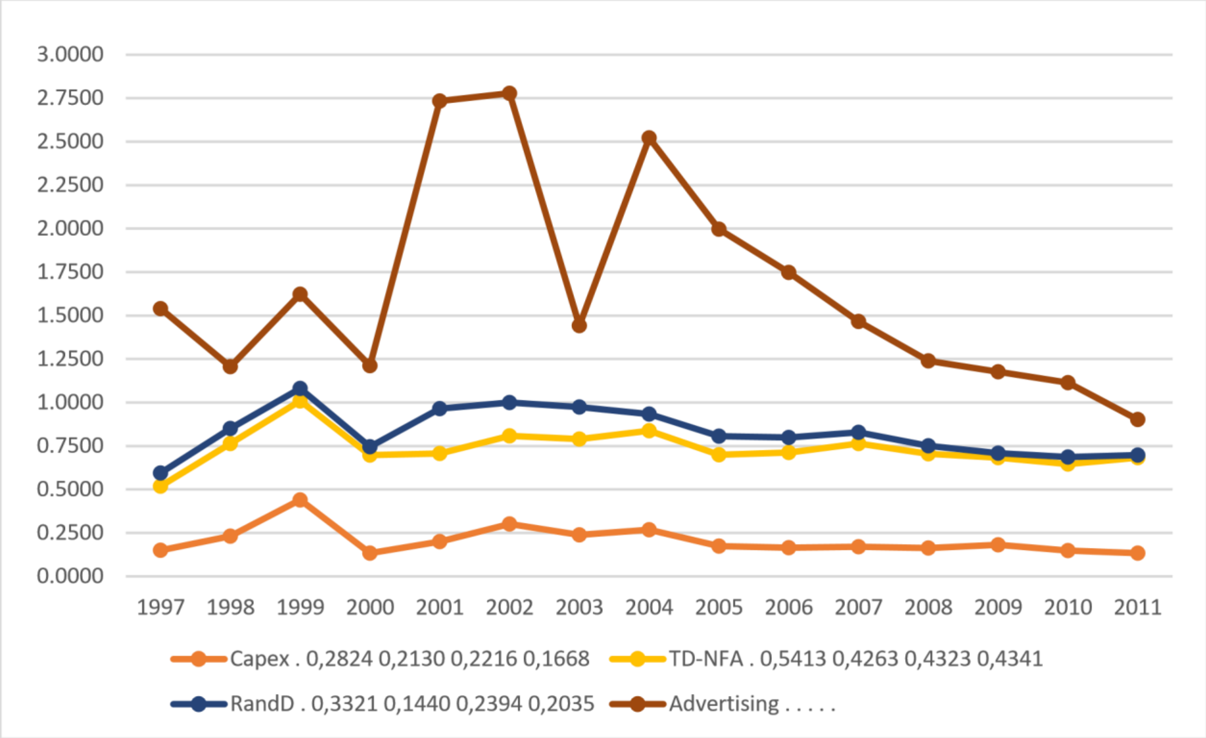


Figure 4-3 Leverage and Investment types

Source: Sample data

Figure 4-2 and 4-3 also show the trend of leverage and the investment types. The figures show that African firms invest more in advertising than research and development. Research and development and advertising are proxies for intangible investments. The trend also indicates a decline in both tangible and intangible investments over time. Low investment in research and development may possibly be another reason for the decline in the overall investment levels of African firms due to lack of innovation from research.

4.4.2 Descriptive Statistics

Table 4-1 shows the descriptive statistics of the depended and independent variables. The statistics reveal a high variation of intangible assets investment relative to the mean. This indicates that investment in intangible assets is not consistent in African firms. Tangible assets investment variation is low relative to its mean and this signifies a relative stability in tangible investment in African firms. Research and development has the lowest mean of 0.0456 and a higher standard deviation relative to the mean. A very low average value of the R&D shows that African firms invest less in research and development. A higher variability is also noted on investment in advertising expenses. High variation indicates inconsistency advertising trends among African firms.

Table 4-1 Descriptive statistics

Variable	Obs	Mean	SD	25%	Median	75%
CAPEX	5557,000	0,2148	0,2630	0,0570	0,1444	0,2800
LTD/TA	6368,000	0,0848	0,1136	0,0000	0,0351	0,1313
TD/TA	6644,000	0,5010	0,1953	0,3612	0,4969	0,6381
Intangibles	4280,000	0,3011	0,8707	0,0015	0,0291	0,1987
Tangibles	4280,000	4,3422	4,4022	1,8833	2,9780	4,9816
R&D	1999,000	0,0455	0,1361	0,0000	0,0000	0,0000
Advertising	1139,000	0,4609	1,0876	0,0415	0,1460	0,4126
CF	5848,000	0,3922	0,6214	0,0858	0,2700	0,5588
Sales	6549,000	5,1151	6,3849	1,3275	2,8807	6,1229
Tobin Q	5887,000	1,4908	0,8242	0,9395	1,2349	1,7775
EBIT	6167,000	0,4808	0,6005	0,1246	0,3041	0,6175
DEPR	5600,000	0,1364	0,0986	0,0717	0,1129	0,1754
Beta	4176,000	0,7672	5,8145	-0,1194	0,6043	1,6347

Source raw data

4.4.3 Regression results

Table 4-2 presents the regression output of the leverage investment model. Two measures of leverage were used with long-term debt and total-debt-to total-assets. Two-step system GMM with an orthogonality option was used to estimate the model. For long-term debt, the forward orthogonal deviation instruments for the orthogonal equation were EBIT and depreciation. Leverage, capex, advertising and Tobin Q were used as the endogenous (GMM- type) instruments. For the second measure total debt EBIT R&D and depreciation were used as the instruments for the forward orthogonal deviations equations. Leverage, capex Tobin Q as endogenous instruments. The same instruments were used for the levels equations.

Table 4-2 Dynamic panel-data estimation, investment tangibility and leverage

	LEVERAGE *LTD-NFA*	LEVERAGE *TD-NFA*
L.LTD/TA	0.344*** (149.66)	
Capex	-0.0892***	-0.0241***
	(-51.28)	(-7.36)
R&D	-0.0321***	-0.0702***
	(-35.99)	(27.42)
Advertising	-0.00417***	-0.0142***
	(-8.24)	(-7.84)
Beta	-0.000675***	-0.000492***
	(-63.05)	(-7.61)
Tobin-Q	-0.00444***	-0.00488***
	(-15.40)	(-6.29)
EBIT	-0.00173***	-0.0124***
	(-3.62)	(-4.72)
DEPR	0.00499**	0.0828***
	(3.06)	(5.62)
L.TD/TA		0.431*** (307.11)
N	168	177
AR (2)	0,089	0,65
Hansen test	0,99	0,98

This table provides dynamic panel data regression results of investment tangibility on leverage on African publicly traded firms. Two measures of leverage were used (Long-term and total debt to total assets). t-statistics are provided in parenthesis below the coefficients estimates. AR (2) is used to test for serial autocorrelation and the Hansen test is used to test for over-identification of instruments.

, and*** denotes significance at the 10%, 5% and 1% level respectively.*

The results indicate that variation in debt is explained by investment type. The findings are consistent for the two measures of leverage used. Our results provide evidence that capital expenditures, advertising and R&D both as investment types have a negative impact on a firm’s long-term debt. This indicates that African firms that invest more, whether in tangible or intangible investment, reduce their debt levels. It was found that African firms facing both tangible and intangible investment lower their leverage. This is contrary to Long (1985) who found that in USA firms facing tangible investments have higher leverage than those facing intangible investment.

The negative relationship between tangible investment and leverage is consistent with the hypothesis that high-growth firms expanding their operations borrow less to avoid the agency costs of debt that may lead to underinvestment and a decline in the firm's value. On average, African firms are high-growth as shown by an average growth opportunity measured by Tobin's Q greater than one. In this respect, the suggestion is that growth in tangible assets in high-growth firms sustains the generation of more cash flow for future investment opportunities. Physical assets are not only used as collateral to obtain debt from financial institutions and bondholders. This is consistent with the finding of Lim et al., (2016) who contend that more tangible assets are an indication of a stable foundation of return, which enables a firm to generate more cash-flow internally and to discourage external financing. Morellec (2001) concurs that in times of financial hardships the cheapest source of finance is asset sales Therefore, firms with more physical assets can sell part of their assets to finance their investments rather than borrow. This also explains the negative relationship between growth in tangible investment and leverage.

The results are consistent with Daskalakis and Thanou (2013) in Greek firms, who found a negative correlation between debt and assets tangibility. They argued that firms that generate more cash flow from efficient use of physical assets, avoid the use of debt. However, our findings are inconsistent with Koksal et al., (2013), who found a positive relationship between debt financing and investment tangibility in Turkey's firms. Campello and Giambona (2011) attest that asset tangibility is a significant determinant of leverage,
Degryse et al., (2012) found a positive relation between assets structure and leverage. Heyman et al., in support of the assets liability matching principle, document that the growth in the firms physical and long-term assets is financed by long-term debt suggesting a positive relationship between debt and tangible investment. The results also suggest that lenders consider other criteria of intangible assets to evaluate firms as indicated by Deari (2009), who found that lenders also significantly use the goodwill of the firm in credit valuation. The variations in these results may be explained by the peculiar characteristics faced by firms in the heterogeneous economic environments in which they operate and the different life cycles that the firms are in. La Rocca et al., (2009) indicates that the intensity of the relationships between leverage and investment tangibility varies across the life cycles of

firms suggesting different relationships may exist. In African firms, a negative relationship between leverage and investment tangibility was found.

A negative association was found between leverage and the two proxies of intangible investment (adverting and R&D). African firms with high levels of intangible assets invest less. The negative relationship between leverage and intangible assets is consistent with the underinvestment and assets-substitution hypothesis. Shareholders can easily increase the risk of the firm through intangible assets which are not easily anticipated nor monitored by bondholders and the capital markets (Long and Malitz; 1985). Therefore, due to higher risk, lack of security and uncertainty, bondholders and the market are reluctant to lend to such firms, suggesting that firms with more intangible assets are expected to support less debt. Haris and Raviv (1991) also indicate that firms with intangible assets have less liquidation value, a significant determinant of debt financing, suggesting a negative correlation between leverage and intangible investments. Myers (1977), in the underinvestment hypothesis, argues that, if bondholders cannot estimate the potential underinvestment or the investment opportunities of a firm, they will assume the worst case and be reluctant to extend credit which is the case for intangible investments. This suggests a negative relationship between leverage and intangible investments. African firms with intangible investments also have low leverage levels.

4.4.3.1 Economic Impact of regression results

Table 4-2.A, shows the economic impact of tangible and intangible investment on the firm's leverage policy. The results on the table show what impact one standard deviation change on intangible and tangible investment will have on the firm's leverage. The economic impact is calculated as follows:

$$Economic\ impact = \frac{SD_{EXPLANATORY\ VAR} \times Regression\ Coefficient}{SD_{DEPENDENT\ VAR}}$$

Where:

$SD_{EXPLANATORY\ VAR}$ is the standard deviation of the explanatory variable.

$SD_{DEPENDENT\ VAR}$ is the standard deviation of the dependent variable (investment)

Table 4-2A Economic impact of the regression estimates.

VARIABLE	LTD	TA
CAPEX	-0.2065	-0.0325
R&D	-0.0372	-0.0473
ADVERTISING	-0.0399	-0.0790
BETA	-0.0085	-0.0146
EBIT	-0.0914	-0.0381
DEPRECIATION	0.0043	0.0418

Source: Own calculations based on sample data.

The coefficients shown in Table 4-2 of tangible and intangible investment range from 0.0702 to -0.00417 for the two proxies of intangible investment and -0.0241 to -0.0892 for capital expenditures for the two measures of leverage. The economic implication of these coefficients shown in Table 4-2A is that one standard deviation change in intangible investment proxied by R&D and advertising will result in -0.0372 to -0.079 percentage decrease in the long-term and total debt. One standard deviation change in tangible investment will result in -0.0325 to -0.2065% decline in leverage for the two measures of leverage where one standard deviation change in asset-risk is measured by Beta -0.0085 to 0.0146 for long-term and total debt measures of leverage. The impact values show that leverage is more sensitive to capital expenditure than the two proxies of intangible investment R&D and advertising, as shown by higher percentage change values. This implies that for a given change in capital expenditures there is a corresponding higher change in leverage compared to advertising and R&D the measures of intangible investment.

Systematic assets-risk also has a negative relationship with financial leverage. Firms with higher assets risk tend to reduce their leverage levels. High-risk firms reduce their leverage to avoid financial distress. This is consistent with the financial theory which argues that risk increases the chances of financial distress. Also, high-risk firms have less access to debt and they borrow at higher costs than lower-risk firms. Therefore, they will have lower debt levels.

The coefficient of the lagged-dependent variable is less than one which is consistent with dynamic stability. The lagged-dependent variable is significant and positive, implying consistency in past leverage realisations. A positive sign indicates a positive effect of past leverage levels on current levels. Current leverage levels are dependent on past leverage trends. The adjustment coefficient of the lagged-dependent variable of leverage also indicates a modest speed of adjustment to target leverage levels in African firms. The coefficient of adjustment is specified by one minus the coefficient of the lagged-dependent variable which is 0.656 (1- 0.444) and 0.569 (1-0.431) for the two models on total debt and long-term debt measures of leverage. There is an inverse relationship between the cost of adjustment and the speed of adjustment towards the desired capital structure. The modest adjustment indicates lower adjustment cost in African financial markets. Baños-Caballero et al., (2014) describes the adjustment process as a trade-off between the adjustment cost in the direction of the target and the cost of being off-target. Firms will adjust slowly if there are higher costs of adjustment than the cost of being off-target. The analysis shows a modest speed of adjustment in African firms suggesting low costs of adjustment rather than them being in disequilibrium. The modest speed can be explained by the adoption of financial liberalisation policies in many African countries. Higher speed of adjustment can also be due to low transaction costs (Myers and Majluf 1984)

Other variables are as predicted and expected. We found a negative relationship between growth opportunities and leverage. Firms with more investment opportunities borrow less. This is consistent with the Myers (1977) theory that leverage induces under-investment for high-growth firms. Therefore, firms with growth opportunities tend to be conservative borrowers so that they are able to take on investment opportunities as they arise.

As expected, earnings are also negatively associated with leverage. Firms with higher earnings can generate more cash flow to finance their investment needs. Therefore, they borrow less. On the other hand, firms that generate low earnings are forced to borrow to finance investment needs and other operational expenses.

4.4.4 Model specification tests.

The GMM-estimation technique is consistent in the absence of second-order serial correlation in error terms. The AR (2) test for auto-correlation proposed by Arellano and Bond (1991) has a p-value above 5 per cent, indicating that there is no serial auto-correlation of order two. The Hansen two-step-test was used to test for over-identification of instruments. The p-value is also above 5 per cent indicating that the instruments are correctly specified.

4.4.5 Additional tests

4.4.5.1 Financial constraints and tax shield

Variables suggested by other scholars on leverage were examined. Included was the investment-related tax shield as another determinant of leverage, as suggested by Miller and Modigliani (1963). Financial constraints should also be considered, including cash flow which indicates the availability of internal funds.

Miller (1977), DeAngelo and Masulis (1980) document that financial leverage depends on the availability of a tax shield related to investment such as depreciation and investment-tax credit. They argue that corporate capital-structure is relevant in the presence of tax shields. Gains from substituting debt for equity are affected by the presence of such non-debt tax shields (Miller, 1977). The probability of losing non-debt tax shields increases with financial leverage. Therefore, firms with a lower tax shield are expected to employ more debt in their capital structure. The implication is that firms that invest heavily in capital equipment should have less debt because of more tax shields. Following literature, depreciation, tax shield was computed as depreciation expense multiplied by the corporate marginal tax rate plus the change in deferred taxes. Total investment-related tax shield was taken as the summation of investment-tax credit and depreciation-tax shield.

Table 4-3 presents the regression results, including tax shields, in the leverage model. As shown on the table, the coefficient of the tax shield is significant and negative. The results indicate a significant negative relationship between investment-related tax shield and leverage as suggested by Miller (1977). Our results imply that African capital-intensive firms with high tax shields reduce their leverage levels. Including investment-related tax shields in our regression model, we also found a significant negative relationship between leverage and all tangible and intangible investments (proxied by advertising and R&D).

Table 4-3 Financial constraints and investment-related tax shield

	Constant	t-statistic	Std. Err
CAPEX	-0.0976***	(-15.09)	0,006495
R&D	-0.0409***	(17.83)	0,00229
Advertising	-0.0105***	(-14.88)	0,0007
Beta	-0.00061***	(-3.53)	0,00017
Tobin's Q	-0.00461***	(-8.39)	0,00055
EBIT	-0.0165***	(-5.55)	0,0029773
DEPR	0.238***	(11.02)	0,02157
L.leverage	0.544***	(110.37)	0,004927
CF	0.00577**	(3.41)	0,00169
Tax shield	-0.00330***	(-26.85)	0,00122
N	177		
AR(2)	0,6		
Hansen	0,79		

This table provides dynamic panel data regression results of investment tangibility on leverage on African publicly traded firms. Two measures of leverage were used (Long-term and total debt to total assets). Two additional test financial constraint and tax shield introduced.AR (2) is used to test for serial autocorrelation and the Hansen test for over-identification of instruments.

, ** and* denotes significance at the 10%, 5% and 1% level respectively.*

The inclusion of cash-flow as a proxy for financial constraints does not affect the explanatory power of the investment types on leverage. Donaldson (1969) and Miller (1977) suggest that firms finance their investment needs with internally-generated funds in the presence of transaction costs since they are less costly. This suggest that firms generating more cashflow must have low leverage levels. On the contrary, we found a positive relationship between cash-flow and leverage among African firms where those firms that generate higher cash-flow have higher debt levels. The possible explanation for this is that firms with high cash-flow are more creditworthy so, therefore, they can access and support higher levels of debt.

Also, internally-generated funds might be used to pay dividends. Therefore, the need to borrow to support a firm's investment needs.

4.5 Summary and conclusions

The aim of this section was to determine if the leverage level of African firms is influenced by the type of investment the firms undertake. Investment was divided into tangible and intangible investments. A firm's discretional tangible investment was proxied by the firm's capital expenditures while advertising while R&D proxied for intangible investments. A two-step system GMM was used to estimate the model. We found a statistically-significant negative relationship between leverage and tangible and intangible investment types. The robustness of the results was examined by testing for financial constraints as proxied by a firm's operating cash flow. We also tested the relationship in the presence of investment related tax shield. The inclusion of operating cash flow and investment tax shield did not affect the results.

The study concludes that both tangible and intangible investments have a negative effect on leverage in African firms. Firms with high investment ratios both in tangible and intangible investments tend to lower their debt. On average, African firms are high-growth firms and the negative relationship between tangible investment and leverage in African firms implies that expansion in tangible assets in high-growth firms sustains the generation of more cash flow for future investment opportunities and operation expansion. Growth in tangible investments ensures high returns from physical assets, as when firms borrow less to avoid the agency costs of debt that may lead to underinvestment and a decline in the firm's value. The findings provide empirical evidence that financing and investment decisions are not independent, but rather interdependent. Confirming the findings in objective one, firms should consider lower leverage levels to increase investment. African firms should resort more to internally-generated funds and should consider lower pay-out policies to reduce the need for debt financing so as to increase their investment levels. Lower leverage levels enable expansion in physical and non-physical assets for sustainable growth. The next chapter focuses on stock market liquidity and firm investment.

CHAPTER 5

Liquidity and investment

5.0 Introduction

Corporate financial decisions are a two-fold matrix based mainly on the sources and uses of funds. From the perspective of uses of funds, there are two main pillars which encompass investment decision and dividend policy. Investing and dividend payments involve payments or cash outflows hence the use of funds. On the other hand, the sources of funds encompass the capital structure pillar. This is the means through which the firm finances its operations including investment and dividend policy. This brings in the importance of the capital markets with which firms interact when raising funds through debt and equity. Therefore, the stock markets also have a central role to play in a firm’s decision. Consequently, given this relationship, the interaction of the sources of funds (which covers leverage, capital structure, liquidity) and the uses of funds (investment) is, therefore, indispensable and inseparable. Liquidity is a central issue in corporate finance and forms one of the pillars of corporate financial structure that has attracted a lot of attention in relation to investment. Theoretical framework shows largely that capital markets information has significant effects on both financial structure and investment (Hoshi et al., 1991).

5.1 African stock markets overview

This section reviews the African stock markets, building on Chapter Two which gave an overview of the financial and economic system of the African continent. The rapid integration of global financial systems induced the increased importance of global stock exchanges. Africa, compared to other continents has the least number of stock exchanges. They are illiquid and less developed.   Over the last few decades, there has been an increase in the number and breadth of African stock markets. As from 1960, there were only five stock markets in Africa which increased to 18 by 2002 (Patel et al., 2014) Currently, there are twenty-nine exchanges in Africa. There are two regional exchanges, Bourse Regionale des Valeurs Mobilieres (BRVM) which serves eight west African countries and BVMAC (Bourse Regionale des Valeurs Mobilieres d'Afrique Central) which service five central African countries. Although the number of stock exchanges are increasing, there are still very few securities markets in Africa as indicated by seven countries sharing the same stock exchange with only 28 stock markets for the whole continent.

5.1.1. Size and number of listed securities

African stock markets are small and have few listed securities. There are less than 1900 listed firms across all African stock markets, which is a very small number compared to developed economies. All the securities can only constitute one exchange in the developed nations. More than 50 per cent of the listed firms on the continent account for only three economies (South Africa, Egypt and Nigeria). Most African stock markets are dominated by a few larger firms representing a high percentage of the total market capitalisation. For example, in 2013 Ecobank Incorporation accounted for 65 per cent of Ghana's stock market capitalisation. Figure 5-1 below, shows the distribution of listed firms across African stock markets. The graph shows that, on average, most of the African stock markets have less than 50 listed firms with South Africa, Nigeria and Egypt dominating the continent.

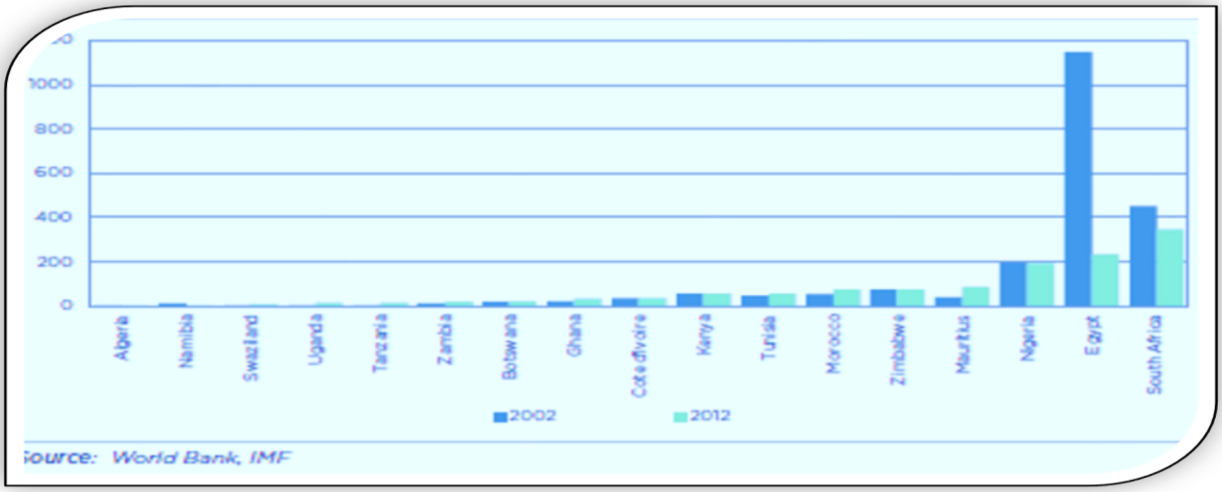


Figure 5-1 Number of listed securities

5.1.2 Liquidity and Market Development

Figure 5-2 and 5-3 show the market capitalisation of African markets relative to the total GDP over the study period. As shown on the graphs, the overall capitalisation, as a percentage of GDP, is below 20 per cent for most of the African countries. South Africa, as shown in Figure 5-3, has the highest capitalisation to GDP ratio. The vertical axis of both the graphs shows the liquidity of African stock markets measured as a ratio of turn-over to market capitalisation. The two graphs show that, for most of the African countries, return to capitalisation ratio is well below 12 per cent, which is an indication of low liquidity in these stock markets. The horizontal axis of the two graphs shows the market development measured by stock market capitalisation as a percentage of GDP. The level of stock market development for African countries, measured by capitalisation as a ratio of GDP, is very low (less than 40 per cent for most of the economies).

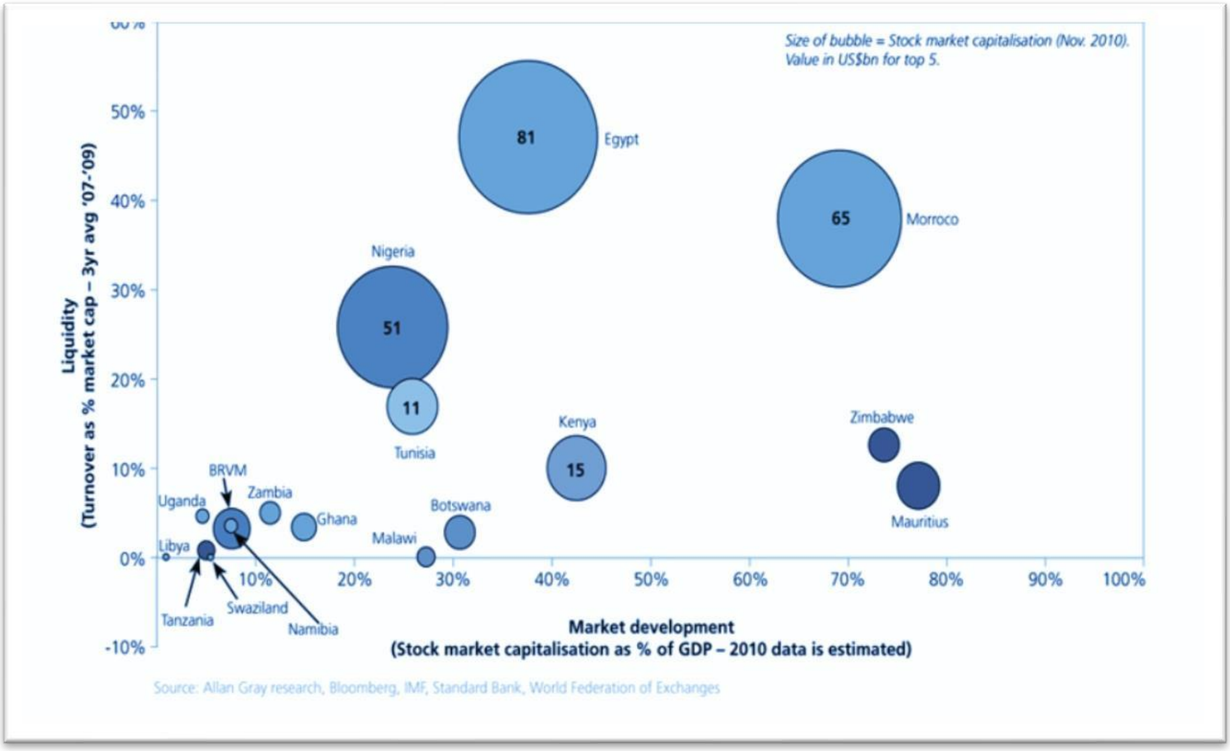


Figure 5-2 Relative liquidity and size (Africa stock exchanges excluding South Africa) Source: Allan Grey research, Bloomberg

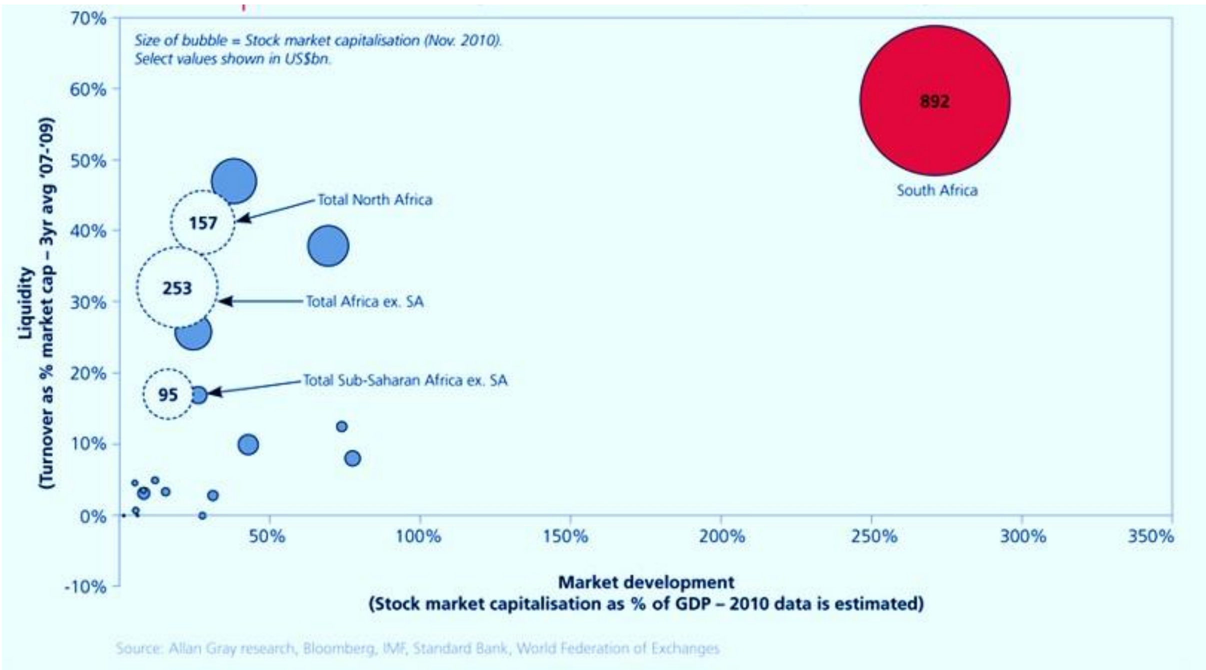


Figure 5-3 Relative liquidity and size (Africa stock exchanges excluding South Africa) Source: Allan Grey research, Bloomberg

Figure 5-4 below, shows the annual turnover ratios for African stock markets from the year 2000. The turn-over ratios were calculated as annual value traded divided by market capitalisation. A higher turnover ratio indicates higher liquidity and a lower ratio depicts lower liquidity. The graphs show that there are relatively few stocks traded on African stock markets. On average, the annual turnover for African firms is below 30 per cent from the period 2000. More illiquidity of African stock markets is noted in the Sub-Saharan region with below 14 per cent turnover ratios accounting for the average daily traded value of less than 15 per cent.

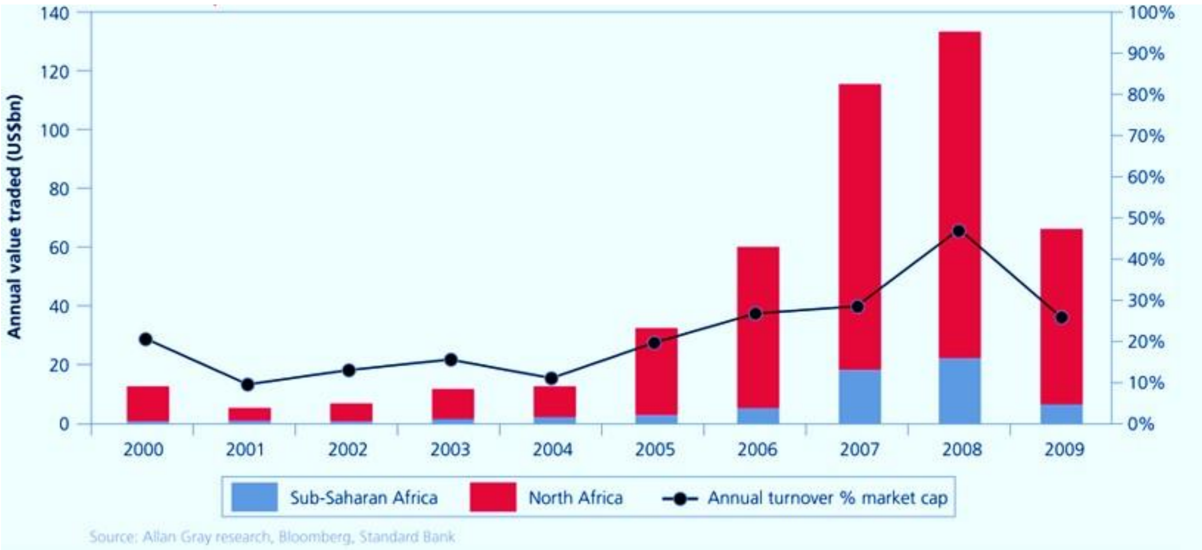
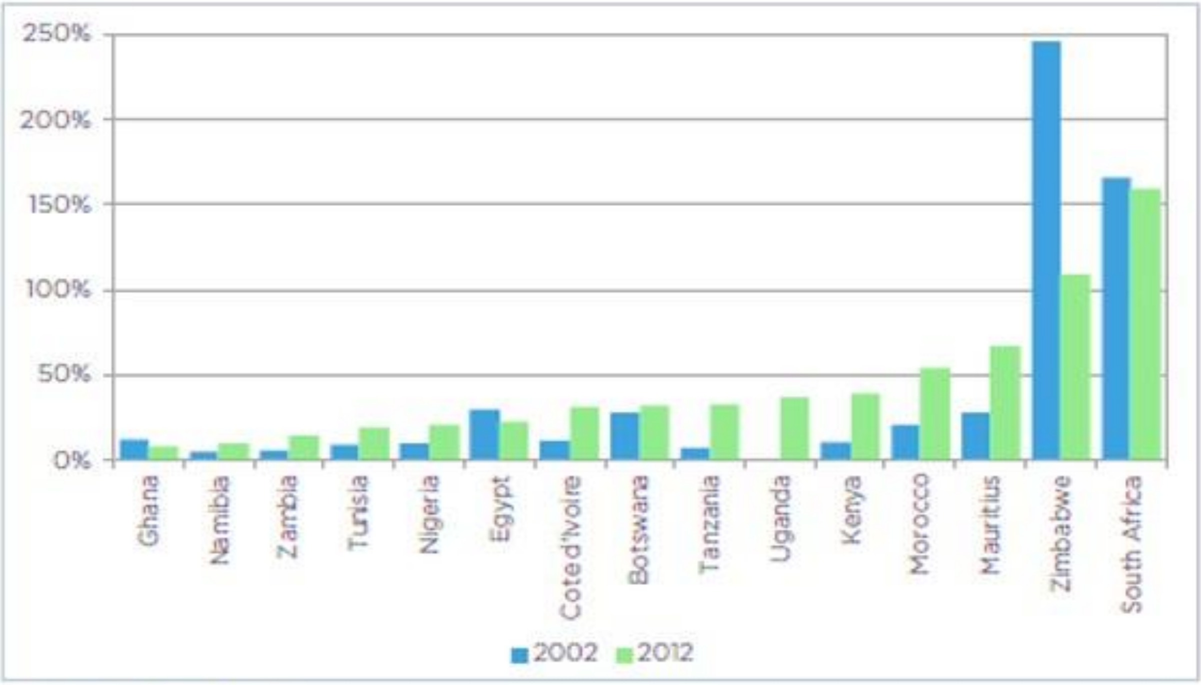


Figure 5-4 Annual value traded for African stock exchanges excluding South Africa

African securities markets are small in terms of market capitalisation, but there is a noticeable strong growth in many African stock markets over the last two decades as shown by Figure 5-5 below. The 2012 figures are higher than 2002. This indicates a capitalisation and development improvement in African stock markets. Financial market development can be assessed by the ratio of stock market development as a percentage of GDP. There are relatively lower ratios (of less than 50 per cent) of market capitalisation to GDP, indicating that African stock markets are smaller relative to their economy sizes. Only Zimbabwe and South Africa experienced a decline in capitalisation from 2002 to 2012.



Source: *World Bank, IMF*

Figure 5-5 Percentage of stock market development to GDP

African stock markets are extremely illiquid and thinly traded (Goldsmith, 2012). Figure 56 below, shows the average annual turnover as a percentage of market capitalisation. The turnover ratio measures the trading activity relative to stock market size indicating the level of liquidity available in the market. The higher the turnover ratio, the higher the liquidity of the market. The figure indicates that the turnover ratio of most of the African stock markets is below 10 per cent, indicating that African stock markets are thinly-traded and extremely illiquid. South Africa has the highest (48) turnover ratio amongst African countries, followed by Egypt (32) and the rest fall below 10 per cent.

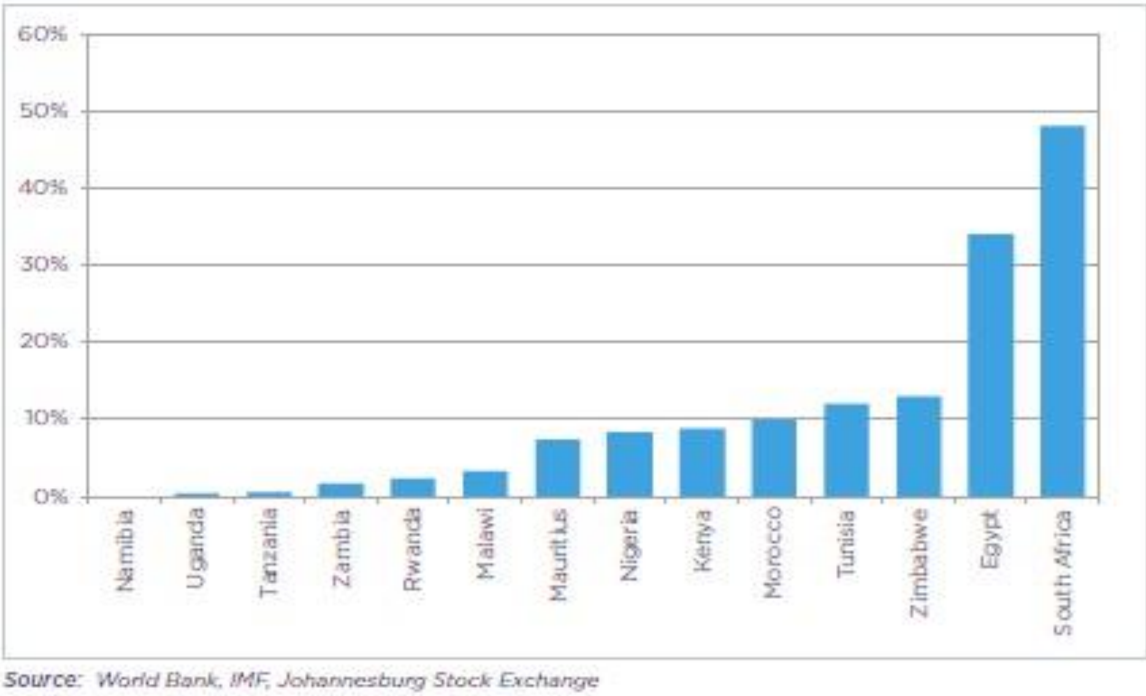


Figure 5-6 Annual turnover as a percentage of market capitalisation

5.1.3 Volatility of African Stock Markets

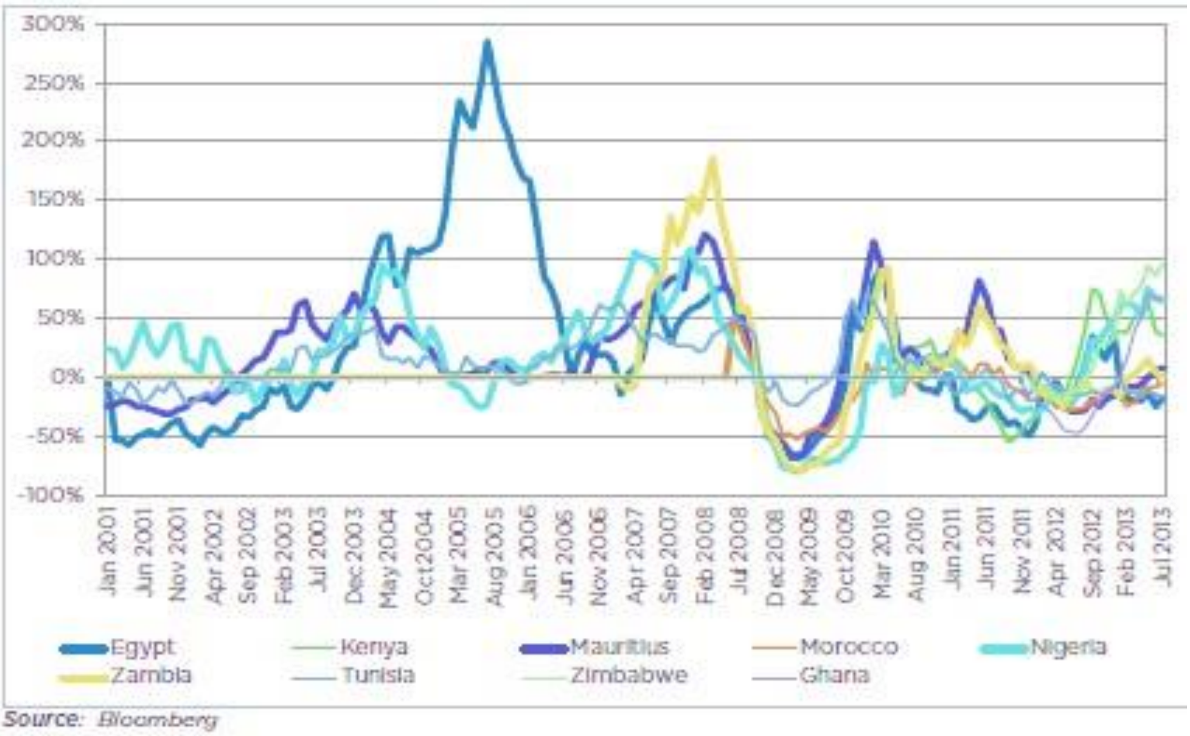


Figure 5-7 Rolling returns of African stock markets 2001-2013

There is relatively high volatility (too much uncertainty) in African stock markets. The volatility of these markets can be largely attributed to illiquidity which induces too many price fluctuations. Unstable economic and political conditions increase country risk which can affect the stability of the security prices and, to a large extent, this affects their size. Figure 5-7 shows the 12-month rolling returns of selected African stock markets from 2001 up until 2013. As shown in the graph, there is higher volatility of returns over time.

5.1.4 Correlations of African Stock Markets and World indices

Table 5-1Correlation of African markets with global indices

	JSE All Share	Nigeria 30	Mo-rocco	Egypt 30	Kenya	S&P Africa 40	S&P 500	FTSE 100	Hang Seng	MSCI World	MSCI EM
JSE All Share	100%										
Nigeria 30	24%	100%									
Morocco	8%	59%	100%								
Egypt 30	6%	76%	83%	100%							
Kenya	20%	87%	56%	80%	100%						
S&P Africa 40	92%	22%	25%	16%	13%	100%					
S&P 500	77%	61%	4%	21%	55%	60%	100%				
FTSE 100	56%	79%	43%	62%	84%	42%	82%	100%			
Hang Seng	78%	56%	43%	55%	54%	74%	67%	73%	100%		
MSCI World	69%	76%	33%	50%	77%	54%	93%	97%	77%	100%	
MSCI EM	91%	49%	42%	44%	47%	88%	73%	72%	94%	79%	100%

Source: *Old Mutual Investment Group South Africa*

African stock markets are not synchronised with the rest of the world. They have a very low correlation with global indices as well as among other African stock markets as shown by Table5-1 and Table 5-2. The correlation of stock markets indices in developed nations are higher, the S&P 500 and the FTSE 100 is 82 per cent, FTSE 100 MSCI World is 97 per cent, S&P 500 and the MSCI World is 93 per cent. In Africa, the S&P Africa 40 has only 42 per cent correlation with the FTSE100, 54 per cent with the MSCI World. Morocco has 4 per cent with S&P 500, 25 per cent with S&P Africa 40. Egypt has 21 per cent with S&P Africa 40. Table 5-2 indicates that the correlation amongst African stock markets is as low as below

40 per cent. Low correlations of African stock markets and the global indices indicate large heterogeneity in the structure and operation of the African stock markets. In line with financial theory and international financial authorities' research on investment destinations, the low correlations are also evidence of a good destination for investments in order to to attain efficient portfolio diversification for global investors.

However, in practice, African stock markets have not been good investment destinations because of the economic and political instability of many African countries. Economic instability pushes investors away because of the fear of losing capital. For example, the hyper-inflation which was experienced in Zimbabwe in 2007-2009 resulted in capital erosion for many foreign and local investors. Consequently, international investors may forego such destinations no matter how lucrative the opportunities may be. Therefore, political risk and lack of good investor protection policies in many African markets also limits African nations from being good investment destinations. In addition, liquidity risk in the markets due to shallowness and a limited range of securities increases the overall risks associated with the investment opportunities and, therefore, discourages international investors.

Table 5-2 Correlation of African stock markets

	Egypt	Kenya	Mauritius	Morocco	Nigeria	Zambia	Tunisia
Egypt	100%						
Kenya	20%	100%					
Mauritius	0%	27%	100%				
Morocco	26%	24%	34%	100%			
Nigeria	32%	48%	24%	28%	100%		
Zambia	-25%	14%	36%	12%	-1%	100%	
Tunisia	8%	13%	48%	25%	-15%	13%	100%

Source: *Old Mutual Investment Group South Africa and the Johannesburg Stock Exchange*

Stock market expansion helps attract private investment and integration into the global financial market place (Murungu et al., 2016). Private investment expands the operations, capital base and, therefore, there is more capacity for new investments. As shown in Chapter

Two there is overwhelming evidence that African stock markets are increasing in number, capitalisation and size, However, firm investment seems to be stagnant in these nations. According to the *United Nations Economic Development Report* of 2015, African firms' investment levels are actually declining. This poses the question of the effect of the growth of these stock markets on investment.

Liquidity in African markets is very low coupled with too volatile cash flow in firms compared to international norms (Oosthuyse et al., 2014). The African Union stresses that African stock markets are less liquid and perform poorly with very few shares to be traded, with wide gaps between buy and sell orders (Sally, 2013). African stock markets are stuck with high trading costs of between 2,5 per cent to 5 per cent which slows down the velocity of trade (Oosthuyse et al., 2014). Many studies in developing economies have examined the relationship between liquidity and economic growth variables as GDP. It is argued that liquidity level affects external funds accessibility and hence investment. Myers and Majluf (1984) predict that highly liquid firms should invest more. Lipson and Mortal (2004) also maintain that stock market liquidity interacts with financial structure. This contribution seeks to add to the growing literature examining the link between the stock market microstructure of a firm and corporate financial structure. This study thus seeks to extend the literature and to examine the impact of the African firms' stock market liquidity, volatile cash flows together with leverage on investment.

5.3 Stock market liquidity and investment-related literature

Stock market liquidity refers to how easily shares of stocks can be converted into cash (Blease and Donna, 2008). Liquidity can also be defined as the extent to which stocks can be sold at stable prices on the stock markets (Moffatt, 2015). A firms' stock is said to be liquid if it can trade rapidly and the trading volume has little impact on the price of the stock. Liquidity in firms 'stock can be assessed through the bid-ask spread, for liquid stocks the spread is thin less than 1 per cent of the stock's price (Wyatt, 2011).

Finance literature reveals three different channels that relate stock market liquidity and investment. The channels derive a neutral, positive and a negative relationship. Theories of Muñoz (2012a). Admati and Pfleiderer (2009a), Mang (1998), Edmans and Manso (2011b) are of the neutral view of liquidity on investment, based on the agency problems. Miller (1977a), and Gilchrist et al., (2005a) predict a positive relation between firm investment and stock market liquidity, their models are based on the asset mispricing. Turning to negative channels Stein (1989) shows that in the presence of asymmetry information, take-over pressure could induce managers to sacrifice good long-term performance (like investment) for higher current profits to keep the stock from becoming undervalued.

Previous studies show that firms with higher liquidity tend to have lower levels of leverage (Muñoz, 2012b). This is because such firms can take advantage of mispricing in the stock market to issue expensive stock to raise finances hence lowering debt in their capital structure. Moreover, Lesmond et al., (2008b) also find firms that increase their level of leverage reduced liquidity. Similarly, Bharath et al., (2009) show a negative relationship between debt and liquidity in the stock market. Fang et al., (2009) find that firms with greater liquidity have a better performance measured as the market-to-book ratio of assets. Banerjee and Spindt (2005) also found firms with low stock market liquidity to be paying dividends, Lipson and Mortal (2004) predict that stock market liquidity interacts with debt.

In financial theory most recently, there has been a growing interest in studying the relationship that may exist between liquidity in the stock market and the real economy. Kaul and Kayacetin (2009),Beber et al., (2010) and Naes et al., (2011) evidence a positive relationship between stock market liquidity and real variables as GDP this is however at the macro-economic level. The impact of stock market liquidity on investment has been studied at the firm level using share issue, (Butler et al., 2005b, Gilchrist et al., 2005a), leverage (Lipson and Mortal, 2009) and the performance of the firms (Fang et al., 2012). However, a study centered on the relationship between firm real investment and stock market liquidity has not been previously undertaken in Africa. This research will close this gap and contribute to the small growing literature that studies the relationship between stock market liquidity and firms’ decisions.

5.3.1 Channels that predict a positive relationship

5.3.1.1 Mispricing mechanism

Models related to assets mispricing yield a positive correlation between firm-level investment and stock market liquidity. Miller (1977b) suggests that due to the presence of heterogeneous beliefs amongst investors, optimistic investors would make high stock valuation whilst pessimistic ones will exit the stock market. In this regard, the stock price will reflect a higher value from optimistic investors. As the company evaluates financing for investment purposes, the heterogeneous beliefs amongst investors induce demand and promot equity issuance. Short sale constraints and the dispersion of investor beliefs may cause stock market bubbles supporting equity issuance at inflated prices (Gilchrist et al., 2005). The total shares the firm will have to choose to finance its investment will positively depend on the dispersion of opinions amongst these investors (Munoz 2012). Banerjee and Kremer (2010) and Hong and Stein (2007) found that the differences in opinions among investors may explain trade volume patterns.

Given that the differences in opinion give rise to stock market bubbles, to this end the widening of the dispersion between investor opinion will result in higher trading volumes yielding a positive correlation between firm investment and trading volume. Baker et al., (2007) show that the elevation of stock market liquidity under short sale constraints is attainable if irrational investors are optimistic thus indicating investor sensitivity.

According to the catering theory firm management may try to adjust investments of the firm to capture investor sentiments (Polk and Sapienza, 2008). The informational asymmetry arguments that investors evaluate a firm based on its investment behaviour. Firms that reject projects that are deemed valuable by investors will experience a bearish trend on the stock market as investors would be offloading their holdings. Pan (2005) and Dixing (2011) suggest that firm investment is influenced more by investor sentiments through catering trend in an uptrend period than in a downtrend.

5.3.1.2 Capital Cost

Amihud and Mendelson (1986) assume that the liquidity cost is taken into consideration by investors before they can invest such that illiquid stocks attract higher transaction costs and hence commands higher returns. The expected return on a project to investors is the firm's cost of capital. Hence the higher the expected return the higher the cost to the firm and thus would reduce the project's net present value Ross et al., 2009. In this regard firms with higher stock market liquidity will benefit from lower costs as investors will demand a low expected return and hence a higher net present value suggesting a positive association between liquidity on the stock market and firm level investment. Amihud (2002) and Pástor and

Stambaugh (2003) using different measures of liquidity also confirm the negative relationship between liquidity and expected return supporting the view that illiquidity will result in higher cost and lower investment.

5.3.1.3 Stock issuance costs

When companies issue stocks, they may go through an underwriting process by an investment bank that charges an offering fee. Butler et al., (2005) suggest that investment banks should demand lower offering fees for firms with higher liquidity than illiquid firms since it would be easier for a seasoned offering of a liquid stock than an illiquid stock. With higher liquidity inventory costs, trade and searching costs will decline with an improvement in liquidity (Munoz 2012). Hence this suggests a negative relationship between liquidity and offering costs. To this end, more liquidity would be associated with more issuance which supports more investment (Munoz, 2012). This Suggests a positive correlation between stock market liquidity and investment. Empirically GU and CHEN (2009) confirm the negative association between liquidity and the cost of supplementary offerings in the stock market implying a positive relationship between liquidity and investment.

5.3.2 Neutral channel on investment and liquidity

5.3.2.1 Feedback Mechanism

The stock price and the indication in the stock price can be changed by informed trading (Khanna and Sonti, 2004). Decision-making efficiency improves with the behaviour of informed investors, informed traders also influences the financial constraints and firm performance. Kyle and Vila (1991) document that the feedback effect is strengthened in liquid stocks which promotes more trade with informed investors. The argument of Khanna and Sonti (2004) on informed investors predicts a positive relationship between liquidity and performance no direct investigation on the impact of stock market liquidity and firm investment decision. Edmans (2009) highlights that stock market liquidity enhances stockholder entry which in turn induces more monitoring activities and improved firm management Maung 1988.Edmans and Manso (2011a), Admati and Pfleiderer (2009b) reveals that block holder trading on private information tends to discipline managers when their compensation is more tied to share prices. All these studies approach the investment and liquidity relationship without a specific sign prediction in such a relationship.

5.3.3 Negative channels on investment and liquidity

5.3.3.1 Corporate Control

The channel that suggests a negative relationship between stock market liquidity and investment relates to corporate control. Stein (1988) highlights that in the presence of asymmetric information between managers and investors, managers may be induced to sacrifice long-term investment for current profits to avoid undervaluation of the share price on the stock market. Undervaluation will be a product of long-term returns and higher risk resulting from long-term investments putting more pressure on management. Porter (1992) states that liquid stocks have lower trading costs that facilitate entry and exit of investors trading on the stock announcements. This channel predicts that managers may sacrifice long-term investment to maintain short-term profitability to avoid undervaluation of stock prices suggesting a negative relationship between liquidity and investment.

Table 5-3 Studies on investment and liquidity

Munoz (2013)	Used a panel of Latin American listed firms with quarterly data using trading volume as a measure of liquidity in the stock market. Unlike many studies on firm investment decisions, the different measures of investment used in this study were growth in total assets, plant property and equipment and inventories these measures were necessitude by the fact that the commonly used measure of investment capital expenditures is not reported by firms in Latin America on their financial statements. Munoz used panel data and Instrumental variables technique (IV) to control for endogeneity problems. They found that liquidity is associated with an increase in investment and the positive relation is greater for firms with more investment opportunities, higher financial constraints and in stock issuance seasons.
Fang et al., (2013)	In a panel of American firms used minimal tick size change on traded shares and found that liquidity is associated with lower innovation.
Jiacai Xiong (2016)	In China, non-financial listed firms using different measures of liquidity also found a positive relationship between liquidity and investment. Jiacai indicates that the positive relationship is affected by financial constraints, investment opportunities and riskiness.

There are very few empirical analyses conducted on the relationship between stock market liquidity and investment of which all are based on the firm's data from developed economies. Developed economies have liquid and advanced stock markets, less informational asymmetries. Stock markets in developing economies differ from those of advanced economies in that they are highly illiquid, less developed and have more informational asymmetries due to less informed investors and structures hence they may exhibit different characteristics and relationships yet there are no studies that cover these economies in this respect. Hence this study sought to investigate the impact of such market condition on investment. Very few studies that have been done that access the influence of stock market liquidity on investment are based on the firms from developed economies.

Hypothesis:

H_1 : There is a positive relationship between stock market liquidity and investment ratios.

H_2: Firms with low stock market liquidity invest less.

5.4 Empirical approach

5.4.1 Data and the variables

The data and variables used in this section are from the same sample of African stock markets as previously defined in chapter 3. In this chapter, only new variables are defined and explained. Two different definitions of investment were used for robustness of the results. Capital expenditures and fixed assets growth. Following empirical studies (Lang et al., 1996, Aivazian et al., (2003) firm-level investment defined as relative investment which is the amount of investment per one unit of fixed assets. Generally, capital expenditures are a function of the speed of a firms' growth. High growth firms are expected to have higher net capital expenditures than low growth firms. Constrained firms may have negative net capital expenditures since they will be disposing of more fixed assets.

The new measure of firm investment used in this section is the growth in fixed assets. Defined as the percentage of the difference between prior years fixed assets from the current year fixed assets divided by the prior year's fixed assets. This measure accounts for tangible long-term firm investments. Fixed assets are defined as long-term tangible assets used and owned by a firm on its operations and not expected to be resold nor converted into cash in less than a year. These assets are reported under the section of plant property and equipment in the balance sheet of the firm.

$$Investment(Fixed\ Assets\ growth) = \frac{FA_t - FA_{t-1}}{FA_{t-1}}$$

Where: FA_{t-1} is fixed assets for the previous period and F_t is fixed assets for the current period.

5.4.1.1 The main independent variable

Liquidity

Liquidity was measured by the firm level trading volume of each firm in the respective stock markets. The firm-level trading volume was created using daily data of the quantity of shares traded and the total number of shares of the firm as reported on the Bloomberg. This measure has been used in financial literature by Munoz (2012) and Lesmond et al. (2008a). Days, when trading volume exceeds the total number of shares of the firm were eliminated.

Firm-level trading volume liquidity was estimated as given by Munoz (2012) as follows:

$$\frac{\sum_{t=1}^{Q} Tradedshares_t}{D_Q * Totalshares}$$

Where D_Q is the number of days of transactions in the quarter, traded shares are the total of the shares traded in the day t.

Most empirical studies used trading volume as a proxy for difference of opinion. Sadka and Scherbina (2007), Thakor and Whited (2010) and Yae (2012), empirically validate trading volume as a proxy for differences of opinion. On the other hand, other studies used trading volume as a proxy for investment horizons and information on prices (Polk and Sapienza, 2008, Dong et al., 2007). Cremers and Pareek (2011), Barber and Odean (2000), and Grinblatt and Keloharju (2009), document that investors who trade most frequently are those who are overconfident. This interpretation would thus be in line with this work, given that trading volume captures the overconfidence among investors, which is reflected when they trade more.

5.4.1.2 Other independent variables

Other independent variables used in literature leverage, cash flow, Tobin's Q and firm size that influence investment are as previously defined in chapter three and four.

5.4.2 Model estimation

5.4.2.1 Stock market liquidity and firm-level investment

A dynamic panel model was estimated extending the standard Lang (1996) reduced form investment equation. A dynamic panel model was considered since panel data is under consideration, a dynamic model helps control for possible endogeneity and heterogenous problems through the estimation technique used.

The standard investment model specification is given as;

$$\frac{Investment_{i,c,t}}{K_{i,t}} = \alpha_i + \alpha_{c,t} + \beta liquidity_{ict} + \theta X_{i,ct} + \epsilon_{i,ct} ----------(5.1)$$

Where i is individual firm, t is period, c country. $X_{i,ct}$ is a vector of standard regressors leverage, Cash flow representing financial constraints, and Tobin's Q a proxy for investment opportunities. Fixed effects at the firm levelα_i, which captures firm-specific characteristics,

Equation (5.1) was extended to a dynamic panel model as given by Flannery and Rangan (2006) the specific model estimated is:

$$\frac{I_{i,c,t}}{K_{i,c,t}} = \beta_0 \left(\frac{I_{i,c}}{K_{i,c}}\right)_{t-1} + \alpha_i + \beta_1 liq_{ict} + \lambda Lev_{i,ct} + \eta CF_{i,ct} + \delta Q_{i,ct} + \epsilon_{i,ct} ---(5.2)$$

Where i is individual firm, t is period, c country. Standard regressors leverage, Cash flow representing financial constraints, and Tobin's Q a proxy for investment opportunities are included. Fixed effects at the firm level α_i, which captures firm-specific characteristics, country fixed effects $\alpha_{c,t}$ are also included to capture business-cycle effects inherent to each country (λ, η, δ, β_1) are the model coefficients to be estimated

Theoretically, in the finance literature, it is advocated that more information on prices would lead to more efficient investment (Khannand, 2004). This, however, doesn't imply that investment should be higher or lower, By the same token, if trading volume only captures information on prices, its relation to investment is not conclusive, it's not clear if more information implies more investment (Muñoz, 2012a). the results from equation 5.2 evidence the implication of information on investment.

5.4.3 Robustness tests

5.4.3.1 Financial constraints on firm liquidity and Investment

Financial constraints may also affect the degree of sensitivity to liquidity (Muñoz, 2012a).To examine if our results are not driven by financially constrained firms, we controlled for financial constraints on our model. Almeida and Campelo (2007) and Munoz (2012) separated companies into large and small according to their total assets with the objective of capturing their financial constraints. The separation of small and large firms is also in line with Beck et al., (2008) who found a difference in funding between small and large firms in Latin America. Intuitively, they argue that small firms tend to have less external financing. Hence liquidity could relax these differences for financially constrained firms (small firms), thus encouraging further investment.

The studies by Munoz (2012), Almeida and Campelo (2007) and Beck et al., (2008) on financial constraints assumed that all small firms are financially constrained given that they cannot access external financing easily. However, this is not always the case and may not be the case for African firms, most of the African economies are driven by small firms. Not all small firms are financially constrained. Firm size is not a good proxy of financial constraints. In this study, financial constraints were determined using the interest coverage ratios. This measure was motivated by the fact that financially constrained firms generate less earnings relative to their debt payments thus they are unable to service their interest payments. Hence a lower interest coverage ratio would be a superior indicator of higher financial constraints. Interest coverage ratio indicates how easily a firm can pay interest on its outstanding debt from earnings. Following literature financially constrained firms were classified as those firms with interest coverage ratio less than one.

Financial constraints were measured as the ratio of earnings before tax and interest payments (EBIT). A higher ratio indicates that a firm generates more earnings to service its debt. A lower ratio indicates financial difficulties in paying interest.

$$ICR = \frac{EBIT_t}{Interest_t}$$

Where ICR is interest coverage ratio, EBIT is earnings before interest and tax for period t and interest is the firm's interest expense for the same period t.

To control for financial constraints a dummy variable 'D' representing the interest coverage ratio of the firm was added to interact with liquidity. The dummy variable is equal to one (1) for firms with interest coverage ratio greater than one (1) representing non-financially constrained firms and zero otherwise (D=1 for ICR>1 and D=0 for ICR<1). A significant and negative coefficient would represent that the effect of stock market liquidity on investment is heterogeneous by financial constraints.

Model 5.2 extended to include a dummy interacted with leverage to take the following form:

$$\frac{I_{i,c,t}}{K_{i,c,t}} = \beta_0 \left(\frac{I_{i,c}}{K_{i,c}}\right)_{t-1} + \alpha_i + \beta_1 liq_{ict} + \beta_2 D * liq_{ict} + \lambda Lev_{i,ct} + \eta CF_{i,ct} + \delta Q_{i,ct} + \epsilon_{i,ct} \quad (5.3)$$

Where i is individual firm, t is period, c country. $D * Liq_{i,c,t}$ is the interaction of the dummy variable for interest coverage ratio and liquidity. Standard regressors leverage, Cash flow representing financial constraints, and Tobin's Q a proxy for investment opportunities. Fixed effects at the firm level α_i, which captures firm-specific characteristics, country fixed effects $\alpha_{c,t}$are also included to capture business-cycle effects inherent to each country (. λ, η, δ, β_1) are the model coefficients to be estimated.

β_1 is the coefficient for financially constrained firms, the coefficient for non-constrained firms is the sum of the coefficients incorporating liquidity *(β_1+β_2).*

5.4.3.2 Growth opportunities, liquidity and investment

Finally, if liquidity encourages more investment, this effect should be more pronounced in those firms that have greater investment opportunities (Muñoz, 2013). Zhang (2007) argued that firms with greater investment opportunities ('growth') would have the greater ability on the timing of their investment. To test the effect of growth opportunities on the relationship between market liquidity and investment we also include in the base regression (4.2) a dummy indicating whether the firm is value or growth, interacted with the measure of liquidity.

Tobin's Q was used as a proxy for growth opportunities. Calculated as a ratio of market value to book values. The market is assumed to account for investment opportunities a firm has and discounts everything efficiently. Hence, firms with Q greater than one (1) are considered high growth since they have higher market values relative to historical book values. Firms with Q less than one (1) are considered to have no or low growth opportunities (value stocks)

$$\frac{I_{i,c,t}}{K_{i,c,t}} = \beta_0\left(\frac{I_{i,c}}{K_{i,c}}\right)_{t-1} + \alpha_i + \beta_1 liq_{ict} + \gamma D_i * Liq + Lev_{i,ct} + \frac{CF_{i,ct}}{K_{i,c,t}} + Q_{i,ct} + \epsilon_{i,ct} \quad (5.4)$$

Where i is individual firm, t is period, c country. $\gamma D_i * \text{Liq}$ is the interaction of the dummy variable for growth opportunities and liquidity. $X_{i,ct}$ Standard regressors leverage, Cash flow representing financial constraints, and Tobin's Q a proxy for investment opportunities. Fixed effects at the firm levelα_i, which captures firm-specific characteristics, country fixed effects $\alpha_{c,t}$ are also included to capture business-cycle effects inherent to each country (. λ, η, δ, β_1) are the model coefficients to be estimated.

$\gamma D_i * Liq$ has been added to the model. If the coefficient is significant and negative it indicates that the effect of liquidity is heterogenous by growth opportunities. β_1 is the coefficient for low growth firms and $\beta_1 + \gamma$ is the coefficient for high growth firms.

5.4.4 Estimation technique

Previous studies estimated their investment equations using pooled ordinary least squares and fixed effects. Estimating equations (4.2-5) using OLS and fixed effects estimators may result in endogeneity problems because Tobin's Q can be an endogenous regressor (Almeida et al 2010). The fixed effects model can solve the issues of individual effects across firms and countries. However, it cannot handle the endogeneity problem. As noted by Bond and VanReenen (2008) the problem arises because the standard way of introducing stochastic variation into the Q model is to treat it as a stochastic parameter. Endogeneity problems can arise from the measurement errors in the variables.

Extending previous studies, to address these problems we employ a novel estimation technique that deals with endogeneity which has not been used in financial literature to assess this relationship. The GMM technique will be adopted to estimate the equations following Bond and Van Reenen (2008) and Almeida et al., (2010). The estimation technique involves differentiating the model and use lags of the endogenous variable as instruments and accounts for Q as a stochastic variable to deal with endogeneity.

5.5 Empirical results

5.5.1 Descriptive statistics

Table 5-4Descriptive statistics for investment, liquidity and control variables

Variable	Obs	Mean	25%	Median	75%	Std. Dev.
CAPEX	6236.0000	0.2160	0.0603	0.1504	0.2891	0.2435
L.CAPEX	5475.0000	0.2176	0.0635	0.1543	0.2916	0.2401
FA-GRW	6990.0000	13.5044	-2.4673	5.8456	20.6574	27.4648
L.FA GRW	6138.0000	13.9373	-2.0629	6.3333	21.0930	27.1764
LIQUIDITY	6740.0000	-0.7256	0.2305	-0.5495	0.9725	2.4470
LEVERAGE	7013.0000	0.0846	0	0.03477	0.1311	0.1130
CASH FLOW	6525.0000	0.4621	0.08749	0.2769	0.59378	0.8196
SALES	7219.0000	5.7169	1.307	2.8685	6.4879	8.3668
TOBIN'S Q	6536.0000	1.5190	0.9483	1.2487	1.8199	0.8525

Source: Author's calculations based on sample data

The table provides the descriptive statistics of the main variables of interest. Where CAPEX is the capital expenditures, FA-GRW is fixed assets growth, LIQUIDITY is trading volume on the stock market, CF is operating cash flows scaled by net fixed assets, SALES are net sales scaled by total assets and TOBIN'S Q is a proxy for growth opportunities estimated as a ratio of market to book value

Table 5-4 presents the descriptive statistics of the main variables of interest. Two measures of investment used in this analysis capital expenditures and fixed assets growth. The descriptive statistics show a very low value (0.2160) of average capital expenditures of African firms. A comparable low average FA assets growth for African firms with a mean value of 13.5 per cent is noted over the same period. Standard deviations of capital expenditure and fixed asset growth are high relative to the means. FA-growth standard deviation is two times the mean. High standard deviations indicate high levels of dispersion, no-consistency and high volatility in investment levels among African listed firms.

The average stock market liquidity level as measured by trading volumes for African firms is -0.7256,which indicates a relatively very low liquidity for African firms as compared to developed markets standards. Muñoz (2013) found an average of 0.002 for American firms. The standard deviation of liquidity is 2.45 which is more than three times of the mean value over the sample period. This depicts high dispersion in liquidity levels for African firms. The summary statistics show that African stock markets are relatively unstable and illiquid.

The average cash flows to net fixed assets is 0.46 with a standard deviation 0.82. The high standard deviation relative to the mean indicates high volatility of cash flow in African listed firms. The higher volatility of cash flow, low and volatile liquidity may be an explanation for the low volatile investment levels in African listed firms. An average Tobin's Q of 1.51 indicates that on average most of the African firms can be classified as high-growth firms. The median Tobin's Q value of 1.24 confirms that more than 50 per cent of African firms have higher growth opportunities as shown by high market values than book values.

5.5.2 Trend analysis on Investment and liquidity

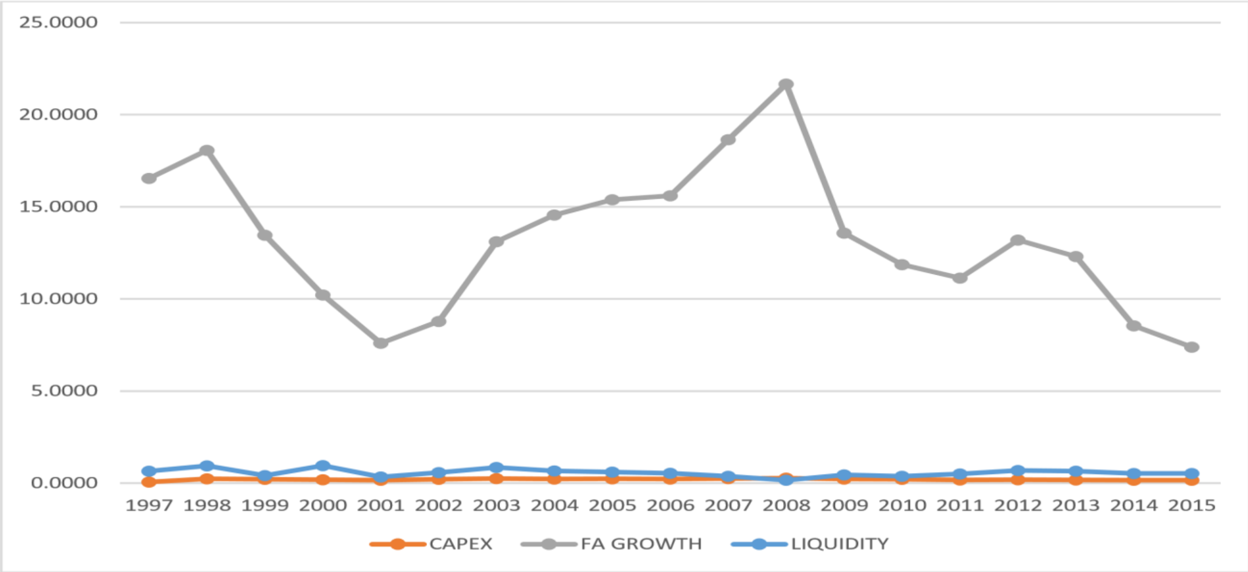


Figure 5-8 Investment and stock market liquidity in African firms

Source Own calculations based on Sample data

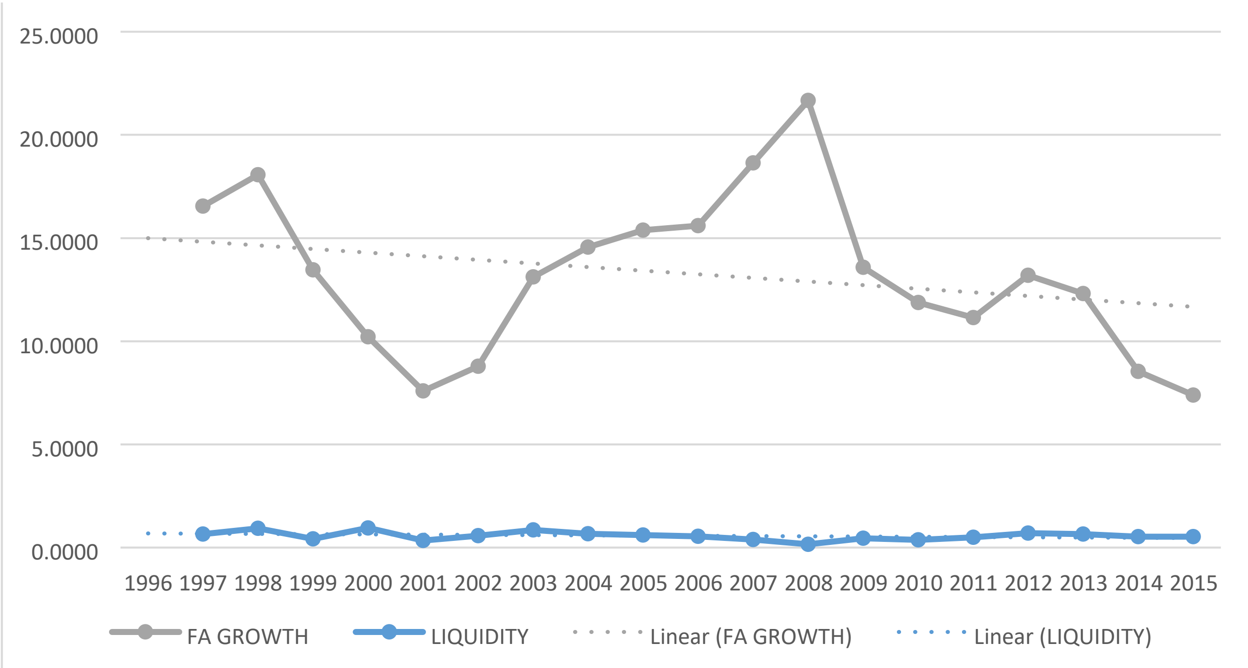


Figure 5-9 Fixed assets growth and liquidity trend in Africa

Source: Raw data

Figures 5-8 and 5-9 show that there is high volatility of fixed assets growth in Africa and very low liquidity levels. This reflects inconsistent acquisitions and disposal of fixed assets.

The FA linear growth trend line in Figure 5-9 depicts a down sloping trend indicating deterioration in fixed assets. This implies that African firms are disposing more than they are acquiring fixed assets. The figure also shows that African firms' fixed assets are declining with low and declining liquidity levels indicating a positive association.

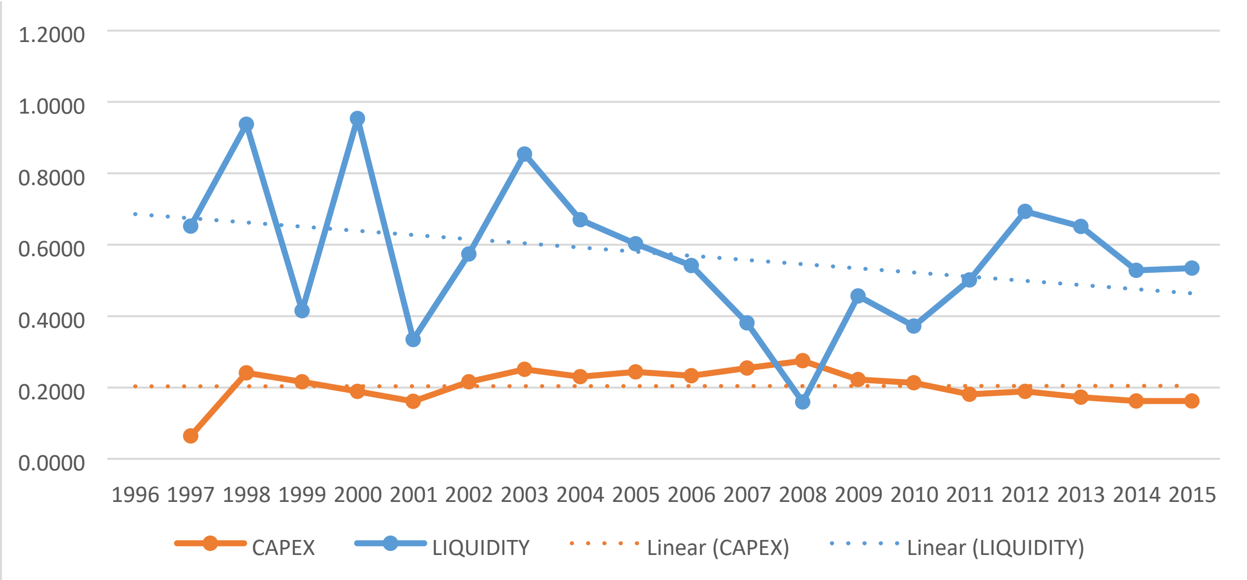


Figure 5-10 Capital expenditures and liquidity trends

Source: Raw data

Figure 5-10 shows the liquidity and capital expenditure trends in Africa. The graph shows that there is ahigh variation of liquidity in African stock markets. African stock markets liquidity levels are too volatile and risky. High variation of liquidity levels is also coupled with a decline in liquidity levels over the sample period as shown by the negative slope of the linear trend line given on the chart. In general, this indicates that in addition to being too volatile African stock market liquidity levels and declining. This trend is also associated with stagnant and slowly declining investment levels as shown by an almost constant capital expenditure trend line. This concurs with the *United Nations Economic Development Report* of 2015, which reports economic stagnation of Africa. This shows that African firms investment levels are low.

5.5.3 Correlation analysis

Table 5-5Correlation matrix

	CAPEX	FA.GRWTH	LIQUIDITY	CF	SALES	TOBIN Q	LEVERAGE
CAPEX	1						
FA.GRWTH	0.7136* 0.0000	1					
LIQUIDITY	0.1252* 0.0000	0.0871* 0.0000	1				
CF	0.2480* 0.0000	0.0820* 0.0000	0.0313* 0.0157	1			
SALES	0.2830* 0.0000	0.0864* 0.0000	0.1153* 0.0000	0.3994* 0.0000	1		
TOBINQ	0.1935* 0.0000	0.1359* 0.0000	0.0442* 0.0006	0.1759* 0.0000	0.0524* 0.0000	1	
LEVERAGE	-0.071* 0.0000	-0.0154 0.2131	-0.0156 0.2254	-0.135* 0.0000	0.1870* 0.0000	-0.091* 0.0000	1

Source: Author's calculations based on sample data

The table provides the correlation analysis of the main variables of interest. Where capex is the capital expenditures, FA-GRW is fixed assets growth, liquidity is trading volume on the stock market, CF is operating cash flow scaled by net fixed assets, sales are net sales scaled by total assets and Tobin's q is a proxy for growth opportunities estimated as a ratio of market to book value.

Table 5-5 depicts the correlation matrix of the variables. The correlation analysis shows that capital expenditures and fixed assets growth are significant and positively associated with trading volumes in African firms. Analysis of the correlation of the proxies of investment and trading volume a proxy for liquidity, we note that the positive correlation between liquidity and investment is stronger for capital expenditures than fixed assets growth. The positive association implies that firms with frequently traded securities invest more in fixed assets this concurs with Munoz (2013) who found a positive relationship between trading volume and investment levels. Concurring with the analysis in section three, leverage also has a statistically significant negative association with the two different proxies of investment capital expenditure and fixed assets growth used in this section. This shows that the negative relationship between leverage and investment is maintained for broader measures of investment. Cash flow, sales and growth opportunities have a positive correlation with capital expenditures and fixed assets growth. Firms with high cash flow invest more and generate higher levels of sales supported by more investment opportunities they face. The correlations amongst explanatory variables are low (less than 0.4) suggesting that multicollinearity is not a problem in this analysis.

5.5.4 Regression results on investment and stock market liquidity

***Table 5-6*Dynamic panel estimation liquidity and investment, two-step diff & sys GMM**

	CAPEX		FA-GROWTH	
	Diff GMM	*SYS GMM*	*Diff GMM*	*SYS GMM*
L.capex	0.254***	0.386***		
	(5.57)	(33.53)		
Liquidity	0.0197*	0.00329*	2.214***	2.252***
	(2.56)	(2.13)	(2815.93)	(319.19)
Leverage	-0.180***	-0.0297*	-14.11***	-7.396***
	(-3.69)	(-2.54)	(-1226.63)	(-55.09)
Cash Flow	0.0291*	0.0549***	1.282***	1.709***
	(2.10)	(19.32)	(354.93)	(121.22)
Sales	0.0146***	0.00714***	1.810***	0.641***
	(6.13)	(20.44)	(6683.47)	(301.64)
Growth opp	0.0271***	0.0348***	6.579***	3.811***
	(3.97)	(18.04)	(1934.36)	(415.25)
L.FA_growth			0.108***	0.142***
			(1205.92)	(556.73)
N	3806	4403	4165	4775
Number of id	549	597	565	610
Instruments	439	280	536	459
AR (2)	0.372	0.115	0.266	0.109
Sargan test	0.44	0.405	0.989	0.555

Source: Author's calculations based on sample data

The table shows regression results on stock market liquidity and investment for African firms. Two methodologies: the difference and system GMM used. The two measures investment capital expenditures (capex) and fixed assets growth (FA-growth), Cas Flows is operating cash flows scaled by net fixed assets, Sales are sales scaled by lagged net fixed assets and Tobin Q is a proxy for growth opportunities measured as market to book ratio, L. Capex is the lagged dependent variable of capital expenditures and L.FA-growth is the lagged dependent variable of fixed assets growth. The AR (2) tests for autocorrelation, and the HansenSargan test tests for overidentification of instruments. The results reveal a positive relationship between liquidity and investment for African firms. t-statistics are given in parentheses

**** p<0.01 significant at 1% level,** p<0.05 significance at 5 % level, * p<0.1 significance at 10% level*

The objective of this section was to examine the impact of stock market liquidity on discretional investment in Africa. Table 5-6 presents the regression output on the impact of stock market liquidity on firm investment in Africa. Two different proxies of investment were used for robustness checks (capital expenditure and fixed assets growth). Two methodologies were used to estimate the model: the difference GMM and the two-step system GMM with orthogonal option since we have unbalanced panel data.

The results in Table 5-6 shows that the coefficient of interest in equation 5-2 $\beta_1$for liquidity is significant and positive for all the classifications of investment, indicating that there is a positive relationship between stock market liquidity and investment. The regression coefficients of liquidity measured by capital expenditures are 0.0197 and 0.00329 positive and significant at 10 per cent significance level for difference and system GMM respectively. For fixed assets growth, the coefficients are 2.214 and 2.252 positive and significant at 1 per cent level for difference and system GMM. The coefficients of the two models and two investment proxies ranges from 0.00329 to 2.252. Consistent with the mispricing channels, liquidity on the stock market has a significant positive impact on investment in African firms. The positive relationship is robust for the two estimation techniques and the two different investment proxies used.

5.5.4.1 Economic Impact of regression results

Table 5-6-A shows the economic impacts of liquidity and other explanatory variables on investment. The results on the table show what impact one standard deviation change on the explanatory variables will have on investment (the depended variable) for all the four models.

For the two estimation techniques and the measures of leverage the table above shows that, for capital expenditure as a measure of investment, one standard deviation change in liquidity will result in 0.1979% and 0.033% increase in capital expenditures under difference and system GMM estimation techniques respectively. For fixed assets growth as a proxy for long-term investment one standard deviation change in stock market liquidity will result in 0.1973% and 0.2001 percentage increase in fixed assets growth for difference and system GMM. The impact values for the four models range from 0.033 per cent to 0.2001 per cent per one standard deviation change in liquidity. This indicates that for a given percentage increase in liquidity there is a sizeable increase in investment among African firms.

Table5-6A Economic impact of the regression estimates liquidity on investment.

	INVESTMENT = CAPEX		INVESTEMT = FA GRW	
VARIABLE	**Diff GMM**	**SYS GMM**	**DIFF GMM**	**SYS GMM**
L.INVESTMENT	0.2504	0.3801	0.1069	0.1405
LIQUIDITY	0.1979	0.0331	0.1973	0.2001
TD: TA	-0.0836	-0.0138	-0.0581	-0.0304
CASH FLOW	0.0979	0.1848	0.0383	0.0510
SALES	0.5017	0.2453	0.5514	0.1953
TOBIN'S Q	0.0949	0.1218	0.2042	0.1183

$$Economic impact = \frac{SD_{EXPLANATORYVAR} \times RegressionCoefficient}{SD_{DEPENDENTVAR}}$$

Source: Authors calculations based on Economic impact formulae given above.

The economic impact results also show that the change in liquidity has a greater impact on fixed assets growth as shown by higher percentage change (0.1973%-0.2001%) for fixed assets growth compared to capital expenditures (0.0331% - 0.1979%). African firms with higher liquidity invest more in fixed assets. The results of the economic impacts under section three on leverage and investment in Table 5-6-A shows that one standard deviation change in leverage reduces investment by a range of -0.0124 per cent to -0.0323 per cent for all the four models. These values are lower than those of the impact of liquidity, implying that a change in liquidity is most likely to have a higher impact on investment than a change in leverage for African firms.

The lagged dependent values of investment have higher impact values ranging from 0.1069 to 0.3801 percentage increase for one standard deviation change in past investment level than for liquidity. This indicates that previous investment levels have a higher significant economic impact on future firm investment levels for African firms. One standard deviation change in cash flow results in 0.0383 to 0.1848 change in investment. These figures show that investment is more sensitive to liquidity compared to cash flow levels as there is higher percentage change in liquidity than in cash flow for sales growth, one standard deviation change in sales leads to a 0.2453 to 0.5514 percentage change in investment for the four models and the two measures of investment. Sales growth has the highest impact on investment in African firms compared to other explanatory variables as shown by higher percentage changes. Firms that generate more sales invest more. An increase in sales is an indication of business expansion hence such firms are able to support more investment.

The interpretation of the coefficients shown in Table 5-6-A implies that the capital expenditure and asset growth on average increase by 0.0331 per cent to 0.2001 per cent following a standard deviation change in stock market liquidity for the two estimation methodologies employed. Concurring with Munoz (2012) using Latin American firms and the instrumental variable estimation technique, the results from this analysis reflect that increased liquidity is associated with higher investment in African firms. Firms with higher trading volumes invest more in capital expenditures consistent with the mispricing channel Gilchrist et al., (2015) and firms with low trading volumes dispose of their fixed assets rapidly.

Other control variables have the expected signs. In line with the analysis in section three under model one leverage has a significant negative effect on investment. Confirming also that debt constrains investment. High levered firms will dedicate their cash flow more to interest payments and thus constrains any profitable investment prospects. This supports the over-investment channel of the agency cost theory.

Sales and investment opportunities also have a significant positive relationship with investment. Firms that generate more sales and have higher growth prospects invest more in capital expenditures and have a positive growth in fixed assets. Capital expenditures and fixed assets growth increase with the increase in sales, growth opportunities and liquidity and decreases with an increase in leverage these findings are consistent with (Aivazian et al., 2005, Munoz, 2013, Polk and Sapienza 2009). Trading on the stock market is highly influenced by a firm’s fundamentals, increase in sales and growth opportunities is an indication of prosperity in the firm’s products and this will induce demand for stocks of such firms and they will be traded more. High trading volumes means high liquidity which can support more investment.

In agreement with Almeida and Campello (2007) cash flow also has a significant and positive association with investment. African firms which generate more cash flow invest more in fixed assets. The positive relationship between cash flow and investment reflects the financial constraints that African firms face. As documented by Fazzari et al., (1988) cash flow allows greater investment for firms that are restricted from foreign credit. Bond et al, (2003) and Muñoz (2013) found a significant negative relationship between cash flow and earnings before interest and tax (EBIT) indicating that cash flow is related to financial constraints. Firms that have higher cash flow are less financially constrained and tend to invest more.

The coefficient of the lagged dependent variables of fixed assets growth and the definition of investment is significant and positive. Consistent with dynamic stability the coefficients of all the lagged investment definitions are less than one in both models. The significant positive relationship implies persistency in past investment realisation and a positive effect of past investment levels to current investment realisations. Firms that have more fixed assets tend to invest more in assets in the subsequent periods. This can be due to more access to external financing, supported by their collateral.

The results evidence a positive relationship between investment and stock market liquidity. This is in line with expectation since most African firms are still young and emerging and very few are listed on the exchanges there is high optimism regarding such firms, hence there is more room to expand through stock issuance for investment purposes to grow the firms. These results support the mispricing channel notion as shown by Miller (1977a) who suggests that, due to the presence of heterogeneous beliefs amongst investors, optimistic investors would make high stock valuation whilst pessimistic ones will exit the stock market. In this regard, the stock price will reflect a higher value from optimistic investors. As the company evaluates financing for investment purposes, the heterogeneous beliefs amongst investors induce demand and mispricing promoting equity issuance. Banerjee and kremer, hong and stein 2007 found that the differences in opinions among investors may explain trade volume patterns. For Butler et al., (2005a), higher liquidity is associated with low stock issuance costs and hence higher investment. Polk and Sapienza (2009) posit that firm investment is greater when shares are overvalued, over-valuation of shares by the market is an over-reaction signal to firm's good prospects and hence higher trading volume and liquidity. Gilchrist et al., (2005b)concur that firms issue stock to take advantage of low cost of capital for investment purposes. Firms can only issue additional stock if the trading volume is high enough on the stock market that can support the subscription suggesting a positive relationship between liquidity and investment.

The positive relationship between liquidity and investment can be explained by the capital cost channel as shown by Amid and Mendlson (1986) that liquidity cost is taken into consideration by investors before they can invest such that illiquid stocks attract higher transaction costs and hence commands higher returns. The expected return on a project to investors is the firm's cost of capital. Hence the higher the expected return the higher the cost to the firm and this would reduce the project's net present value Ross et al., (2009). In this regard firms with higher stock market liquidity will benefit with lower costs as investors will demand a low expected return and hence a higher net present value, suggesting a positive association between liquidity on the stock market and firm level investment.

Consistent with the corporate control channel Fang et al., (2014) found a negative relationship between liquidity and innovation. In the presence of asymmetric information between managers and investors, managers may be induced to sacrifice long-term investment for current profits to avoid undervaluation of the share price on the stock market (Stein, 1988). This distinction might be explained by the definitions of investment used, Fang et al., (2014) used innovation which they termed long-term investment as opposed to capital expenditure and fixed asset growth used in this analysis.

Liquidity is positively correlated with investment. African stock markets are highly illiquid and shallow, investment is low, the current leverage levels are constraining investment suggesting the need for other sources of finance. Firms and policy makers in Africa in broadening the financing base of firms should consider stimulating liquidity in the stock markets to boost investment as it was shown that investor sentiments have a bearing on the cost of funds through equity issuance. African economies should promote investor protection so as to attract international and new investors to improve the activity and liquidity in the stock markets for financing purposes. Improving the liquidity on the stock market can help firms to issue stock at a lower cost, enjoy a low cost of capital and take advantage of mispricing, as investors seek better prospects for such stocks, it will sell higher and raise more funds for investment purposes. Our analysis in chapter three provided evidence that leverage is constraining investment, African firms should focus on internal funds and the stock markets to boost investment. Most African firms operate in the informal sector, firms should be encouraged to list and trade on the stock market to be able to raise funds for investment purposes. Authorities in African markets may consider setting up more alternative exchanges with less stringent listing requirements to accommodate small to medium firms and to facilitate capital accumulation for investment which will facilitate growth.

5.6 Additional tests

5.6.1 Controlling for financial distress

Table 5-7 Dynamic panel-data estimation controlling for financial distress

	CAPEX		FA-GROWTH	
	Diff GMM	***SYS GMM***	***Diff GMM***	***SYS GMM***
L.invstnet	0.284***	0.510***		
	(27.27)	(40.56)		
liquidity	0.0268***	0.0168***	1.773***	0.507***
	(6.77)	(4.68)	(7.85)	(4.85)
D*liquidity	-0.0125***	-0.0199***	-0.498**	-0.314**
	(-4.36)	(-4.61)	(-3.07)	(-2.81)
leverage	-0.189***	-0.0347**	-16.47***	5.854***
	(-10.76)	(-2.77)	(-11.24)	(6.17)
Cash Flow	0.0404***	0.0770***	2.951***	2.852***
	(11.73)	(11.88)	(10.77)	(22.41)
Sales	0.00824***	0.00265***	0.774***	0.411***
	(14.25)	(7.55)	(14.45)	(17.92)
Growth opp	0.0178***	0.0261***	6.845***	2.855***
	(4.91)	(12.94)	(49.68)	(27.10)
L.FA-Growth			0.108***	0.172***
			(21.07)	(48.56)
N	3343	3899	3633	4203
Number of id	501	556	521	570
Instruments	259	219	319	353
AR (2)	0.71		0.314	0.1
M (2) test	0.245	0.418	0.529	0.329

Source: Author's calculations based on sample data

*The table shows regression results on stock market liquidity and investment for African firms controlling for financial distress. Two methodologies: the difference and system GMM used. D*liquidity is the interaction of the dummy variable for financial constraints and liquidity. The two measures investment capital expenditures (capex) and fixed assets growth (FA-growth), Cash Flow is operating cash flow scaled by net fixed assets, Sales are sales scaled by lagged net fixed assets and Tobin Q is a proxy for growth opportunities measured as market to book ratio, L. Capex is the lagged dependent variable of capital expenditures and L.FA-growth is the lagged dependent variable of fixed assets growth. The AR (2) tests for autocorrelation, and the Hansen-Sargan test tests for overidentification of instruments. The results reveal a positive relationship between liquidity and investment for African firms to be stronger for financially constrained firms.*

t-statistics are given in parentheses

**** p<0.01 significant at 1% level,** p<0.05 significance at 5 % level, * p<0.1 significance at 10% level*

Table 5-7 shows African firms regression results on stock market liquidity and investment controlling for financial distress. A dummy variable was introduced to separate financially distressed and non-distressed firms. Shown in the table also are autocorrelation tests and over-identification of instruments tests. Two measures of investment capital expenditures and fixed assets growth were used with two estimation methodologies, the system and difference GMM.

Munoz (2012) analysed Latin American firms and found that financially constrained firms are more sensitive to liquidity, such that they take advantage of liquidity in the market and invest more. Almedia and Campello (2007), Munoz (2012) separated firms into small and large relative to their assets to capture financial constraints. They assumed that all small firms are financially constrained given that they cannot access external financing easily. This may not be the case for African firms, most of the African economies are driven by small firms. Firm size might not be a good proxy of financial constraints in Africa. In this study, financial constraints were determined using the interest coverage ratios. Financially constrained firms generate less earnings relative to their debt payments hence a lower interest coverage ratio. Following literature, financially constrained firms were classified as those firms with interest coverage ratio less than one. The model was re-estimated excluding financially constrained firms to see if the results are not influenced by financial constraints.

Table 5-8 Coefficients for constrained and non-constrained firms

		DIFF GMM	SYS GMM	DIFF GMM	SYS GMM
	COEFFICIENTS	CAPEX	FA-GROWTH	CAPEX	FA-GROWTH
Liquidity	β_1	0.0268	0.0168	1.773	0.507
Liquidity * D (ICR)	β_2	-0.0125	-0.0199	-0.498	-0.314
Non-constrained firms	$\beta_1 + \beta_2$	0.0143	-0.0031	1.275	0.193
Constrained firms	β_1	0.0268	0.0168	1.773	0.507

Source: Author's calculations based on regression results

*The table provides the coefficients of the main variable liquidity. Where β_1 is the coefficient for liquidity and represents constrained firms.β_2 is the coefficient of the interaction of the dummy variable for financial constraints and liquidity D*liquidity. The sum of the two coefficients gives the coefficient of non-constrained firms.*

The results in Table 5-8 indicate a significant and positive relationship between stock market liquidity and discretional investment for both the two estimation methodologies used and the two different measures of investment capital expenditure and fixed assets growth for African firms. This shows that our results are not driven by financially constrained firms. The coefficient of the interaction of liquidity and interest coverage ratio, proxying for financial constraints for the different measures of investment fixed assets growth and capital expenditures, is significant and negative under both the System GMM and Difference GMM estimation techniques, indicating that the effect of liquidity on the stock market is heterogeneous by financial constraints. These results are consistent with Almedia and Campello (2007) and Munoz (2012) who used firm size measured by firm's assets as a proxy for financial constraints in American firms.

The coefficients for financially constrained firms are given by $\beta_1$indicated as liquidity in Table 5-8. The coefficients of non-constrained firms are the summation of the two coefficients β_1 and β_2. β_2 is the interaction of a dummy variable D for firms with ICR greater than one (financially non-constrained) and liquidity. Table 5-8 indicates that financially constrained firms have a higher sensitivity and a closer liquidity and investment relationship than non-constrained firms. This is shown by higher coefficients β_1 for all the models and all the proxies for investment. This is consistent with the evidence found by Munoz (2012) with Latin American firms and Beck et al., (2008). On the contrary, for non-constrained firms in Africa this study found a significant and positive relationship between liquidity and investment. This indicates that African non-financially constrained firms also rely on the stock market for financing. Non-constrained firms are represented by the sum of the two coefficients that incorporate liquidity. Munoz (2012) found an insignificant relationship between liquidity and PPE and inventories. The difference might be due to the divergence in operations of firms in developing economies compared to those in developed nations. The advancement and liquidity of the stock markets in developed nations is higher than those in developing nations hence firms' decisions and reactions to such stock markets tend to diverge. For African firms, we found a significant and positive association of stock market liquidity and investment for both financially constrained and non-constrained firms. However, the correlation and sensitivity is stronger for firms with higher financial constraints than non-constrained firms. The implication is that African financially constrained firms rely on equity financing to fund their investments in periods of higher stock market liquidity. Financially constrained firms have less access to debt financing because of their poor financial standing hence when liquidity in the stock market is high such firms will capitalize on any mispricing and trading opportunity to issue more shares to raise more capital. The results are robust for the two estimation methodologies and the two different measures of investment (capital expenditures and fixed assets growth).

For the two estimation methodologies and the two different proxies of investment, all other control variables are significant and have the expected signs. As expected cash flow, sales and growth opportunities proxied by Tobin's Q are also positively associated with investment after controlling of financial constraints. Leverage is negatively associated with investment confirming the robustness of the results. The same signs of the coefficients of the control variables imply that sales, growth opportunities and cash flow are not heterogeneous by financial distress. For financially distressed and non-distressed firms, investment increases with growth opportunities, firms that generate more sales and cash flow invest more regardless of their financial constraints.

5.7 Growth opportunities liquidity and investment

To test the ability of timing of investments between growth and value firms, firms were also separated into high growth and low growth (value). Zhang (2007) indicates that high growth firms have the greater ability to time their investment than low growth firms which tend to be more stable in investments. Thus, the correlation between liquidity and investment is expected to be more pronounced in high growth firms. Tobin's Q was used as a proxy for growth opportunities. Firms with a ratio greater than one were classified as growth firms and those with a ratio less than one were classified as low growth or value firms. A dummy variable interacted with liquidity was added to the main regression which indicates whether a firm is a high growth or a value firm.

Table5-9 Growth opportunities liquidity and investment

	CAPEX		FA-GROWTH	
	Diff GMM	***SYS GMM***	***Diff GMM***	***SYS GMM***
L.Capex	0.319***	0.367***		
	(189.74)	(9.05)		
Liquidity	0.00870***	-0.0239**	1.494***	2.642***
	(17.64)	(-2.59)	(7.49)	(1002.27)
D*liquidity	-0.00138**	0.0296**	-0.351*	-1.763***
	(-3.09)	(3.11)	(-2.11)	(-685.64)
Leverage	-0.101***	-0.0565*	-13.28***	-7.824***
	(-24.83)	(-2.21)	(-9.12)	(-302.56)
Cash Flow	0.0255***	0.0399**	2.843***	2.055***
	(47.53)	(2.78)	(11.54)	(592.96)
Sales	0.0139***	0.00436***	0.826***	0.554***
	(115.84)	(4.80)	(15.22)	(2408.82)
Growth opp	0.0259***	0.0506***	8.172***	3.545***
	(48.88)	(7.60)	(27.76)	(1420.73)
L.FA-Growth			0.175***	0.146***
			(27.29)	(2643.08)
N	3766	4361	4121	4729
Number of id	546	595	562	608
Instruments	410	467	352	479
AR(2)	0.291	0.185	0.053	0.159
M(2) test	0.507	0.435	0.487	0.607

Source: Author's calculations based on sample data
*The table shows regression results on stock market liquidity and investment for African firms controlling for growth opportunities. Two methodologies: the difference and system GMM used. D*liquidity is the interaction of the dummy variable for growth opportunities and liquidity. The two measures investment capital expenditures (capex) and fixed assets growth (FA-growth), Cash Flow is operating cash flow scaled by net fixed assets, Sales are sales scaled by lagged net fixed assets and Tobin Q is a proxy for growth opportunities measured as market to book ratio, L.Capex is the lagged dependent variable of capital expenditures and L.FAgrowth is the lagged dependent variable of fixed assets growth. The AR (2) tests for autocorrelation, and the Hansen-Sargan test tests for overidentification of instruments. The results reveal a positive relationship between liquidity and investment for African firms to be stronger for firms with low growth opportunities. t-statistics are given in parentheses*
**** p<0.01 significant at 1% level, ** p<0.05 significance at 5 % level, * p<0.1 significance at 10% level*

Table 5-9 indicates that the coefficients of the dummy variable interacted with liquidity are significant and negative in the estimations for both proxies of investment and methodologies.

Consistent with Munoz (2012), these results provide evidence that the impact of liquidity is heterogeneous between investment opportunities. Contrary to the findings in developed nations, the results show that the effect of liquidity on investment is greater for low growth firms than for high growth firms.

Table5-10 Coefficients for liquidity on growth opportunities

		DIFF GMM	SYS GMM	DIFF GMM	SYS GMM
	COEFFICIENTS	CAPEX	FA-GROWTH	CAPEX	FA-GROWTH
Liquidity	β_1	0.00870	-0.0239	1.494	2.642
Liquidity * D (B/M)	β_2	-0.00138	0.0296	-0.351	-1.763
Growth	$\beta_1 + \beta_2$	0.007320	0.0057	1.143	0.879
Value	β_1	0.00870	-0.0239	1.494	2.642

Source: Author's calculations based on regression results

*The table provides the coefficients of the main variable liquidity. Where β_1 is the coefficient for liquidity and represents low growth opportunity firms.β_2 is the coefficient of the interaction of the dummy variable for growth opportunities and liquidity D*liquidity. The sum of the two coefficients gives the coefficient of high growth firms.*

As shown in Table 5-10 the coefficients of low growth firms (value) β_1 are positive and higher than those of high growth firms. The coefficients of high growth firms are given by the sum of all the coefficients that incorporate liquidity $\beta_1 + \beta_2$. For African firms, the correlation between liquidity and investment is stronger for firms with low growth opportunities. The results concerning leverage and investment indicate that there is a negative relationship between leverage and investment and the negative effect is more pronounced for firms with low growth opportunities for African firms. If leverage is constraining firms with low growth opportunities more, the expectation is that African firms with low growth opportunities should rely more on stock markets in financing their investments. Hence in this respect the results are in line with the first objective, as shown on Table 5-9 and 5-10 that the positive correlation of liquidity and investment is higher for low growth firms. Leverage has a greater negative impact on investment in low growth firms and hence these firms rely more on the stock markets to issue equity for financing their investment thus there is a higher positive association of stock market liquidity and investment in such firms.

5.8 Model specification tests

Testing the legitimacy of instruments and model specification is crucial in dynamic panel data analysis. Using a dynamic estimation method implements controls for the possible reverse causality between liquidity and investment, endogeneity issue, and heteroscedasticity through use of differencing and orthogonal instrumentation. However, the differenced equations can produce serial correlation (Baum, 2013). The Arellano Bond AR (2) test was used to test for the existence of second-order autocorrelation. In all our models, the AR (2) test is above 5 per cent hence we reject the existence of autocorrelation of order 2. The moment conditions should be tested for over-identification (Roodman, 2006a), the Hansen-Sargan test as reported in all the models provides evidence of correct identification of instruments. The coefficient of the lagged dependent variable is also less than one which is consistent with dynamic stability. These attest to the correct specification of the models.

5.9 Conclusion

The aim of this section was to examine the impact of stock market liquidity on discretional investment. For robustness investment was classified into two different definitions the ratio of capital expenditures to total assets and fixed assets growth. Both measures focus more on long-term nature and tangible investments. Stock market liquidity was proxied by the trading volumes of stocks on the stock market. Two estimation techniques were used for robustness of the results, the Difference GMM and the System GMM. The System GMM is superior in providing additional instruments for the levels equations together with the orthogonal deviations and it improves the estimation efficiency.

This analysis provides direct African evidence that stock market liquidity is associated with higher average investment levels in capital expenditures and fixed assets. Liquidity remains a significant positive determinant of investment even after controlling for possible financial constraints, availability of internal funds and growth opportunities. It was found that the effect of liquidity on investment is heterogenous by financial constraints and growth opportunities. The positive correlation between liquidity and investment is stronger for financially constrained firms and low growth firms than financially non-constrained firms and high growth firms. The results on growth opportunities are contrary to findings in developed economies. The positive effect of liquidity on investment for low growth firms corresponds with the finding of the negative correlation of investment and leverage on low growth firms.

Low growth firm's investments are constrained more by leverage hence they take advantage of stock market liquidity to finance their investments. Thus, a higher sensitivity of investments to stock market liquidity. The implication of the results to regulators and decision-makers in Africa is that regulators and decision-makers should promote and encourage market liquidity to boost the level of the firm and business investment. For global investors, most of the African stock markets are still small and at their development stage which may be a good avenue for greenfield investors and venture capitalists as such markets may provide higher capital gains.

There is a positive correlation between market liquidity and investment in African firms. Highly traded firms invest more. Thus, African firms and regulators should promote and take advantage of stock market liquidity to boost investment. Firms should consider the effects of stock market liquidity in their risk management decisions. Firms should trade off the effects of enhancing liquidity and the resulting negative impact of liquidity on investment levels. African stock markets are smaller and shallow, deterring liquidity.

In this regard, regulators should promote and encourage a broader product spectrum in each segment to foster liquidity and to enhance investment. Higher transaction costs on African stocks markets attenuates trading on the markets, lowering transaction costs and encouraging stock splits may also help improve liquidity. Firms should also consider or strike a balance between reinvestment and dividend payout to attract short-term investors seeking dividends thereby enhancing trading volume and liquidity in the market. Short sells and stock lending are restricted in most African countries, effective implementation and conduct of short selling indeed progresses market liquidity and in turn, supports firm-level investment. The next chapter focuses on the last objective which analyses cash flow volatility and investment.

CHAPTER 6

Cash flow volatility and discretional Investment

6.0 Introduction

Cash flow is the life blood of any firm as is blood to the heart. Cash flow volatility may throw budgets into disarray, deter capital expenditure, disrupt production, or delay debt repayments (Muñoz, 2012a). Cash flow variation is linked to liquidity and can influence the firm's financial behaviour and financial commitments (Marcelo, 2010). It is thus crucial to examine also the effect of cash flow on investment given the inseparable interplay between these financial pillars.

Financial constraints effects on firm behaviour and the manner in which firms perform financial management are central areas of research in corporate finance (Almeida et al., 2004b). Keynes argues that if a firm has unrestricted access to external capital that is a firm is financially unconstrained there is no need to safeguard against future investment needs. The literature on the impact of financial constraints on the behaviour of firms has traditionally focused on corporate financial constraints. Financial constraints will vary with the availability of internal funds, rather than just with the availability of positive net present value projects. Previous studies left a gap in the general enquiry into whether cash flow volatility influences firms to time their investment decisions or they actually decrease their investments. Accordingly, there is need to examine the influence of financing friction on investment by comparing the empirical sensitivity of cash flow with regard to investment across firms.

Many studies have analysed the relationship between cash flow and investment. In theory, firm investment should be unrelated to internally generated cash flow. (Modigliani and Miller, 1959). Other researchers, Bates, 2005, DeAngelo, et al., 2004, Harford, 1999, Jensen, 1986 Fazzari et al., 1998 document a positive relation between cash flow and investment. However, the volatility of cash flow has not gained much attention.

6.1 Cash flow volatility and investment literature

Risk management theories suggest value creation firms should maintain smooth cash flow (Froot et al., 1993b). They argue that firms that can smoothen their cash flow reduce costs from external financing and hence add value to the firm. This result has two important implications for this study. First explaining the negative relationship between cash flow and investment and also emphasizing the negative impact of cash flow on investment and value of the firm. Minton and Scharand (1999) also confirm that cash flow volatility increases the need for external financing and increases the cost associated with internal financing affecting a firm's investment policy.

In the context of risk management Shapiro and Titman (1986), Lessard and Lightstone (1990), Geczy et al., (1997) and Tufano (1996a) found that active firms in risk management have more benefits from reducing cash flow sensitivity.

Riddick and Whited (2009) suggest that in financing future investment needs, firms trade off the benefits of generating internal funds and the cost of holding cash. This analysis shows that internal funds are valuable to a firm's investment and financing also that internal funds availability determines the decision whether or not to seek external funding. This should then imply that the volatility of the internally generated funds must influence the stability of investment and firm value as well. Riddick and Whited's (2009) analysis indirectly suggests a negative relationship between cash flow volatility and investment.

Using firms in the United States of America Minton et al., (1999), found a negative association between investment and volatility in cash flow implying that firms experiencing lower cash flow forego investment opportunities without accessing the external capital markets. Minton et al., (1999) estimated the standard investment equation with the ordinary least squares technique. This technique may have problems on heterogeneity and endogeneity issues from measurement errors and the possibility that Tobin's Q in the model might be an endogenous variable, leverage might also proxy for investment opportunities hence correlation with the error term (Munoz 2012). The study of Allayannis and Weston (2003) on earnings volatility, cash flow volatility and firm value of firms on Compustat found evidence that investors negatively value the volatility in cash flow. They also found a negative relationship between cash flow volatility and investment opportunities, as measured by Tobin's Q. This was not an indirect measure of volatility on cash flow and investment, however investment is highly related to value if positive net present value projects are taken. Thus, factors that affect value should also affect investment from this analysis we also expect investment to negatively correlate with cash flow volatility as firm value.

Brick et al., (1998), in their study of investment policy and cash holdings, hypothesize that investment and cash holding optimal decisions depend on the exchange between cash holdings and investment. This suggestion is based on the assumption that investment and cash holdings are alternatives for liquidity requirements. Thus, financially constrained firms hold no cash while unconstrained firms have positive cash holdings. Cash flow and its volatility has an impact on cash holdings. Opler et al., (1999) indicate that firms with higher cash flow results in higher cash holdings and the volatility in cash flow will lead to higher precautionary needs and an increase in cash holdings. In this regard, an increase in cash holdings would mean a reduction in investment since cash holding and investment are not independent decisions. More cash holdings will mean less investment, so if cash flow volatility leads to more cash holding then a reduction in investment will result. This suggests a possible negative correlation between cash flow volatility and investment.

Fazzari et al., (1988) suggest that the sensitivity of cash flow should be higher for financially constrained firms. This brings in internal and external financing. Kovacs (2005) suggests that firms rely on external financial markets when there are low informational asymmetries. Almeida et al., (2004a) indicate that non-constrained firms have less cash to cash flow volatility, compared to constrained firms. Acharya and Schaefer (2006) developing from Almeida's (2004) idea added investment opportunities and found an inverse relationship. Considering the elements of corporate cash holdings Ferreira and Vilela (2004) found that firms with more investment opportunities hold more cash and generate higher cash flow than firms with lower investment opportunities.

Using firms in the United States of America, Booth and Cleary (2006) analysed cash flow volatility, financial slack and investment decisions in the presence of market imperfections which causes distinctions in internal and external financing. They found a less than expected correlation between investment and cash flow owing to the construction of a financial slack and strengthening balance sheet by firms should they anticipate any shortages. As a result there is less effect on the investment outlays. They suggest that the higher the volatility of cash flow the higher the level of financial slack hence less sensitivity to cash flow. However, this finding is inconclusive on whether or not these firms increase or decrease their investment levels in being less sensitive.

Donaldson (1963) basing his views on the separation of firm ownership and management justifies a financial hierarchy, Majluf (1984) also agrees to a financing hierarchy based on informational asymmetry when managers have more insider information. These studies indicate that a financing hierarchy restricts investment more to internally generated cash flow due to risk aversions. The financial hierarchy caused by agency or informational asymmetry implies financial constraints which will, in turn, affect the firm's investments. If the firm is restricted to internal cash flow, the volatility of such cash flow is a major risk to the firm's investments. Gilchrist and Himmelberg (1995) found higher investment cash flow volatility in small firms than large firms. Small firms face greater agency costs, informational asymmetries hence more financial constraints. Cleary (2006) on the other hand found that large firms have more cash flow sensitivity than small firms.

Booth and Cleary (2006) found that the uncertainty in the firm's cash flow also introduces uncertainty in the investment present values. Investment value increases monotonically at a decreasing rate in cash flows (Booth (2006)). Increases in cash flow increases the ability of a firm to undertake investments. In modelling the NPV function, Booth et al., (2001) state that as the volatility of cash flow increases with a reduction in future cash flow, the volatility of financial slack increases. The increase in financial slack will, therefore, imply a reduction in available funds for investment purposes, thereby lowering investment. There is a value to financial slack based on the wedge between internal and external financing (Booth, 2006). They suggest that firms with more volatile cash flow experience more value in adding financial slack since they experience the greatest wedge between internal and external capital. Such firms with more financial slack have less correlations between their investment and their cash flow. On the other hand, firms with stable and less sensitive cash flow will have a small external and internal capital wedge which will see little value in financial slack. Such firms increase their debt and have more sensitive investment ratios to cash flow. However, the models were estimated using the fixed effects estimators which cannot account for nickel bias and the endogeneity issues hence an estimator that is capable of controlling such biases may yield better results.

Considerable effort has been expended in analysing the linkage between uncertainty and investment at aggregate levels (Baum et al., 2009). In literature, there are various sources of uncertainty that cause fluctuations in aggregate investment. A multiplicity of studies have analysed the impact of exchange rate fluctuations on aggregate investment and firm-level investment such as Goldberg (1993), Campa and Goldberg (1995), Darby et al., (1999), andServén (2003). Other studies unearthed the impact of uncertainty from output, and interest rate prices (Driver and Moreton (1991), Calcagnini and Saltari (2000), Ferderer (1993), Hurn and Wright (1994), and Edmiston (2004))

Using firm-level data several studies employed measures of uncertainty from output, firm specific liquidity, stock prices, the exchange rate on the firm-level investment. Ghosal and houngai (1991) found a negative relationship between output and firm-level investment. Leahy and Whited (1995) using stock return data found a strong negative impact of stock return uncertainty on investment. Guiso and Parigi (1999) observed a negative correlation between demand uncertainty and capital accumulation. Beach et al., 2001 unearthed that uncertainties in the macroeconomic fundamental significantly affects investment. Bloom et al., (2007) suggest that higher uncertainties reduce the demand shock effects on investment. These studies examined the linkages of various uncertainties and sensitivities and investment at the aggregate and industry levels. An insignificant number of studies focused on the interaction between investment and cash flow uncertainties. Studies that have been done focus more on cash flow levels. However not only cash flow levels are crucial in the investment decision, but their volatility has a significant bearing on firm's behaviour. Few studies that have been carried on the volatility of cash flows are based on firms in developing economies. To our knowledge no research has been done to analyse how firms behave in the cases of cash flow volatilities in Africa and in developing nations, this study thus will cover this gap.

Interpretation of the negative correlation between cash flow volatility and investment is that cash flow volatility hints the possibility of internal cash flow shortages. Cash flow fluctuations can be smoothed through external financing. However, Myers and Majluf (1984) suggest that external financing is more costly than internal financing hence the more external finance is used the more investment is constrained. Minton and Schrand (1999a) remind us that firms with higher variation in cash flow face higher costs from external financial markets, consequently lowering investment since the costs may be higher than the returns based on the basic Net present value criterion.

*Table 6-1 S*ummary of studies on cash flow volatility and Investment

Gilchrist and Himmelberg (1995)	Found higher investment-cash flow **volatility** i**n** small firms rather than large firms. Small firms face greater agency costs, and informational asymmetries hence more financial constraints**.**
Cleary (2006)	Suggests that large firms have more cash flow sensitivity than small firms.
Booth (2006)	Found that the uncertainty in the firm's cash flow introduces uncertainty in the investment value.
Fazzari et al., (1988)	Document that the sensitivity of cash flow should be higher for financially constrained firms.
Almedia (2004)	Indicates that unstrained firms have less cash to cash flow volatility compared to constrained firms.
Opler et al., (1999)	Indicate that firms with higher cash flow results in higher cash holdings and the volatility in cash flow will lead to higher precautionary needs and an increase in cash holdings. In this regard, an increase in cash holdings would mean a reduction in investment since cash holding and investment are not independent decisions.
George Allayannis (2005)	In their study on earnings volatility, cash flow volatility and firm value in firms from the USA, found evidence that investors negatively value the volatility in cash flow. They also found a negative relationship between cash flow volatility and investment opportunities, as measured by Tobin's Q.
Minton and Scharand (1999)	Using firms in the United stated of America found a negative association between investment and volatility in cash flow. Implying that firms experiencing lower cash flow forego investment opportunities without accessing the external capital markets
Whited and Riddik (2009)	Suggests a negative relationship between cash flow volatility and investment.

Hypothesis:

H_1 : firms with high cash flow volatility have low investment ratios.

H_2: There is a positive association between cash flow volatility and investment**.**

Financial theories indirectly propose a link between investment and volatility of cash flow, in the context of hedging and cash flow volatility reduction to mention a few: Shapiro and Titman, 1986, Lessard, 1990, Stulz, 1990, and Froot et al., 1993a. Consistent with these theories, some scholars document that firms that are more active in risk management have the greatest expected benefits from reducing the volatility of cash flows (Dolde, 1995, Geczy et al., 1997, Tufano, 1996b). These theories mutually tested the costs of volatility, however, its impact remains an unanswered question. Jensen and Mickling (1986) in their free cash flow theory, indicate that free cash flow is the major cause for the agency costs, Myers 1977, (Fazzari et al., 1988) in a study of financial constraints and capital structure decisions reveal that cash flow is an important determinant and plays a significant role in a firm's investment policy. According to Cleary et al., (2006) firms with highly volatile cash flow have high financial slack to hedge themselves from any unanticipated outcomes. Low cash flow is associated with lower investment, even for high cash flow generating firms. If the cash flow is volatile such firms will hold more cash to cushion themselves (Cleary et al., 2006).

Holding more cash may be associated with a compromise on the firms' investments. Given this important role of cash flow in a firm's investment policy and behaviour, it is important to analyse not only the level of cash flow but the stability of cash flow. This can help financial strategies to ascertain whether or not they should focus on increasing the cash flow or work on the stability of the cash flow. Muñoz (2012a) found that cash flow volatility is associated with lower investment in capital expenditures in USA firms. However, Munoz estimated his model using the OLS and pooling variables together which has problems of endogeneity and heterogeneity.

This study provides the first and direct evidence of the association between discretional investment and the volatility of cash flow in Africa and complements the findings of these indirect tests using a dynamic panel data model as developed by Arellano and Bond (1991) with the GMM estimation technique to cater for endogeneity and heterogeneity using African firms' evidence. It seeks to contribute to the existing body of financial literature on this particular aspect.

6.2 Empirical approach

The study hypothesizes a negative association between a firm's discretional investment and volatility of cash flow. The relationship was tested following Minton and Schrand, (1999a). The model was however extended to panel data analysis through a dynamic panel model estimated in levels and in first differences to eliminate unobservable heterogeneity using two-step GMM estimators on an unbalanced panel data of 816 African listed firms from 1996 to 2015.

6.2.1 Data and the variables

6.2.1.1 Measures of cash flow and cash flow volatility.

Volatility is the widely-used measure of risk in financial markets. In this regard, volatility can either be historical (observed over time) or implied (predicted from market data) (Guo, 2012). The assumption under historical volatility measure is that the past is a prologue, the historical trend is measured hoping that it is predictive. On the other hand, the implied volatility looks at the volatility implied by the market and ignores history (Guo, 2012). This study focuses on historical volatility since we are using historical cash flows observed by African firms over the past periods as given in the financial statements.

As shown in Figure 6-1 below, historical volatility can be estimated in three ways namely simple volatility, exponentially weighted moving average (EWMA) and the Generalised Autoregressive conditional heteroskedasticity GARCH (x, y) approach. Following financial literature (Minton et al., 1999) we focus on simple volatility as measured by the coefficient of variation of cash flows and the EWMA measure for robustness checks.

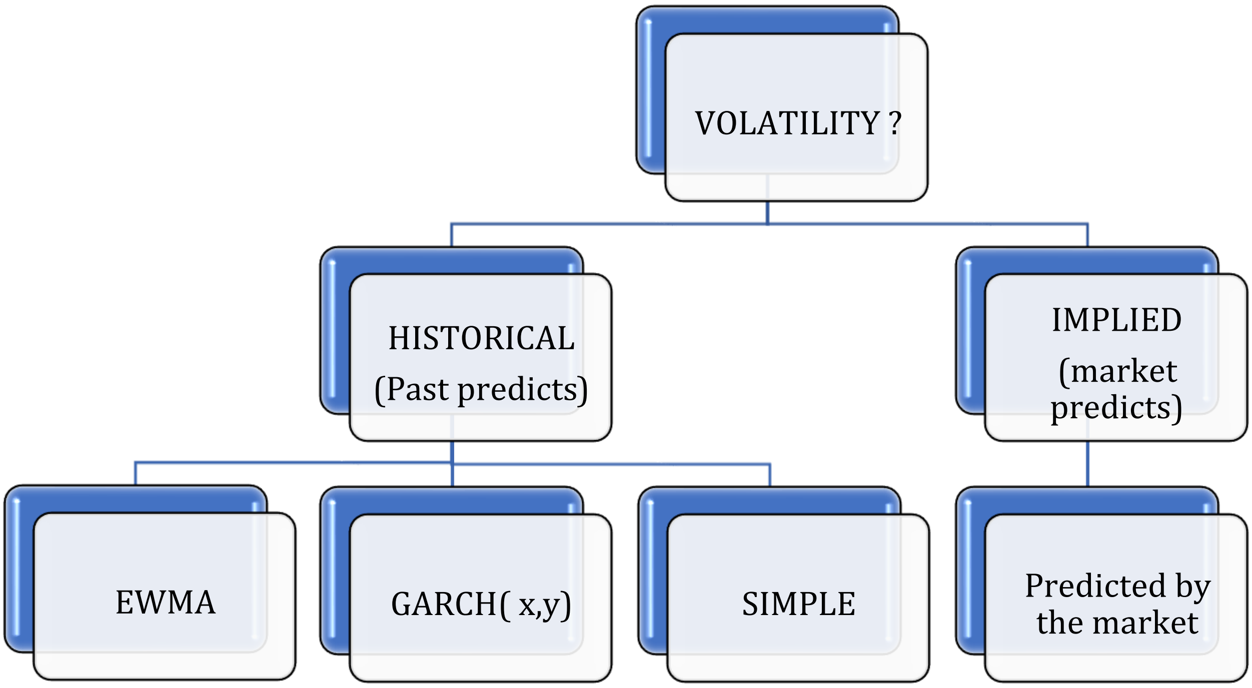


Figure 6-1 Measures of volatility *Source:*

Designed for the thesis.

6.2.1.2 Coefficient of variation of cash flows(CVCF)

The first measure was defined as the coefficient of variation (CV) in a firm's operating cash flow over the period preceding each of the sample years, following Guoming, (2009). In this respect for the year 2015, the coefficient of variation will be computed using 19-year data from 1996 up to 2014 and for 2014 it will be 18-year data from 1996-2013 and so forth. CV accounts for the size of the firm's cash flow as well as the volatility of this cash flow (Booth, 2006). The coefficient of variation also reduces the mechanical relationship between volatility and cash flow levels (Minton and Schrand, 1999a). However, this measure may result in serial correlation from the calculation of the standard deviation over time, a dynamic panel data model and our estimation methodology are robust in dealing with autocorrelation.

Cash flow from operations was obtained from the firms reported cash flow statements through the Bloomberg financial database, measured as the sum of earnings before extraordinary items and depreciation (Net income add back non-cash charges, adjust for working capital changes)

The coefficient of variation is estimated as:

$$\frac{\sigma_{OPCF_{i,t}}}{\mu_{i,t}}$$

Where: $\sigma_{OPCF_{i,t}}$ is the standard deviation of operating cash flow for each firm. CF_i is the firm's cash flow. $\mu_{i,t}$ is the expected value of the realized cash flow for each financial reporting period. The expected value $\mu_{i,t}$ is calculated as the simple average of all cash flow in each financial reporting period for the 20-year period as:

$$\frac{\sum CF_{i,1} + CF_{i,2} + CF_{i,3} + CF_{i,n}}{n} \tag{6.1}$$

To estimate the standard deviation, we first use the previous *n* observations in cash flow to estimate an unbiased estimator of variance as follows:

$$\sigma^2 = \frac{\sum_{1=1}^{n}(OCF_{i,t} - \in (OCF))^2}{n-1} \tag{6.2}$$

Then the standard deviation of cash flows is estimated as the square root of the variance as follows

$$\sigma = \sqrt{\frac{\sum_{1=1}^{n}(OCF_{i,t} - \in (OCF))^2}{n-1}} \tag{6.3}$$

Where:

$$\in (\mathrm{OCF}) = \mu = \frac{\sum \text{Cash flows}}{\mathrm{n}}$$

σ is the standard deviation of operating cash flows *($OCF_{i,t}$)*. $\mu = \in (OCF)$ is the mean of operating cash flows calculated as the arithmetic average of the observations for each year from 1996 to 2015 for the respective period.

6.2.1.3 Exponentially weighted moving average (EWMA)

The standard deviation of cash flows over time may fall short in the sense that it may give rise to substantial serial correlation and also all observations are given the same weight, hence the technique cannot mimic volatility clustering. In this regard, we also employ a more sophisticated different technique, the EWMA, a particular case of the GARCH model, which has the ability to mimic volatility clustering normally found in financial series for the robustness of the results. The EWMA is forward-looking in nature and it predicts the innovations in volatility by weighing more recent levels and considers the fact that recent changes in cash flow levels are more relevant. This approach provides a more representative measure of the perceived volatility and it also enables forecasting of future levels of variances.

The EWMA considers that volatility is very persistent and that it tends to cluster. Particularly higher volatility periods tend to be followed by higher volatility periods and lower volatility is followed by periods of lower volatility (Riskmetrics, 1996).

The EWMA is a special form of the ARCH(m) model developed by Engle (1994) and expressed as

$$\sigma^2{}_n = \omega + \sum_{i=1}^{m} \alpha_i \, x \, r^2{}_{t-i} \qquad (6.5)$$

Where, α_i is an observations weight *I* days ago, $\alpha_i > 0$ and $\sum_{i=1}^{m} \alpha_i = 1$

The weight of α_i decreases exponentially backwards in time such that;

$$\alpha_{i+1} = \lambda\alpha_i = \lambda^2\alpha_{i-1} = \cdots \lambda^{n+1}\alpha_{i-t} \qquad (6.6)$$

The some of the weights are applied such that they equal the unity constraint, it follows that;

$$\sum_{i=1}^{\infty} \alpha_i = \alpha_i \sum_{i=1}^{\infty} \lambda^i = 1$$

For $\lambda < 1, then\ \alpha_i = 1 - \lambda$

It follows that for $\sigma^2{}_{t-1}$ estimate:

$$\sigma^2{}_{t-1} = \sum_{i=1}^{n-1} \alpha_i\, r^2{}_{t-i-1} = \alpha_1 r^2{}_{t-2} + \lambda\alpha_1 r^2{}_{t-3} + \cdots \lambda^{t-3}\alpha_1 r^2 \qquad (6.7)$$

Then the volatility at period *t* ($\sigma^2{}_t$) is estimated as follows;

$$\sigma^2{}_t = (1-\lambda) r^2{}_{t-1} + \lambda\sigma^2{}_{t-1} \qquad (6.8)$$

More generally the EWMA model used to estimate volatility takes the following form:

$$\sigma^2{}_t = (1-\lambda)\epsilon^2{}_{t-1} + \lambda\sigma^2{}_{t-1} \qquad (6.9)$$

Where $\sigma^2{}_t$ is the current volatility at period t, $\sigma^2{}_{t-1}$ is the volatility for the previous period (t-1), $\epsilon^2{}_{t-1}$ is the cash flow mean for the prior period. λ takes the value 0.94 as given by the *Riskmetrics* (1994).

6.2.3 Model specification

To examine the relationship between cash flow volatility and investment the Lang et al., (1999) and Minton and Schrand's (1999a) investment model was extended to a dynamic panel data model which enables the observation of multiple phenomena obtained over multiple time periods for the same firms and countries, the specific model to be estimated takes the following form:

$$\frac{I_{i,c,t}}{TA_{i,t,c}} = \beta_0 \frac{I_{,i,c,t}}{TA}_{t-1} + \alpha_{i,c} + \beta_1 CVCF_{ic} + \sum_{i=2,3} \beta_{ic} CONTROL_{ic} + e_{i.c} \qquad (6.10)$$

$I_{i,c,t}$ is a proxy for the discretional investment scaled by the firm's total assets (TA) to do away with the effect of size and diverging figures. CVCF is the coefficient of variation of cash flows the proxy for cash flow volatility.$e_{i.c}$is the error term. $CONTROL_{ic}$ are the control variables/other explanatory variables that explains firm's investment behaviour. Fixed effects at the firm and country level $\alpha_{i,c}$, was included also which captures firm-specific characteristics and business-cycle effects inherent to each country. β_1 to β_{ic} are *the coefficients of the model to be estimated.*

Two control variables (CONTROL) Tobin's Q and sales growth that measures growth were included in the model. Fazzari et al., (1988) categories sales growth as a significant determinant of CAPEX. Sales growth was measured for the 20-year rolling period as volatility as follows:

$$\frac{\text{Average annual change in sales}}{\text{Beginning of period sales.}}$$

In light of the view that corporate finance studies exhibit uppermost levels of serial correlation and endogeneity as a result of multiple independent variables (Mark and Hankins, 2012), there is a need for an estimation technique that deals with this problem. The dynamic panel model (Equation 6.10) was estimated using the Blundell and Bond (1998) estimation technique for the 20-year period. The estimation technique is motivated by the fact that it corrects for endogeneity problems in Tobin's Q. Also given that it has the lowest root mean squared errors (RMSE) compared to other estimation techniques, this makes it the best estimation technique for panel data models (Mark and Hankins, 2012). Mean of the annual coefficients estimates will be presented. First differencing of the equations will eliminate the firm and country-specific fixed effects.

6.3 Additional tests

To obtain robust results the study also controlled the potential relationship between investment and cash flow and cash flow excess and shortages. To control the mechanical relationship between cash flow levels and investment, equation 6.10 was extended to include cash flow levels, high cash flow and low cash flow.

6.3.1 Cash flow excess and shortages

To test the impact of cash flow shortages and excess on investment, firms were grouped based on cash flow levels. In line with Minton and Schrand (1999b), low cash flow firms were considered based on the difference between a firm's operating cash flows for time t and its average historical cash flows for the cumulative previous periods. A negative figure indicates a shortfall position and a positive one will be an excess position. Cash flow variables controled the observed sensitivity of investments to cash flow levels as documented by (Fazzari et al., 1998), Cleary et al., (1991) and KZ (1997).

6.3.2 Test two: Investment and cash flow levels

To control the potential relationship between investment and cash flow levels the following specification was used extending from equation 6.10.

$$INV = \beta_0 \frac{INV_{ic}}{TA}_{t-1} + \alpha_i + c_1 \frac{OPCF_{i,c}}{TA_{i,t,c}} + C_2 OPCF^2{}_{i,c} + c_3 CVCF + c_4 CVCF_{i,c,t} * OPCF_{i,c} + \sum_{i=5,6} c_i CONTROL_i + e_i. \quad (6.12)$$

$OPCF^2{}_{i,c}$ is the square of the operating cash flow value, C_2, C_3, C_i are regression coefficients to be estimated. $CVCF_{i,c,t} * OPCF_{i,c}$ is coefficient of variation of cash flow as defined in equation 5.1 times operating cash flow.

Equation 6.12 includes a continuous measure of firm-adjusted annual operating cash flow ($\frac{OPCF_{i,c}}{TA_{i,t,c}}$). $OPCF^2$is the square of operating cash flow which controls for probable nonlinearities in the relationship between operating cash flow and investment (Minton and Schrand, 1999a). CVCF*OPCF is the interaction between the coefficient of variation of cash flow and operating cash flow which measures the impact of a firm’s cash flow level on the estimated sensitivity of investment to cash flow volatility. The results of equation 6.11 and 6.12 will be compared with equation 6.10 to check the effect of cash flow levels on investment

6.4 Sensitivity analysis

A sensitivity analysis was conducted to determine whether or not the results are affected by financial distress. Financially distressed firms have low cash flow generation capacity and many financial constraints for investment purposes which may exhibit a negative correlation hence they may influence the results. Three separate measures were used to determine financial distress and to ascertain the behaviour of financially distressed and non-distressed firms on investment.

6.4.1 Financial leverage

Firstly, financial leverage was used as measured by long-term debt as a ratio of total assets. In respect of the matching principle of financing, long-term finance is used to finance long-term projects. In this regard, long-term debt captures the dominant role of debt financing in long-term capital expenditure. This accounts for the possibility of investment sensitivity to financial leverage. The results from this estimation are also compared with the results in equation one to see also the effect of financial leverage on the presence of cash flow volatility. Equation 6.10 was extended to include a measure of leverage. The following specification was estimated:

$$INV = \beta_0 \frac{INV_{i,c,t}}{TA}_{t-1} + \alpha_i + B_1 \frac{OPCF_{i,c,t}}{TA_{i,t,c}} + B_2 CVCF + B_3 \frac{LTD_{i,c,t}}{TA} + \sum_{i=4,5} B_i CONTROL_i + e_i \qquad (6.13)$$

Where INV is a proxy for the discretional investment scaled by the firm's total assets (TA). CVCF is the proxy for cash flow volatility. Fixed effects at the firm level α_i, was included also which captures firm-specific characteristics, country fixed effects, $\frac{LTD_{i,ct}}{TA}$ *is a proxy for financial leverage,* $B_1 - B_n$ *are the regression model coefficients to be estimated.*
$c_i\, CONTROL_i$ $a\ vestor\ of\ control\ variables\ and$ e_i *is the error term.*

6.4.2 Interest coverage ratio

Interest coverage ratio (ICR) was also used to ascertain financially non-constrained firms. Interest coverage is a ration of the firm's earnings and interest expense. ICR shows how easily a firm pays its interest from realized earnings. This measure is motivated by the fact that financially constrained or distressed firms are mostly likely to have challenges in paying their interest expenses smoothly. With regard to the ICR, firms are defined as financial constrained if they generate less earnings than the interest payable. In other words, they are paying more interest than what they are generating in the form of earnings. Hence firms with an interest coverage ratio less than one are regarded as financially constrained. Financially constrained firms were excluded from the analysis to ascertain if the results are or are not driven by financial constraints.

$$ICR = \frac{EBIT_{i,t}}{I_{i,t}}$$

$EBIT_{i,t}$ is earnings before interest and tax of firm i at time t, $I_{i,t}$ is the interest expense payed by the firm at time t.

To examine the variances on the impact of cash flow volatility on financially nonconstrained firms, the study followed Aivazian et al., (2005). Extending from equation 6.10 to include a dummy variable for non-constrained firms to interact with cash flow volatility, the following specification was used to examine the effects of financial constraint on investment.

$$\frac{Inv_{ic}}{TA} = \beta_0 \frac{Inv_{ic}}{TA}_{t-1} + \alpha_{c,t} + \beta_1 CVCF_{ic} + \beta_2 \Re * CVCF_{ic} \sum_{i=2,3} \beta_{ic} CONTROL_{ic} + e_{i.c} \quad (6.14)$$

Where, $\Re$ is a dummy variable = 1 if ICR >1, and 0 otherwise. $\Re$*CFVF has been added to the regression. Hence, for firms with ICR >1, the coefficient for volatility will be $\beta_1 + \beta_2$. $CONTROL_{ic}$ is a vector of other control variables that explains investment (size growth opportunities and investment).

6.4.3 Fixed assets growth

Financially distressed firms have negative growth in fixed assets since they will be disposing their fixed assets to pay off their debts and other operational expenses. We also used fixed assets growth as a proxy for financial distress. Firms with a negative growth in fixed assets were classified as financially distressed and were excluded from the analysis. Equation 6.10 was then re-estimated excluding financially constrained firms.

6.5 Cash flow volatility and growth opportunities

High growth firms are theoretically known for high retention levels associated with high investment levels Kester, 1984). The cash flow of these firms is expected to vary more since they are still in the growth phase and they have higher risks from many investment opportunities they may undertake. The impact of cash flow volatility on high growth firms is also examined. Firms were also separated into high and low growth firms. High growth firms are defined as those firms with Tobin's Q greater than 1. Following financial literature, high growth firms were defined as those firms with Tobin's Q greater than 1. Firms with Tobin's Q > 1 have more investment opportunities, higher market values and may generate higher cash flows from their profitable investment prospects. Hence their cash flows are different from low growth firms with no growth opportunities. This analysis will enable us to determine if the effects of cash flow volatilities are or are not influenced by the growth opportunities that firms face.

To examine the variances on the impact of cash flow volatility on high- and low-growth opportunity firms, the study followed Aivazian et al., (2005). Extending from equation 6.10 to include a dummy variable for high- and low-growth firms to interact with cash flow volatility specifically the following model was estimated.

$$\frac{Inv_{ic}}{TA} = \beta_0 \frac{Inv_{ic}}{TA}_{t-1} + \alpha_{c,t} + \beta_1 CVCF_{ic} + \beta_1 ∲ * CVCF_{ic} \sum_{i=2,3} \beta_{ic} CONTROL_{ic} + e_{i.c} \qquad (6.15)$$

*Where, ∲ is a dummy variable = 1 if Tobin's Q >1, and 0 otherwise.∲ *CFVF has been added to the regression. Hence, for firms with Tobin's Q >1, the coefficient for volatility will be* $\beta_1 + \beta_2$. $CONTROL_{ic}$*is a vector of other control variables that explains investment (size, growth opportunities)*

6.6 Empirical results

6.6.1 Description of variables

Table 6-2 Description of variables

VARIABLE	DESCRIPTION
CFV2	Cash flow volatility as measured by EWMA
CFV	Cash flow volatility as measured by the coefficient of variation of cash flow
INVESTMENT	Discretional Investment as measured by capital expenditures
$\boldsymbol{OPCF_{i,c,t}/TA_{i,c,}}$	Operating Cash flow
CF2	Operating Cash flow square
CFXCFV2	Cash flow sensitivity of cash (cash flow multiplied by its volatility)
CFSHORT	Cash shortages
CFEXCESS	Cash excess
$\boldsymbol{Sales_{i,c,t}/TA_{i,c,}}$	Sales growth a proxy for growth opportunities and size
Q	Market to book ratio a proxy for growth opportunities
$\boldsymbol{LTD_{\ i,c,t}/TA_{i,c,}}$	Leverage (long-term debt to total assets ratio)
NON-DISTRESS	Non-distressed firms measured using ICR, FA GROWTH,
HIGH GROWTH	High growth firms as measured by the Tobin's Q

6.6.2 Summary Statistics.

Firm's financial information, investment, cash flow and other control variables were collected from Bloomberg online database. All African non-financial firms were used to avoid selection bias. The methodology used requires estimation of equations in first differences and lagging of regressors twice or more. To allow for the instrumentation processes and first differencing, at least three cross-sectional observations are needed hence only firms with at least 4-years of financial reported data were selected. The study accessed 13800 observations from an unbalanced panel data of 680 non-financial African firms gathered over a period of 20 years from 1996 to 2015.

Table 6-3 shows the descriptive statistics of investment, cash flows and other control variables. The inspection reveals that there is more variation on realised cash flow volatility (CFV) measured by the coefficient of variation of cash flows as shown by a very high standard deviation (114.16) relative to the mean which is only 2.36. There is less variation of cash flow volatility CFV2 measured by the exponentially weighted moving average (EWMA) this is because of the smoothing effect of the calculation methodology. The variation in cash flow in Africa can be explained by uncertainties in the business cycle operating environment, economic instability, technological hindrances and political unrest. The descriptive statistics also show that there is high variation in cash flow. The standard deviation of cash flow (0.1218) is one-and-half times above the mean (0.1009), indicating the high variation of cash flow in African firms.

Table6-3 Descriptive statistics

VARIABLE	DESCRIPTION	MEAN	SD	25%	MEDIAN	75%
CFV2	Cash flow volatility EWMA	0.2595	0.3512	0.0411	0.1273	0.3236
CFV	Cash flow volatility CV	2.3631	114.1612	0.1280	0.3734	0.8084
INVSTNET	Tangible Investment	0.2217	0.2599	0.0617	0.1517	0.2931
$\boldsymbol{OPCF2_{i,c,t}}$	Operating Cash flow	0.1009	0.1218	0.0328	0.0959	0.1757
CF2	Operating Cash flow square	.02690	0.0420	0.0025	0.0109	0.0322
CFXCFV2	Cash flow sensitivity of cash	0.0234	0.0536	0.0014	0.0087	0.2818
CFSHORT	Cash shortages	-0.2986	0.6850	-0.3085	-0.1321	-0.0155
CFEXCESS	Cash excess	0.0395	0.2766	0.0000	0.0000	0.0000
SALE	Sales	1.0941	0.7275	0.5847	0.9544	1.4174
Q	Growth opportunities	1.5070	0.8056	0.9498	1.2512	1.8096
LeverageB	Leverage (long term debt)	0.1220	0.1220	0.0258	0.0855	0.1775
NONDISTRESS	Non-distressed firms	0.2073	0.3155	0.0094	0.0835	0.2468
HIGHGROWTHB	High growth firms	0.2489	0.3328	0.0408	0.1232	0.3105

Source: Authors calculations based on data obtained from Bloomberg

The Table provides descriptive statistics of dependent and the explanatory variables of the sample firms for the 20-year period between 1996 to 2015 for listed African firms.

Table6-4 Within and between statistics for the main model variables.

Variable		Mean	Std. Dev.	Min	Max	Observations
Investment	overall	0.2173	0.2420	-0.1903	2.4228	N = 5945
	between		0.1654	-0.1015	1.2083	n = 661
	within		0.1975	-0.4560	2.2471	T-bar = 8.9
CFV	overall	2.4008	115.2103	-474.0277	8651.5980	N = 5836
	between		48.8655	-155.3264	1235.9620	n = 665
	within		106.6980	-1234.6760	7418.0370	T-bar = 8.8

Source: Own calculations based on sample data.

Table 6-4 reports the descriptive statistics within and between the sample firms. Inspection of the data reveals that more variation of cash flow volatility is within firms (106.698 standard deviation) than between firms (48.8655). This implies that African firms' cash flow varies more within an individual firm over time than between firms. The data also shows that there is more variation of investment levels within individual firms than between firms as shown by a higher standard deviation within firms of 0.1975 as compared to between firms of 0.165 Investment adjustment is greater within individual firms than across firms. As expected the statistics show that high growth and non-distressed firms have a lower volatility of cash flow than the overall sample of firms which included distressed and low growth firms.

6.6.3 Cash flow volatility and investment trend analysis

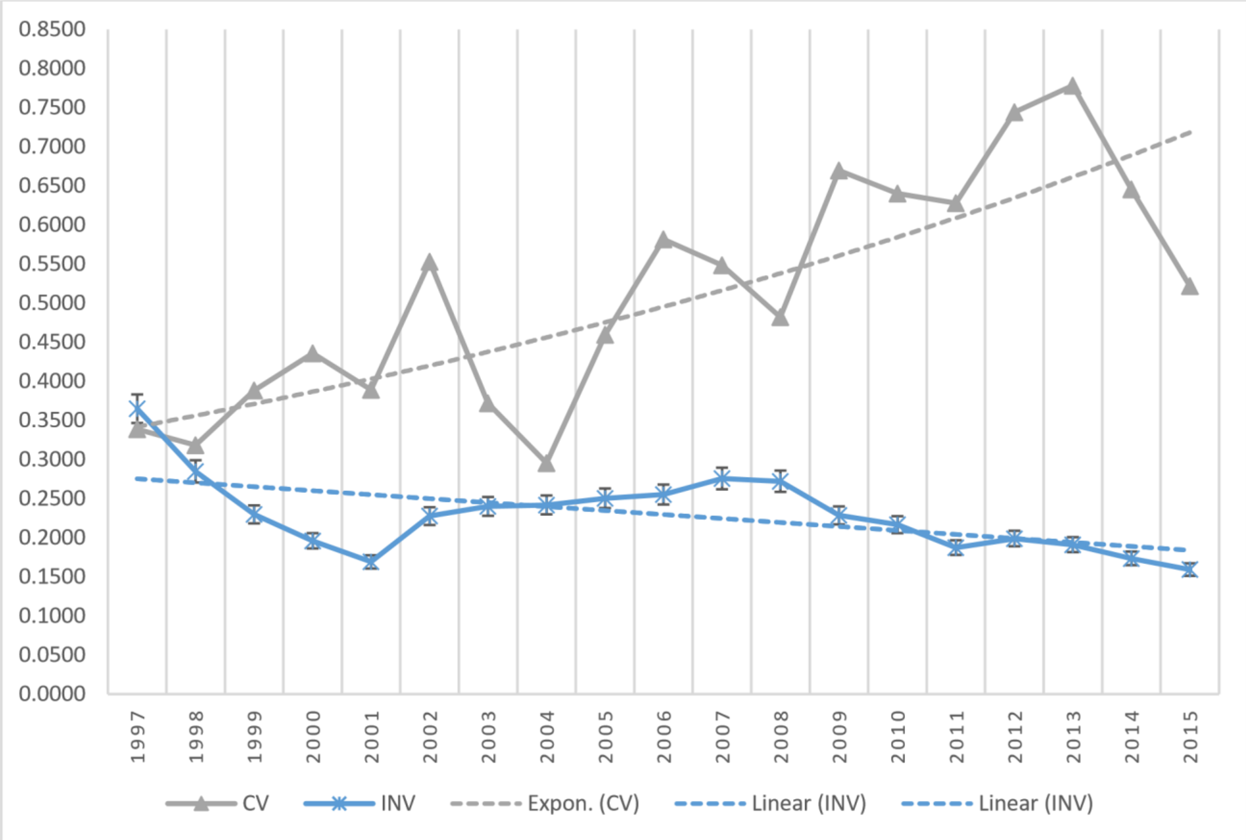


Figure 6-2 Cash flow volatility (CFCV) and investment trends

Source Raw data

Figure 6-2 shows investment and cash flow volatility trends of listed African non-financial firms for the period 1996-2015. Cash flow volatility as measured by the coefficient of variation of cash flows (CFV). The trend reveals that there is less variation in investment trends in African firms and there is a notable decline in investment levels over the sample period as shown by the negative gradient on the trend line. The figure shows that from 1996 investment levels in Africa were declining up until 2000, from then there is a notable constant increase in investment levels for the period 2002-2007. This was probably due to the effects of globalisation, new foreign direct investment, capital injection and adoption of new technologies in Africa which have seen the region being the highest destination of FDI during this period.

A notable decline is seen from 2008 and this can be explained by the global financial crises. Since then African firms' investments have not yet recovered from the financial crisis effects coupled with other region's peculiar effects as shown by a declining trend in investment. Figure 6-2 also shows that there is more variation and randomness of cash flow volatility over time. Figure 6-3 gives the investment and cash flow volatility trend as measured by the exponentially weighted moving average in cash flow variations. There is less variation of cash flow volatility with this measure as shown by Figure 6-3. The smoothing effect in the calculation of variation with this measure reduces the randomness. From both measures in Figure 6-2 and Figure 6-3,there is a notable general increase in variation of cash flow of listed African firms over time. This attests to a general increase in uncertainty and randomness of cash flow generated by African firms and a general decline in fixed asset investment for these firms.

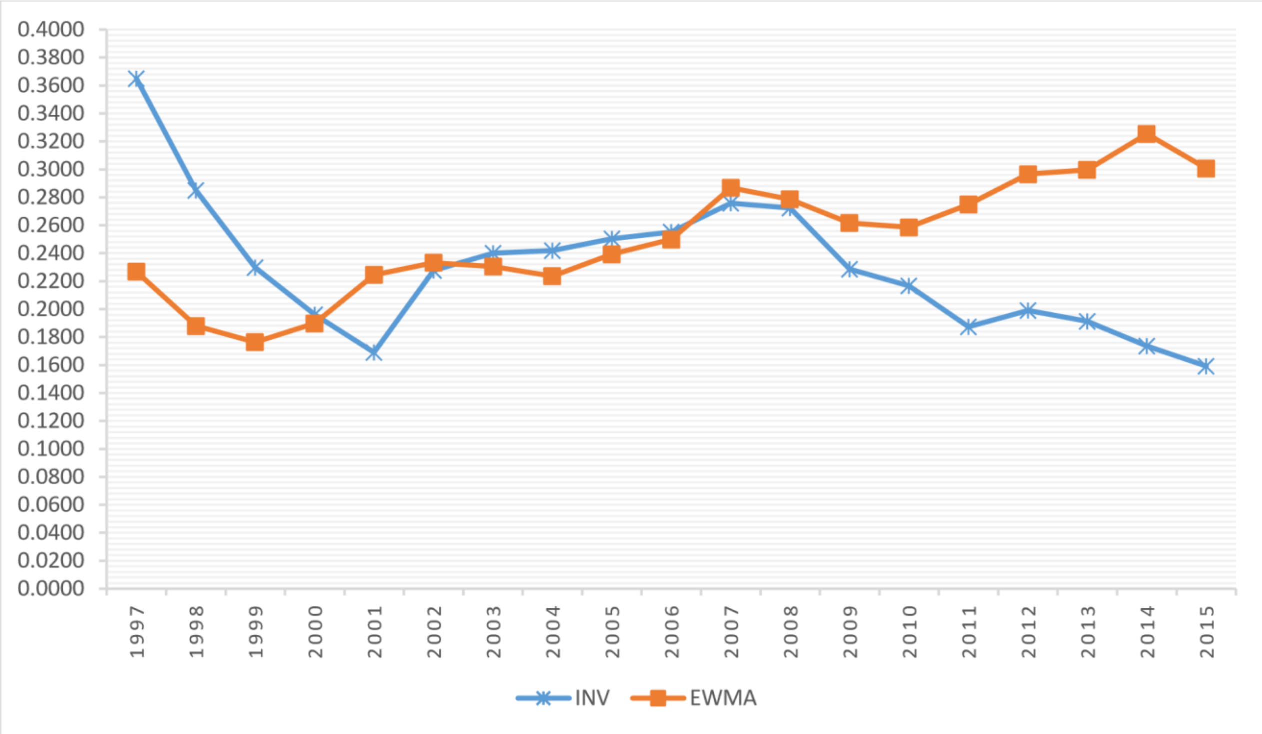


Figure 6-3 Cash flow volatility (EWMA) and investment trend

Source: Own calculations based on raw data

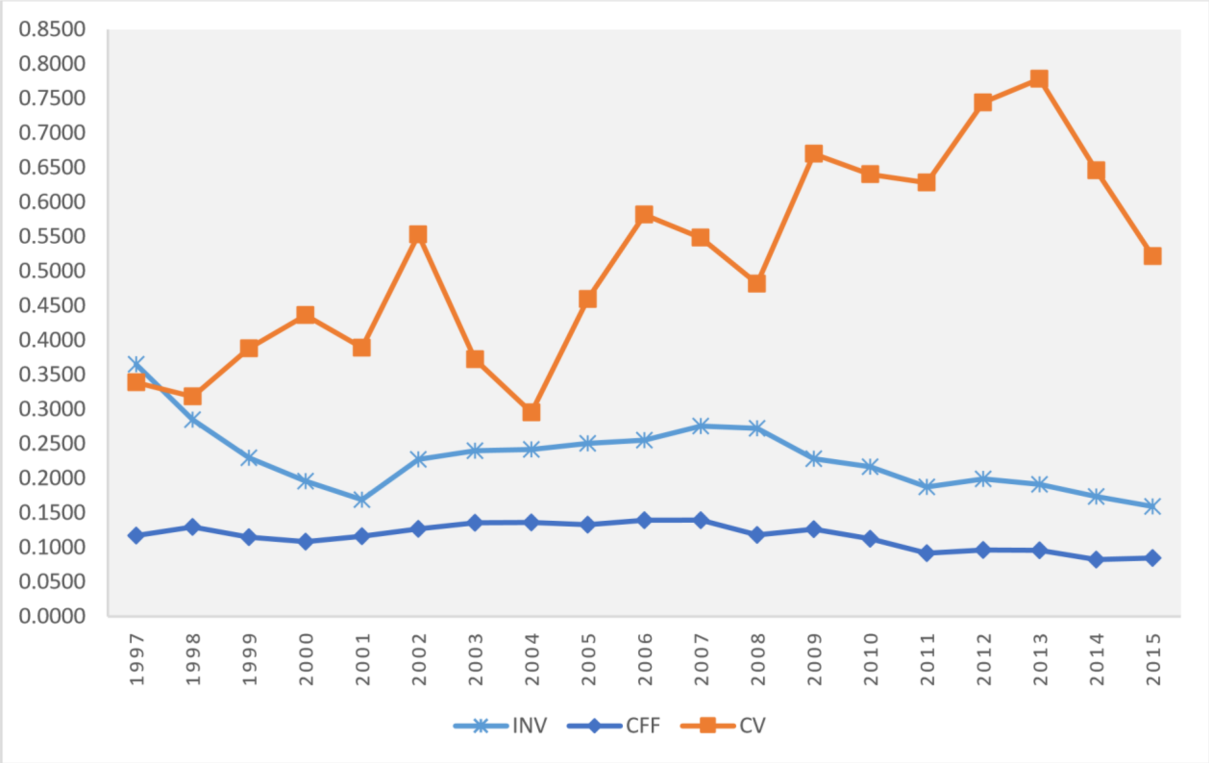


Figure 6-4 Cash flow, cash flow volatility and investment trends

Source: Raw data

Figure 6-2 displays investments, cash flow and cash flow volatility trends over time. The trend reveals also a decline in cash flow levels within the sample period. The evolution of cash flow volatility is random depicting a stochastic trend. The random trend in cash flow volatility is associated with a decline in investment and cash flow levels. It can be noted from the graph that the levels of volatility and the trend is increasing over time associated with a gentle decline in cash flows and investment levels. The possible explanation for the decline in investment levels is that as cash flow becomes more uncertain, firms tend to hold more cash for precautionary purposes and they reduce their long-term investments. African firms' investments are not generating stable cash flows which might also be causing too much volatility of cash flows and hence a reduction in investments. The gradient of investment trend line is higher than that of cash flows this indicates that a small percentage change in cash flows and its volatility results in a wider margin change in investment levels by African firms. There is a possible existence of the convexity effect. A small decline in cash flow levels, resulting in an increase in volatility, leads to a higher percentage decline in investment levels. Hence proper risk management practices should be put in place to ensure the stability of cash flow and attain sustained investment levels.

6.6.4 Correlation analysis

Table6-5 Correlation matrix

	Investment	CFV2	CFV	CF	CF SHORT	CFEXCESS	Sale
Investment	1						
CFV2	-0.055*	1					
	0.0001						
CFV	-0.0144	-0.0009	1				
	0.2976	0.9449					
CF	0.1865*	-0.1347*	-0.0141	1			
	0.0000	0.000	0.2947				
CFSHORT	-0.179*	-0.0352*	0.0037	-0.060*	1		
	0.0000	0.0078	0.7854	0.0000			
CFEXCESS	0.0618*	0.0358*	-0.0035	-0.059*	0.0623*	1	
	0.0000	0.0068	0.7951	0.0000	0.0000		
Sale	0.2033*	0.0009	-0.014	0.1401*	-0.1542*	0.0037	1
	0.0000	0.9444	0.2804	0.0000	0.0000	0.0541	
TobinQ	0.1827*	-0.0708*	-0.0174	0.3543*	0.1178*	-0.0027	0.1154*
	0.0000	0.0000	0.196	0.0000	0.0000	0.0894	0.0000

Source: Own calculations based on sample data

*CFV cash flow volatility EWMA measure, CFV volatility measured by the coefficient of variation, CF operating cash flow * statistically significant.*

Table 6-5 reports the correlation matrix of the response variables and investment. The correlations are included to check for multicollinearity. A correlation above 0.8 between independent variables is an indication of the presence of multicollinearity. From the table above the highest correlation is 0.37 between cash flow and Tobin's Q. All the values are below 0.5 which proves the absence of multicollinearity among the independent variables. The correlation table gives pre-evidence of a negative correlation between investment and cash flow volatility for all measures of cash flow volatility. There is a statistically significant negative correlation between investment and cash flow volatility. Firms with too volatile a cash flow tend to invest less. Pre-analysis of the data from the table also shows a statistically significant negative relationship between cash flow shortages and investment, and a positive relationship between excess cash and investment. African firms experiencing cash flow shortages have less investment ratios and firms with excess cash flow invest more. There is a significant negative correlation between cash flow volatility and operating cash flow. Sales and growth opportunities as expected has also a positive relationship with investment. In line with our previous analysis leverage has also a negative impact on investment.

6.6.5 Regression results

Table6-6 Dynamic panel-data estimation, cash flow volatility and discretional investment

	VOLATILTY= EWMA		VOLATILITY=COEFFICIENT OF VARIATION	
	Difference GMM	*System GMM*	*Difference GMM*	*System GMM*
L.investment	0.199***	0.269***	0.351***	0.430***
	(-0.0721)	(-0.0517)	(-0.0097)	(-0.00888)
$CFV2_{i,c,t}$	-0.203***	-0.0541**		
	(-0.0516)	(-0.0223)		
$Sales_{i,c,t}/TA_{i,c,}$	0.0765**	0.0909***	0.121***	0.0731***
	(-0.0359)	(-0.0105)	(-0.00859)	(-0.00313)
$Q_{i,c,t}$	0.0682***	0.0363***	0.0384***	0.0170***
	(-0.018)	(-0.00897)	(-0.00423)	(-0.00248)
$CFV_{i,c,t}$			-0.00309***	-0.00211***
			(-0.000275)	(-0.00035)
Observations	3,546	4,138	3,593	4,192
Number of id	543	592	550	599
Instruments	173	382	217	230
AR(2)	0.643	0.37	0.191	0.128
Hansen test	0.337	0.365	0.264	0.077

This table provides dynamic panel data regression results of cash flow volatility on investment on African publicly traded firms. Two estimation techniques were used (Difference and System GMM) and two different measures of cash flow volatility (CFV and CFV2), L.investment is the lagged dependent variable. standard errors are provided in parenthesis below the coefficients estimates. AR (2) is used to test for serial autocorrelation and the Hansen test is used to test for over-identification of instruments.
*,**,*** *Significant at the 10%,5% and 1% level respectively*

Table 6-6presents the regression output of the investment model given in Equation 6.10. We used two GMM estimation techniques to estimate our model: the two-step difference and system GMM with orthogonal deviations option which handles unbalanced panel data. Two measures of volatility were used, the coefficient of variation on the historic cash flows and the

EWMA technique. The coefficient of variation reduces the mechanical relationship between volatility and cash flow levels.

The EWMA predicts the innovations in volatility by weighing more recent levels and considers the fact that recent changes in cash flow levels are more relevant. System GMM uses the levels equation together with the AB type orthogonality conditions to obtain a system of equations in levels and the other differenced. The second equation provides additional instruments and increases efficiency (Blundell and Bond, 1998). Instruments for orthogonal deviations equations used are: for standard forward orthogonal deviations (FOD), Cash flow volatility and time dummies. For the GMM type (those assumed to be endogenous) investment, CFXCFV, Tobin Q sales were used. For the levels equations, cash flows and cash flow volatility were used as additional instruments to the orthogonal equation instruments.

The coefficients of $CFV2_{i,c,t}$ (EWMA) and $CFV_{i,c,t}$ (coefficient of variation of cash flows) are negative and statistically significant at one per cent significance level. These results provide evidence that there is a negative relationship between cash flow volatility and investment at ninety per cent confidence level. Variation of cash flows has a significant adverse effect on investment in African firms. This is in line with risk management theories which suggest that smooth cash flow creates value for firms (Froot et al., 1993b). From the risk management theories perspective firms that can smoothen their cash flow reduce costs from external financing and hence add value to the firm. Minton and Schrand (1999b) also confirm that cash flow volatility increases the need for external financing and increases the cost associated with internal financing affecting a firm's investment policy.(Shapiro and Tituman ,1986), Lessard (1990), Geczy et al., (1997) and Tufano (1996) in the context of risk management found that active firms in risk management have more benefits from reducing cash flow sensitivity. Those firms experiencing high volatility in cash flow will experience higher financing costs lowering the NPV of its investments. Thus, cash flow stability is valuable to a firm's investment. From the perspective of cash holding and cash sensitivity Opler et al., (1999), indicate that firms with higher cash flow experience higher cash holdings and the volatility in cash flow will lead to higher precautionary needs and increase cash holdings. In this regard, an increase in cash holdings would mean a reduction in investment since cash holding and investment are not interdependent decisions. More cash holdings will mean less investment so if cash flow volatility leads to more cash holding then a reduction in investment will result

The results are consistent with Minton's (1999) study in the United States of America. He also found that volatility is associated with lower investment. Indirectly, George Allayannis (2005) on the study on earnings volatility, cash flow volatility and firm value in firms on Compustat found evidence that investors negatively value the volatility in cash flow and a negative relation between cash flow volatility and investment opportunities, as measured by Tobin's Q. As investors value negatively, the volatility of cash flows this will reduce liquidity, increase the cost of accessing external finance thus negatively impacting on firm investment. Using firms in the United States of America, Booth and Sean Cleary (2006) analysed cash flow volatility financial slack and investment decisions in the presence of market imperfections, which causes distinctions in internal and external financing. They found less correlation between investment and cash flows owing to the construction of a financial slack and strengthening balance sheet by firms should they anticipate any shortages hence less effect on the investment outlays.

6.6.5.1 Economic Impact of regression results

Table 6-6-A reports the economic impacts of cash flow volatility and other explanatory variables on investment. The results show the percentage change on investment per one standard deviation change in the explanatory variable.

Table 6-6-A Economic impact of the regression estimates

	VOLATILITY = EWMA		VOLATILITY = CVCF	
VARIABLE	**Diff GMM**	**SYS GMM**	**DIFF GMM**	**SYS GMM**
$\boldsymbol{CFV2_{i,c,t}}$	-0.2743	-0.0731		
$\boldsymbol{Sales_{i,c,t}/TA_{i,c,}}$	0.2141	0.2544	0.3387	0.2046
$\boldsymbol{Q_{i,c,t}}$	0.2114	0.1125	0.1190	0.0527
$\boldsymbol{CFV_{i,c,t}}$			-1.3572	0.9268

$$\boldsymbol{Economic\ impact = \frac{SD_{EXPLANATORY\ VAR} \times Regression\ Coefficient}{SD_{DEPENDENT\ VAR}}}$$

Source: Own calculations based on regression results.

The negative relationship is robust for the two estimation methodologies the difference and the system GMM and for the two cash flow volatility measures used. The coefficients estimated range from -0.00035 to -0.203 for the two estimation techniques and measures of cash flow variation. The economic impacts of these results are that for one standard deviation change in cash flow volatility investment ratio decreases by -0.0731% to -1.3572% for the four models. The EWMA measure of volatility depicts a higher sensitivity of investment to cash flow variation as shown by higher coefficients (-0.203 and -0.0541 compared to 0.000275 and -0.00035 for the coefficient of variation) and higher impact values -1.3572 per cent to 0.9268 per cent compared to -0.0731 per cent to 0.2743 per cent. The results imply that cash flow volatility is an important determinant of firm investment in African firms. African firms with a more volatile cash flow substantially reduce their investment. The results are in line with our expectations for African firms' due to many uncertainties in African economies business operations become uncertain, which makes cash flow volatile. Firms in such markets will reduce their investment in fear of the unknown and hold more cash and reserves instead of just for precautionary purposes.

In theory, Modigliani and Miller (1959) hypothesize that firm investment should be unrelated to internally generated cash flows. With respect to this, we would expect the volatility of cash flow also to be unrelated to the investment policy. However, we found evidence against this proposition. Cash flow and its volatility has significant information about investment policy embedded in it. The stability of cash flow is an important determinant of investment in Africa. Cash flow is positively correlated to investment, firms that generate more cash flow invest more. On the other hand, the volatility of this cash flow is negatively associated with investment. African firms with unstable cash flow also reduce investment.

The negative impact of cash flow volatility on investment is explained by the fact that high volatility predicts cash flow shortages hence firms will hold more cash to counter the shortage, if firms hold more cash investment is foregone. Alternatively, firms in deficit may borrow from the external financial markets which are costlier, hence affecting investment negatively. The results imply that African firms with higher levels of cash flow uncertainty tend to reduce their investment. African firms should advance their risk management techniques, diversify their portfolios, keep lower leverage levels to maintain sustainable cash flow and to generate stable cash flows for investment purposes. Higher cash flow volatility will call for borrowing from the external financial market, increasing leverage will suppress available cash flow to interest payments constraining investment. Firms should not only be worried about generating more cash flow but the stability of the cash flow has a significant bearing on the investment policy. Stable cash flow generation improves the investment policy of the firm.

Consistent with financial theory, and prior analysis, firm size as proxied by sales growth also has a positive impact on firm investment. As firms generate more sales and expand they tend to invest more. Growth opportunities as measured by Tobin's Q have a significant positive impact on investment, and high-growth firms have high investment ratios implying higher investment levels compared to low growth firms.

6.6.6 Controlling for a possible relationship between investment and cash flow levels

To account for a possible relationship between cash flow levels and investment, an equation 6.11, an augmented version of equation 6.10, was used, which includes a measure of annual operating cash flow scaled by total assets ($OPCF_{i,c,t}$) averaged over the 20-year sample period as cash flow volatility. Following Minton and Schrand (1999) a square of operating cash flow variable ($OPCF^2{}_{i,c,t}$) was included, which controls for possible non linearities between average cash flow levels and investment. Also included is CFXCFV an interaction of cash flow levels and a coefficient of variation which captures the sensitivity of investment to cash flow volatility. Table 6-7 shows that there is a negative correlation between operation cash flows ($OPCF_{i,c,t}$) and EWMA cash flow volatility measure (CFV2) with a correlation coefficient of -0.115 this relation justifies the use of levels variable in the equation for this estimation. The coefficient of variation measure of cash flow volatility accounts for this mechanical relation between levels and volatility by scaling the standard deviation variable by the absolute mean.

Table6-7 Two-step GMM possible relation between investment and cash flow levels

	VOLATILTY= EWMA		VOLATILITY=COEFFICIENT OF VARIATION	
	Difference GMM	*System GMM*	*Difference GMM*	*System GMM*
L.invstnet	0.210***	0.295***	0.233***	0.308***
	(-0.00189)	(-0.00154)	(-0.00356)	(-1.80E-05)
$OPCF_{i,c,t}/TA_{i,c,}$	0.168***	0.107***	0.0573***	0.294***
	(-0.00836)	(-0.00492)	(-0.01640)	(-5.02E-05)
$OPCF2_{i,c,t}$	0.496***	0.405***	1.054***	-0.212***
	(-0.01580)	(-0.0142)	(-0.0537)	(-0.000167)
$CFV2_{i,c,t}$	-0.0197***	-0.0395***		
	(-0.00140)	(-0.000951)		
CFXCFV2	-0.0505***	-0.0324***		
	(-0.00475)	(-0.00517)		
$Sales_{i,c,t}/TA_{i,c,}$	0.0760***	0.0677***	0.0449***	0.0550***
	(-0.00100)	(-0.00049)	(-0.00261)	(-9.16E-06)
$Q_{i,c,t}$	0.0326***	0.0348***	0.0478***	0.0344***
	(-0.00033)	(-0.000434)	(-0.000876)	(-5.39E-06)
$CFV_{i,c,t}$			-0.0100***	-0.00813***
			(-0.000249)	(-9.88E-07)
CFXCFV			-0.0370***	0.0101***
			(-0.00300)	(-1.03E-05)
Observations	3,671	4,267	3,718	4,320
Number of id	549	596	557	602
Instruments	404	349	288	499
AR (2)	0.71	0.316	0.51	0.311
Hansen test	0.449	0.424	0.303	0.99

This table provides dynamic panel data regression results of cash flow volatility on investment on African publicly traded firms controlling for apossible relation between cash flow levels and investment. Two estimation techniques were used (Difference and System GMM) and two different measures of cash flow volatility (CFV and CFV2) OPCF is a measure of operating cash flows, $OPCF^2_{i,c,t}$ is a square of operating cash flows CFXCFV and CFXCV2 are the interactions of volatility and cash flow levels measuring the sensitivity of investment to volatility. Standard errors are provided in parenthesis below the coefficients estimates. AR (2) is used to test for serial auto correlation and the Hansen test is used to test for over-identification of instrument. *, **, *** Significant at the 10%, 5% and 1% level respectively.

Model	Instruments for orthogonal deviation equation		Instruments for levels equation (system GMM)	
	Standard	GMM type	Standard	GMM type
Diff GMM	FOD- CFV, CFV2, years (1996-2015)	Investment, CFXCFV, Tobin's Q CF2 Sale		
Sys GMM	FOD investment, CF2 CFXCFV2 Tobin Q, Sale		CF, 1996-2015	CF2 CFV2, CFXCFV2, Tobin's Q, Sale

Table 6-7 results indicate that African firms' investment levels are sensitive to operating cash flow volatility, and the sensitivity degree is a function of operating cash flow levels. Including a continuous measure of operating cash flow into the model, resulted in the finding that cash flow volatility (for both the measures of volatility CFV and CFV2) has a negative association with investment. This negative relation is a function of cash flow levels as shown by the positive coefficient of cash flow levels ($OPCF_{i,c,t}$) that firms with high cash flow have higher investment levels. The interaction of operating cash flow and cash flow volatility (CFXCVF and CFXCFV2), a measure of the sensitivity of investment to operating cash flow, is negative and significant at the 1 per cent level indicating that the sensitivity of investment to cash flow volatility is stronger as cash flow increases. These results are consistent with Minton and Schrand (1999a) prediction that the influence of volatility is second order relative to the effect of cash flow levels. The negative impact of cash flow volatility on investment is maintained with a regression that controls for the relation between cash flow levels and investment.

6.6.7 Cash flow levels and investment

In the analysis of leverage and investment concurring with most empirical studies, it was found that a positive relationship existed between cash flow and capital expenditure. This reveals that cash flow shortages are associated with lower investment. To establish how African firms, respond to cash flow shortages and excess firstly, capital expenditure of low cash flow firms was examined. In line with Minton and Schrand (1999b), low cash flow firms were considered, based on the difference between a firm's operating cash flow and its average historical cash flow. A negative figure indicates a shortfall position and a positive one will be an excess position.

6.6.8 Cash flow shortfalls

The results in Table 6-8 below indicate that firms experiencing cash flow shortfalls relative to their historical levels are highly sensitive and they have lower levels of investment. Controlling for cash flow shortages in this estimation it was also found that a negative relationship existed between investment and cash flow volatility as shown by the negative coefficients of $CFV2_{i,c,t}$ (EWMA) and $CFV_{i,c,t}$ (coefficient of variation of cash flows). Cash flow is an important determinant of investment. On top of paying attention to improving cash flow, decision-makers should also focus more on cash flow stabilization. All other control variables have the expected signs.

Table 6-8 Dynamic panel estimation controlling for cash flow shortages

	VOLATILTY= EWMA		VOLATILITY=COEFFICIENT OF VARIATION	
	Difference GMM	*System GMM*	*Difference GMM*	*System GMM*
L.investment	0.0311	0.173***	0.208***	0.224***
	(-0.04090)	(-0.04880)	(-0.00080)	(-0.04430)
CFSHORT	-0.0878***	-0.0609***	-0.0574***	-0.0517***
	(-0.02018)	(-0.02270)	(-0.00050)	(-0.01250)
$OPCF_{i,c,t}/TA_{i,c,}$	0.513***	0.212***	0.333***	0.244***
	(-0.09830)	(-0.04110)	(-0.00190)	(-0.03670)
$CFV2_{i,c,t}$	-0.192***	-0.0669***		
	(-0.04408)	(-0.02380)		
$Sales_{i,c,t}/TA_{i,c,}$	0.0599**	0.0820***	0.0680***	0.0650***
	(-0.02790)	(-0.01140)	(-0.00050)	(-0.01070)
$Q_{i,c,t}$	0.0526***	0.0325***	0.0367***	0.0296***
	(-0.01390)	(-0.00970)	(-0.00020)	(-0.00810)
$CFV_{i,c,t}$			-0.00420***	-0.00971**
			(-0.00010)	(-0.00380)
Observations	3671.0000	4267.0000	3718.0000	4320.0000
Number of id	549.0000	596.0000	557.0000	602.0000
Instruments	479.0000	474.0000	399.0000	396.0000
AR (2)	0.1970	0.9450	0.7400	0.6500
Hansen test	0.5980	0.4570	0.2430	0.3660

This table provides dynamic panel data regression results of cash flow volatility on investment on African publicly traded firms controlling for cash flow shortages. For the two different measures of cash flow volatility. CFSHORT measures firms with cash flow shortages. Standard errors are provided in parenthesis below the coefficients estimates. AR (2) is used to test for serial autocorrelation and the Hansen test is used to test for over-identification of instruments.
***, **, *** Significant at the 10%, 5%, 1% level respectively.**

Model	Instruments for orthogonal deviation equation		Instruments for levels equation (system GMM)	
	Standard	GMM type	Standard	GMM type
Diff GMM	Years (1996-2015)	Investment net, CFV2, CFV, Tobin's Q CFSHORT CF Sale		
Sys GMM	YEARS	Investment, CFV2 CFSHORT Tobin Q, Sale	CF, 1996-2015	CFV2, CFSHORT, Tobin's Q, Sale INVST

6.6.9 Cash flow excess

Table6-9 Dynamic panel-data estimation controlling for cash flow excess

	VOLATILTY= EWMA		VOLATILITY=COEFFICIENT OF VAR	
	Difference GMM	*System GMM*	*Difference GMM*	*System GMM*
L.invstnet	0.163***	0.258***	0.202***	0.308***
	(-5.77E-05)	(-0.00021)	(-0.00701)	(-5.14E-05)
CFEXCESS	0.0141***	0.0711***	0.0773***	0.0775***
	(-0.00014)	(-0.00033)	(-0.02870)	(-0.00032)
$OPCF_{i,c,t}/TA_{i,c,}$				
	0.289***	0.229***	0.615***	0.259***
	(-0.00016)	(-9.35E-05)	(-0.02050)	(-9.95E-05)
$CFV2_{i,c,t}$				
	-0.129***	-0.0214***		
	(-6.34E-05)	(-4.98E-05)		
$Sales_{i,c,t}/TA_{i,c,}$				
	0.0660***	0.0820***	0.107***	0.0853***
	(-5.47E-05)	(-2.17E-05)	(-0.00652)	(-3.07E-05)
$Q_{i,c,t}$				
	0.0437***	0.0230***	0.0466***	0.00790***
	(-2.98E-05)	(-5.13E-05)	(-0.00418)	(-2.14E-05)
$CFV_{i,c,t}$				
			-0.00208**	-0.00124***
			(-0.00103)	(-5.95E-06)
Observations	3,671	4,267	3,718	4,320
Number of id	549	596	557	602
Instruments	570	474	269	521
AR (2)	0.9690	0.4550	0.8320	0.3640
Hansen test	0.9840	0.4650	0.5390	0.9830

This table provides two GMM dynamic panel data regression results of cash flow volatility on investment on African publicly traded firms with excess cash flow. CFEXCESS is the variable for firms with excess cash flows. standard errors are provided in parenthesis below the coefficients estimates. AR (2) is used to test for serial autocorrelation and the Hansen test is used to test for over-identification of instruments. *, **, *** Significant at the 10%, 5%, 1% level respectively.

Model	Instruments for orthogonal deviation equation		Instruments for levels equation (system GMM)	
	Standard	GMM type	Standard	GMM type
Diff GMM	FOD years (19962015)	Investment, CFV2, Tobin's Q CFEXCESS CF Sale		
Sys GMM	CF, YEARS	Investment, CFV2 CFEXCESS TQ, Sale	CF, 1996-2015	CFV2 CFEXCESS, Tobin's Q, Sale Investment

The previous analysis provides evidence that cash flow shortages are associated with lower investment. Thus, firms experiencing excess cash flow should invest more. Secondly, firms with excess cash flows are those with higher cash flows relative to their historical averages. Two GMM estimation techniques were used to estimate the model: the two-step difference and system GMM with orthogonal deviations option which handles unbalanced panel data. The coefficient of variation on the historic cash flows $CFV_{i,c,t}$ and the exponentially weighted moving average technique $CFV2_{i,c,t}$were the two measures of volatility used as proxies for the volatility of cash flow. CFEXCESS represents firms with excess cash flow.

The coefficient of CFEXCESS is positive and significant at 1 per cent level. As expected African firms with excess cash flow have higher investment levels. Controlling for firms with excess cash flow, the coefficient of the measures of cash flow volatility are significant and negative. These results also indicate that firms with highly volatile cash flow have low investment levels even when cash flow shortages and excess are controlled for as shown by the analysis in Table 6-8 and Table 6-9 The negative relationship is robust for the two measures of volatility ($CFV2_{i,c,t}$ and $CFV_{i,c,t}$) and the two estimation methodologies used.

A positive relationship between cash flow and investment was found, also firms with excess cash flow invest more and those with cash flow shortages reduce their investment. There is a negative relationship between cash flow volatility and investment. The implication of these findings is that even for firms with excess cash flow, the variability of the cash flow has a constraining effect on investment. Firms generating high cash flow will also reduce investment if the cash flow is not stable. Implying that although African firms may aim at generating high cash flow they should pay attention to minimize uncertainty in the cash flow. Not only cash flow but its stability is key to firm investment in African firms.

6.7 Sensitivity analysis

Table6-10 Controlling for the possibility of financial distress using leverage

	VOLATILTY= EWMA	
	Difference GMM	*System GMM*
L.invstment	0.231***	0.246***
	(-0.05820)	(-9.80E-05)
$OPCF_{i,c,t}/TA_{i,c,}$		
	0.288***	0.213***
	(-0.04440)	(-0.00012)
$CFV2_{i,c,t}$		
	-0.175***	-0.0464***
	(-0.04050)	(-5.83E-05)
$LTD\ _{i,c,t}/TA_{i,c,}$		
	-0.241**	-0.00293***
	(-0.10200)	(-0.00020)
$Sales_{i,c,t}/TA_{i,c,}$		
		0.0808*** (-5.33E-05)
$Q_{i,c,t}$		
	0.0642***	0.0318***
	(-0.01730)	(-2.63E-05)
Observations	2,619	3,109
Number of id	438	494
Instruments	218	284
AR(2)	0.319	0.35
M2 test	0.568	0.472

This Table provides dynamic panel data regression results of cash flow volatility on investment on African publicly traded firms controlling for financial leverage. Leverage is the ratio of long-term debt to total assets. standard errors are provided in parenthesis below the coefficients estimates. AR (2) is used to test for serial autocorrelation and the Hansen test is used to test for over-identification of instruments. *, **, *** Significant at the 10%, 5%, 1% level respectively.

Model	Instruments for orthogonal deviation equation		Instruments for levels equation (system GMM)	
	Standard	GMM type	Standard	GMM type
Difference	FOD CF, years(1996-2015)	Investment, CFV2, Tobin's Q, leverage		
System	CF, Years (19962015)	Investment, CFV2 LEVBB TQ, Sale	CF, 1996-2015	CFV2 LEVEBB, Tobin's Q, Sale INVST

A sensitivity analysis was conducted to determine whether or not the results are affected by financial distress. The results in model one under chapter two suggest that financial distress is correlated with investment decision. This is shown by the negative relationship between leverage and investment. Also, cash flow volatility and cash flow levels are potentially correlated to financial distress probability. Included in model 6.13 was firm leverage as a proxy for financial distress. Leverage is measured as the ratio of long-term debt to total assets.

Fazzari et al., (1988) document that the sensitivity of cash flow should be higher for financially constrained firms. This brings in internal and external financing. (Chikan et al., 2005) suggest that firms rely on external financial markets when there are low informational asymmetries. Almedia (2004) indicates that unstrained firms have less cash to cash flow volatility compared to constrained firms. Acharya (2006) developing from Almedia's idea added investment opportunities and found an inverse relationship.

Consistent with the results in the model was the empirical prediction that highly leveraged firms on average invest less (Ahn et al., 2006, Aivazian et al., 2005, Lang et al., 1996a). As shown in Table 6-10 the coefficient of leverage is also negative and significant at 1 per cent level. Controlling for the possibilities of financial distress the significance of the association between investment and cash flow volatility holds. The possibility of financial distress cannot explain away the negative relationship between cash flow volatility and investment.

6.7.2 Financially distressed firms (Interest coverage ratio)

Financially constrained firms are identified and eliminated. Table 6-11 shows the results of model 6.14 estimated to exclude financially constrained firms. Following literature financially constrained firms are considered to be those firms with an interest coverage ratio

(ICR) of less than 1. As shown inTable 43 the coefficients of $D * CVCF_{ic}$ and $CVCF_{ic}$ are negative and significant at 1 per cent level. This implies that the negative relation between cash flow volatility and investment is maintained even for financially non-constrained firms.

Table6-11 Controlling for the possibility of financial distress using ICR

	VOLATILTY= EWMA		VOLATILITY=COEFFICIENT OF VAR	
	Difference GMM	*System GMM*	*Difference GMM*	*System GMM*
L.invstnet	0.210***	0.272***	0.240***	0.316***
	-0.0578	-0.0488	-0.00167	-1.78E-05
$OPCF_{i,c,t}/TA_{i,c,}$				
	0.342***	0.226***	0.746***	0.313***
	-0.0456	-0.0375	-0.00293	-8.80E-05
$D * CVCF_{ic}$	-0.160***	-0.0633**		
	-0.0531	-0.0311		
$Sales_{i,c,t}/TA_{i,c,}$				
		0.0806***		0.0829***
		-0.0108		-7.69E-06
$Q_{i,c,t}$				
	0.0514***	0.0288***	0.0234***	0.00193***
	-0.0183	-0.00903	-0.000722	-9.72E-06
$CVCF_{ic}$			-0.00950***	-0.00479***
			-7.30E-05	-9.31E-07
Observations	3,240	3,796	3,285	3,849
Number of id	514	560	518	567
Instruments	232.00	383.00	325.00	456.00
AR(2)	0.929	0.760	0.985	0.656
M2 test	0.376	0.600	0.339	0.847

*This table provides dynamic the two GMM panel data regression results of cash flow volatility on investment on African publicly traded firms controlling for financial distress using the Interest coverage ratio. D*CFCV is the interaction of the ICR and the volatility representing non-constrained firms. Standard errors are provided in parenthesis below the coefficients estimates. AR (2) is used to test for serial autocorrelation and the Hansen test is used to test for over-identification.*

*, **, *** Significant at the 10%, 5%, 1% level respectively.

Model	Instruments for orthogonal deviation equation		Instruments for levels equation (system GMM)	
	Standard	GMM type	Standard	GMM type
Difference	FOD years (19962015)	Investment, nondistress Tobin's Q		
System	FOD CF, YEARS	Investment, NONDISTRSS TQ, Sale	CF, 1996-2015	Investment Tobin's Q, Sale, nondistress

6.7.3 Financially constrained firms (Fixed assets growth)

Table6-12 Controlling for the possibility of financial distress using fixed assets growth

	VOLATILTY= EWMA	
	Difference GMM	***System GMM***
L.investment	0.222***	0.330***
	(-0.04740)	(-0.04540)
$OPCF_{i,c,t}/TA_{i,c,}$		
	0.215***	0.255***
	(-0.03790)	(-0.03410)
$CFV_{i,c,t}$		
	-0.125***	-0.0165***
	(-0.02600)	(-0.00604)
NONDISS	0.140***	
	(-0.02760)	
$Sales_{i,c,t}/TA_{i,c,}$		
	0.0875***	0.0704***
	(-0.01020)	(-0.0093)
$Q_{i,c,t}$		
	0.0274***	0.0161**
	(-0.00877)	(-0.00784)
NONDISS1		0.0257***
		(-0.00719)
Observations	4,256	4,309
Number of id	596	602
Instruments	474	389
AR(2)	0.686	0.318
M2 test	0.526	0.35

NONDISS is a measure of financial distress using fixed assets growth. AR (2) is used to test for serial autocorrelation and the Hansen test is used to test for over-identification of *instruments.* Significant at the 10% level, ** Significant at the 5% level*** Significant at the 1% level*

Following KZ (1997) average asset growth over the 20-year period was used to eliminate distressed firms. Firms with a negative average asset growth are considered financially distressed. The results from Table 6-12 also indicate that the negative relationship between cash flow volatility and investment still exist. Thus, financially distressed firms do not appear to drive the results.

6.8. Cash flow volatility and growth opportunities.

The comprehensive analysis shows that there is a negative relationship between cash flow volatility and investment decisions for African firms. High growth firms are theoretically known for high retention levels associated with high investment levels. Cash flow in these firms is expected to vary more since they are still in the growth phase and they have higher risks from many investment opportunities they may undertake. The impact of cash flow volatility on high growth firms was also examined. To examine the variances on the impact of cash flow volatility on high- and low-growth opportunity firms, Aivazian et al. (2005) were followed. Extending from Equation 6.10 to include a dummy variable for high- and low-growth firms to interact with cash flow volatility. Following financial literature, high growth firms were be measured as those firms with Tobin's Q greater than 1.

The results in Table 6-13 indicate that the coefficient of high growth firm's cash flow volatility is negative and significant at one per cent level. This shows that the negative relationship between cash flow volatility and investment decisions cannot be explained away by the growth opportunities faced by a firm. The negative relationship between cash flow volatility and investment is still evident even for high growth firms. Considering the elements of corporate cash holdings Ferreira and Vilela (2004) found that firms with more investment opportunities hold more cash and generate higher cash flow than firms with lower investment opportunities.

The interpretation of the results is that the volatility of cash flow leads to lower investment. However, another different explanation is that investment levels produce different volatilities in cash flow because of the nature of the investments. This is a possible causality relation between volatility and investment. Results are consistent with the findings. There is a low correlation between cash flow volatility and the proxy for growth, as suggested by Minton and Schrand (1999a) a strong and positive correlation should be expected if investment determines cash flow volatility. Over the sample period, the correlation coefficient between cash flow volatility and the proxies for growth opportunities (Tobin's Q and sales) are between -0.0162 to 0.045 for sales and Tobin's Q for both measures of leverage. Thus, the causality does not work in the other direction. Investment levels cannot explain cash flow volatilities but rather cash flow volatilities explain investment levels.

Table 6-13 High growth firms and cash flow volatility

	VOLATILTY= EWMA		**VOLATILITY=COEFFICIENT OF VAR**	
	Difference GMM	***System GMM***	***Difference GMM***	***System GMM***
L.investment	0.0709***	0.214***	0.153***	0.222***
	-2.16E-05	-9.14E-05	-0.000113	-8.26E-05
High-growthB	-0.306***	-0.027***		
	-0.000276	-0.000151		
OPCF	0.345***	0.372***	0.528***	0.368***
	-0.000388	-0.000349	-0.000141	-0.000286
Sales	0.0845***	0.108***	0.0924***	0.105***
	-9.06E-05	-5.76E-05	-5.05E-05	-6.06E-05
Q	0.0236***	0.0032***	0.00461***	-0.0075***
	-3.67E-05	-2.01E-05	-3.63E-05	-2.74E-05
High-growthC			-0.00308***	-0.001***
			-5.58E-06	-8.73E-06
Observations	2,432	2,942	2,455	2,971
Number of id	431	510	436	516
Instruments	402	473	402	365
AR(2)	0.284	0.975	0.533	0.942
M2 test	0.832	0.981	0.857	0.42

This table provides dynamic panel data estimation results of cash flow volatility on investment on African publicly traded high growth firms. High-growthB is an interaction of high growth firms and the two measures of volatility. standard errors are provided in parenthesis below the coefficients estimates. AR (2) is used to test for serial autocorrelation and the Hansen test is used to test for over-identification of instrument. Significant at the 10% level. ** Significant at the 5% level.*** Significant at the 1% level*

Model	Instruments for orthogonal deviation equation		Instruments for levels equation (system GMM)	
	Standard	GMM type	Standard	GMM type
Diff GMM	FOD years (19962015)	Investment, Tobin's Q, high-growth, CF Sale		
Sys GMM	FOD CF, YEARS	Investment, TQ highgrowth, CF Sale	1996-2015	Investment, TQ high--growth CF Sale

The third sensitivity analysis shows that the results are not affected by cross-sectional variation in growth opportunities. High growth firms were tested and the negative effect remains. The high growth firm analysis supplements the controls for growth in the model based on Tobin's Q and sales. Volatility remains a significant negative determinant of investment.

The estimation technique used controls for the possible bi-directional relationship through the use of a lagged dependent variable and the use of a system of equations with orthogonal deviations together with an instrumental technique. The results are also robust to alternative measures of leverage. The coefficient of variation captures the mechanical relationship between levels and volatility by scaling the standard deviation of the cash flow with the mean absolute value. The other measure emphasises the importance of the current volatility in calculating average volatility and hence captures innovations in volatility levels. The results are qualitatively similar.

A statistically significant negative relationship was found to exist between cash flow volatility and investment for both high and low cash flow firms suggesting that firms with unstable cash flow tend to reduce their investment. This shows that firms with higher variability in cash flow face greater shortages and should become actively involved with the external financial markets. Unstable cash flow will call for issuing debt or equity in the capital markets. The analysis in chapter three shows that the current leverage levels of African firms are constraining investment. Too much debt will suppress the available cash flow to interest payments and thus suppress investment. On the same note, if firms have unstable cash flow to cover up for the shortages they may want to use the equities markets as the analysis shows that there is a positive relationship between stock market liquidity and investment. Firms in need of cash flow can use the stock markets to finance their investment needs. Thus, African firms, in trying to generate higher cash flow, should aim at maintaining the stability of cash flow and rely more on internally generated funds since debt financing commits a firm's cash flow to interest payments. African economies should also invest in improving the liquidity of the stock markets to stimulate investment in these economies.

6.9 Model specification tests

Testing the legitimacy of instruments and model specification is crucial in dynamic panel data analysis. Using a dynamic estimation method controls for endogeneity and heteroscedasticity, however, the differenced equations can produce serial correlation (Baum, 2013). The AB AR (2) test was used to test for the existence of second-order autocorrelation. In all the models, the AR (2) test is above 5 per cent hence the existence of autocorrelation of order 2 is rejected. The moment conditions should be tested for over-identification (Roodman, 2006), the Hansen-Sargan test as reported in all the models provide evidence of correct identification of instruments. The coefficient of the lagged dependent variable is also less than one which is consistent with dynamic stability. These attest to correct specification of the models.

6.10 Summary and conclusions

The purpose of this chapter was to analyse the impact of cash flow volatility on discretional investment. Investment was defined as the ratio of capital expenditure to total assets. Two different measures of cash flow volatility were used, the standard deviation of historical cash flow and the exponentially weighted average technique. The exponentially weighted average is forward-looking in nature and it captures innovations in cash flow volatilities. The coefficient of variation captures the mechanical effect of the possible relation between cash flow levels and volatility by scaling the standard deviation of cash flow with an absolute mean of the cash flow (Minton and Schrand, 1999a). Two estimation techniques were used for robustness of the results the difference GMM and the system GMM. The system GMM is superior in providing additional instruments for the levels equations together with the orthogonal deviations and it improves the estimation efficiency.

This analysis provides direct African evidence that volatility of cash flow is associated with lower average investment levels in capital expenditure. The volatility of cash flow remains a significant negative determinant of investment even after controlling for possible financial distress, availability of internal funds and growth opportunities. Firms should consider the effects of volatility in their risk management decisions. African firms should trade off the effects of managing volatility and the resulting negative impact of cash flow volatility on investment levels. This research shows that not only cash flows are an important determinant of investment decisions, but the variability of the cash flows also has a significant bearing on the investment levels of African firms. Cash flow risk as measured by volatility was found to lead to lower investment even for firms with excess cash flow hence African firms should not only focus on those strategies to improve cash flow levels, but they should also aim to maintain the stability and reduce the volatility of the cash flow at any given level of operation. The next chapter presents the summary and implications of the study.

CHAPTER 7

Summary, conclusions, and implications

7.0 Introduction

The previous chapters analysed listed African firm's investment behaviour in relation to leverage, liquidity and cash flow volatility. This last chapter of the study summarises and presents conclusions drawn from the study. The chapter aims to:

(1) summarise and conclude how the conservative use of leverage by African firms is impacting on investment, the effects of investment tangibility on African firm's investment, the impact of stock market liquidity on investment decisions and the influence of cash flow volatility on investment decisions;

(2) to indicate the implication of the research findings to financial practitioners, investors and policymakers on the best practice for value creation; and

(3) suggest areas of further research.

Summary of findings

7.1.1 Summary on leverage and investment

The aim of this section was to analyse how the conservative use of leverage by African nonfinancial listed firms is impacting on investment decisions. The analysis was motivated by the observation that African firms use leverage conservatively compared to their developed nations compatriots. On the same note, the leverage levels were noted to be rising, however, investment is stagnant in Africa which is a cause for concern in the global economy. The study sought to find out how these developments are influencing the investment policies of African firms. Most studies that have been done on investment are concentrated on investment at the aggregate level, however, the few studies that analyse firm investment and leverage are predominantly based on developed economies.

The study sample consisted of 815 non-financial firms in 22 African stock markets studied over a period of 20 years from 1996 to 2015. The study employed an unbalanced panel data of 16300 observations after checking and screening for apparent coding errors and missing data. Data were obtained from the Bloomberg online financial database. Listed firms were specifically selected because of the availability of reliable financial data. Financial firms were excluded given the complexities in their capital structure natures and because their capital structures are regulated. For robustness, two different measures of leverage were used the long-term debt to total assets and the total debt to total assets. investment was measured as net capital expenditures. Other control variables sales growth a proxy for size, Tobin's Q a proxy for growth and investment opportunities and cash flow proxying for financial constraints were used as used in literature.

The reduced form investment model used by previous studies in developed economies was extended to a dynamic panel data model. Panel data sets for economic research possess several major advantages over conventional cross-sectional or time-series data. It enables observation of multiple phenomena over many periods of time. Panel data usually give the researcher a large number of data points (N T), increasing the degrees of freedom and reducing the collinearity among explanatory variables, hence improving the efficiency of econometric estimates. More importantly, longitudinal data allow a researcher to analyse several important economic questions that cannot be addressed using cross-sectional or timeseries data sets. Panel data provide a means of resolving the magnitude of econometric problems that often arise in empirical studies, the presence of omitted (mismeasured or unobserved) variables that are correlated with explanatory variables are accounted for. Adding to empirical literature, a new estimation technique was used, the generalised methods of moments that has not been used in previous studies. The GMM technique was employed to estimate the models. The utilisation of the orthogonal conditions on the variance-covariance capacitates control for the correlation of errors over time, heteroscedasticity in firms, simultaneity, and measurement errors, and the ability to address the problems of endogeneity from the relation between leverage and growth opportunities through instrumentation of the system of equations at levels and at first differences. Under these circumstances the GMM estimator became a handy tool.

Using two different measures of leverage and two estimation methodologies, in African nonfinancial listed firms, new evidence was presented, based on African listed non-financial firms. t Current leverage levels of African firms were shown to be constraining investment. This may imply that an increase in debt is associated with a decline in investment and firms with low debt levels invest more due to low financing costs and agency constraints. The results are inclined to the under and over investment hypothesis of the agency theory that leverage plays a disciplinary role to avoid over-investment and debt overhang accentuate under-investment. Previous studies have been concentrated in developed economies where firm's leverage levels are generally high, using African firms with low leverage levels the negative relationship is confirmed. These results suggest that a negative relationship exists for both highly levered and lowly levered firms. In other words, low leverage is detrimental and high leverage is detrimental to the investment policy of the firm. The experimental analysis indicates that an increase in leverage can boost investment to a certain turning point. However, African economies do not have active and liquid debt markets that can support efficient and cheap debt financing hence internal financing would be the best strategy. In light of growth opportunities, the analysis revealed that the negative impact of leverage is greater for firms with low-growth opportunities than high-growth firms. The results reveal that the negative impact of leverage is maintained in the absence of South African firms, suggesting that the results are not influenced by any one large economy. The analysis for South African firms only was also undertaken, and a significant negative relationship between leverage and investment was confirmed. The negative impact of leverage on investment is maintained for non-constrained firms, suggesting that the results are not driven by financial constraints. The results are robust in all situations tested, suggesting a significant negative relationship between investment and current leverage levels of African firms.

The study examined the relationship between leverage and intangible and tangible investment. Capital expenditure was used as aproxy for discretionary investment, reported research and development (R&D) and advertising expenditures were used as proxies for intangible investments. A statistically significant negative relationship was found to exist between leverage and the two forms of investment tangible and intangible investments. The robustness of the results was examined by testing for financial constraints as proxied by firm's operating cash flow. The relationship in the presence of an investment-related tax shield was also tested. The inclusion of operating cash flow and investment tax shield did not affect the results. Higher investment whether in tangible or intangible investment is associated with lower leverage for African firms. This indicates that in the current financial economic system, African firms should keep lower leverage levels to have higher investment.

7.1.2 Summary of liquidity and investment

The aim of this section was to examine the influence of stock market liquidity on firm's investment policy. Existing studies are more centred on liquidity and economic growth variables as GDP and firms' liquidity ratios from financial statements. This study sought to extend this to consider how African firm's investment policy is influenced by the external stock market liquidity development by examining the link between the stock market microstructure of a firm and corporate investment behaviour. Data was also obtained from the Bloomberg financial database. For robustness investment was classified into two different definitions the ratio of capital expenditures to total assets and fixed assets growth. Both measures focus more on long-term nature and tangible investments. Firm's trading volume was used as a measure of liquidity. Lang's reduced form investment model was also extended to a dynamic panel data model with fixed effects to capture individual firm heterogeneity and country-specific effects. The model was estimated with the two-step difference and system GMM to control for endogeneity issues within the variables.

The trend analysis of African listed firms depicts a higher variation of liquidity in African stock markets coupled with a decline in liquidity levels over the sample period. In general, this indicates that in addition to being too volatile, African firm's stock market liquidity levels as measured by trading volumes are declining. This analysis provides direct African evidence that stock market liquidity is associated with higher average investment levels in capital expenditures and fixed assets. Controlling for financial distress using interest coverage ratio and the availability of internal funds using cash flows liquidity remains a significant positive determinant of investment. It was found that the effect of liquidity on investment is heterogenous by financial constraints and growth opportunities. The positive correlation between liquidity and investment is stronger for financially constrained firms and low growth firms than for financially non-constrained firms and high growth firms. The results on growth opportunities are contrary to findings in developed economies. The positive effect of liquidity on investment for low growth firms agrees with the finding of the negative correlation of investment and leverage on low growth firms. Low growth firm's investments are constrained more by leverage hence they take advantage of stock market liquidity to finance their investments. Thus, a higher sensitivity of investments to stock market liquidity.

7.1.3 Summary of cash flow volatility and investment decision

The focus of this section was to examine how the volatile cash flow of African firms is influencing the investment policy. The literature on the impact of financial constraints on the behaviour of firms had traditionally focused on corporate financial constraints. Financial constraints will vary with the availability of internal funds, rather than just with the availability of positive net present value projects. Previous studies left unanswered the question of whether cash flow volatility influences firms to time their investment decisions or if they actually decrease their investment. Accordingly, this study examined the influence of financing friction on investment by comparing the empirical sensitivity of cash flow to investment across firms. Many studies have analysed the relationship between cash flow and investment, however, the volatility of the cash flow has not gained much attention.

Data for non-financial listed African firms was obtained from the Bloomberg financial database for the same rolling period of 20 years from 1996 to 2015.This study focused on historical volatility since it used historical cash flow observed by African firms over the past periods as given in the financial statements. Following literature, the study focused on simple volatility as measured by the coefficient of variation of cash flow and the EWMA measure for robustness checks. The first measure was defined as the coefficient of variation (CV) in a firm's cash flow. CV accounts for the size of the firm's cash flow as well as the volatility of the cash flow and also it reduces the mechanical relationship between volatility and cash flow levels. However, this measure may result in serial correlation from the calculation of the standard deviation over time and also all observations are given the same weight, hence the technique cannot mimic volatility clustering. In this regard, use was made of a more sophisticated different technique using the EWMA, a particular case of the GARCH model, which has the ability to mimic volatility clustering normally found in financial series for the robustness of the results. The EWMA is forward-looking in nature and it predicts the innovations in volatility by weighing more recent levels and considers the fact that recent changes in cash flow levels are more relevant. This approach provides a more representative measure of the perceived volatility and it also enables forecasting of future levels of variances. Investment was measured as net capital expenditure.

The Minton and Schrand reduced form investment model was expanded to a dynamic panel data model estimated with the generalised methods of moments estimation technique. This analysis provides direct African evidence that volatility of cash flows is associated with lower average investment levels in capital expenditures. Volatility of cash flows remains a significant negative determinant of investment even after controlling for possible financial distress, availability of internal funds and growth opportunities. The results indicate that firms experiencing cash flow shortfalls relative to their historical levels are highly sensitive and they have lower levels of investment. The negative relationship between cash flow volatility and investment is evident regardless of growth opportunities faced by a firm. This study shows that it is not only cash flow that is an important determinant of investment decisions, but the variability of the cash flow also has a significant bearing on the investment levels of African firms. Cash flow risk as measured by volatility leads to lower investment even for firms with excess cash flow.

7.2 Conclusions

The study contributes to two important dimensions of literature. The literature on the investment policy and the theory of developing economies. Leverage levels in African firms are rising from their historically low levels. This study has shown that this is having a negative impact on investment and the negative effect is more pronounced for low-growth firms. It istherefore,concluded that that leverage constrains investment for both highly leveraged firms and for firms with too low a leverage level. Firms in developed economies are highly leveraged where-as African firms in developing economies use leverage conservatively. Existing studies in developed economies with highly leveraged firms found that leverage has a negative impact on investment. From this analysis of developing economies with less leveraged firms it was found that a significant negative relationship existed between leverage and investment. This indicates that leverage constrains investment from both extreme high leverage and low level of leverage. The constraining effect of leverage on investment in African economies is more pronounced in firms with low-growth opportunities. Capital structure decisions on investment affect more firms with less growth opportunities. Thus, such firms should not be actively involved in debt financing. The results are inclined to the theory that increase in leverage plays a disciplinary role to avoid overinvestment for firms with low growth opportunities and debt overhang accentuates underinvestment. Highly leveraged firms commit more of their cash flow to interest payments and debt covenants and they are thus not able to take on investment opportunities as they arise. This proves that investment policy does not solely depend on the neoclassical fundamentals but also on financing strategy. Investment and financing are interdependent decisions.

With regard to investment tangibility and leverage, it is concluded that both tangible and intangible investments have a negative effect on leverage in African firms. Firms with high investment ratios both in tangible and intangible investments tend to lower their debt. On average African firms are high growth firms, the negative relationship between tangible investment and leverage in African firms implies that expansion in tangible assets in high growth firms sustains the generation of more cash flow for future investment opportunities and operation expansion. Growth in tangible investments ensures high returns from physical assets, such firms borrow less to avoid the agency costs of debt that may lead to underinvestment and a decline in the firm’s value. The findings provide empirical evidence that financing and investment decisions are not independent but rather interdependent. Confirming the findings of objective one, firms should consider lower leverage levels to increase investment. African firms should resort more to internally generated funds and should consider lower pay-out policies to reduce the need for debt financing so as to increase their investment levels, and lower leverage levels to enable expansion in physical and nonphysical assets for sustainable growth.

In addition, it was found that stock-market liquidity is associated with higher average capital expenditure. The effect of liquidity on investment is heterogenous by financial constraints and growth opportunities. Financially constrained and low growth firms are more sensitive to illiquidity than unconstrained and high growth firms. Firms that are highly traded can easily issue stocks at lower costs and at a higher price to finance their investment needs than illiquid firms. Illiquid firms face more financial constraints from external markets which reduces the NPV of projects.

The study also concludes that cash flow variability has a significant negative impact on investment. Cash flow is not only an important determinant of investment decisions but its variability has a significant bearing on the investment policy. High cash flow volatility predicts a cash shortage and forces firms to increase their financial slack through cash holdings. Holding more cash will then reduce the cash flow available for investment purposes. Firms experiencing cash flow shortfalls relative to their historical levels are highly sensitive and they have lower levels of investment. Firms generating high cash flow will also reduce investment if the cash flow is not stable. This implies that although firms may aim at generating high cash flow they should pay attention to minimizing uncertainty in the cash flow. Not only cash flow but its stability is key to firm investment in African firms.

High cash flow sensitivity signals cash shortages this will send a signal to the stock market lowering liquidity resulting in more issuance costs and capital cost. Firms will hold more cash or borrow. In borrowing they are affecting leverage and an increase in leverage constrains investment. Such firms can use the stock market to issue stock to raise funds this decision is also affected by the liquidity of the stock in the market illiquid firms that face higher financial constraints from external markets. They borrow at a higher interest rate or issue stock at lower prices. The availability of funds through these channels will determine the investment policy to be adopted by firms, the value of such investments, the value of the stock on the stock market resulting from the previous investment which will affect the future capacity to raise funds for investment purposes. Thus, there is an indispensable interplay between investment, leverage, liquidity and cash flow. African firms have high cash flow volatilities, low liquidity and lower investment ratios. Firms with high cash flow volatility have low leverage because they are less credit-worthy this also affects the liquidity on the stock market reducing the ability to raise funds and thus low investment.

7.3 Implications

This section outlines the policy and theory implications of the study for financial managers practitioners, investors, government and policy makers. The contribution of this study is to investment policy in the context of developing economies.

The MM irrelevance theory put forth that a firm's investment policy should depend on the fundamental determinants of cash flow, profitability and net-worth. Based on the findings from this study the investment policy does not solely depend on the neoclassical fundamentals. In the presence of agency costs and informational asymmetries, the financing strategy has a considerable bearing on a firm's investment policy. The irrelevancy theory argues that financing structure is irrelevant Later developments in the capital structure theory supports the advantage of leverage on firm value owing to tax shields. Firm value is created from the investments that the firm undertakes. This study reveals that leverage is constraining investment in African firms. The investment policy of a firm depends on the financing structure. Leverage is parasitic to investment in both firms with high and low leverage levels and more harmful to firms with no investment opportunities. Highly leveraged firms are forced to service their debts when firms with less leverage are busy investing.

Based on the findings African firms are recommended to maintain their low leverage levels and to consider internal growth, mergers and acquisitions, divestitures, lower their payout policies and increase their earnings retention and to finance their investments with internally generated funds. Maintaining low debt levels reduces interest payment commitments and loan covenants from debt holders. Low debt will reduce the shareholder-bondholder conflict this will avail more free cash flow and enable the firm to freely take on investment opportunities as they arise without any constraints. However, for firms with no growth opportunities in the presence of shareholder-manager conflict investors in Africa should consider higher leverage to reduce the propensity of over-investment in non-profitable projects by management. Policy makers should foster competitiveness in the financial sector to ensure sustainable availability of credit for investment, a large pool of funds reduces the financing costs hence firms may enjoy the benefit of debt.

Stock market liquidity is associated with higher average investment levels in capital expenditure and fixed assets. Highly liquid and actively traded firms on the stock market invest more. The effect of liquidity on investment is heterogenous by financial constraints and growth opportunities. The positive correlation between liquidity and investment is stronger for financially constrained firms and low growth firms than financially non-constrained firms and high growth firms. Contrary to findings in developed economies low growth firm's investments are constrained more by leverage hence they take advantage of stock market liquidity to finance their investments. Thus, African firms and regulators should promote stock market liquidity and take advantage of stock market liquidity for financing to lower leverage so as to boost investment. Firms should pay more attention to stock market effects in their risk management decisions, interact more with the stock market to keep the stock active and overpriced to raise cheap finances for investment purposes. Regulators should promote and encourage a broader security spectrum in each segment to foster liquidity in the market. Introduction of more assets to be traded in line with developed markets standards, revision of investment policies in taxes and regulations related to security trading may help improve liquidity. Higher transaction costs on African stocks markets attenuates trading on the markets, so that lowering transaction costs and encouraging stock splits may also help improve liquidity. Firms should also consider or strike a balance between reinvestment and dividend pay-out to attract short-term investors seeking dividends thereby enhancing trading volume and liquidity on the market. Short sells and stock lending are restricted in most African countries, effective implementation and conduct of short selling progresses market liquidity and in turn, supports firm financing thus boosting investment. Regulators and policy-makers in African countries should also consider introducing more alternative exchanges for small to mediums firms to access the stock market to raise funds rather than depending only on overpriced debt which constrains investment.

For global investors, most of the African stock markets are still small and at their development stage which may be a good avenue for greenfield investors and venture capitalists as such markets may offer higher capital gains.

This study reveals that it is not only cash flows that are an important determinant of investment decisions, but the variability of the cash flow also has a significant bearing on the investment policy of African firms. Firm's investments are not only affected by the availability of internal funds but also by the sensitivity of the cash flow. Firms that experience more volatile cash-flow are induced to hold more cash or borrow more for precautionary purposes debt will come with restrictive covenants and hence they will invest less.

African firms should not only focus on strategies to improve cash flow but they should consider reducing the volatility of cash flows in their risk management decisions. It is important to maintain the stability of cash flow since cash flow risk as measured by volatility leads to lower investment even for firms with excess cash flow. Firms should trade off the effects of managing volatility and the resulting negative impact of cash flow volatility on investment levels.

The study reveals that leverage constrains investment, stock market liquidity has a positive impact on investment, cash flow is positively related to investment and the volatility of cash flow has a negative impact on investment. In light of the findings, African firms should reduce leverage since it constrains investment. Reduce leverage and focus on the stock market liquidity for financing which positively correlates with investment. Improving cash flow standing and smoothening cash flow boosts market confidence, improves liquidity and provides a platform for financing investment opportunities.

7.4 Main contributions of the study

This research contributes three important items to the literature:

i. Literature on the firm's investment policy;
ii. Literature on the theory of developing economies particularly in Africa; and
iii. From a methodological point of view, a novel estimation technique.

The study reveals that the investment policy does not solely depend on the neoclassical fundamentals determinants of net worth, profitability and cash flow but the financing strategy has a significant bearing on the investment policy. Specifically, leverage constrains investment for both firms with high and low leverage levels. The constraining effect of leverage on investment is stronger for firms with less growth opportunities. The study also reveals that the liquidity of the stock market has a significant positive relationship with the firms' investment. Also, African firm's investments are negatively affected by cash flow volatility.

Regarding the theory of developing economies, the few studies that have been done on the firm's investment policy are predominantly concentrated in developed economies mainly the USA and Europe. However, there is persistent behavioural and structural heterogeneity between firms in developed and developing economies. Developing economies have different institutions, financial situations, economic conditions, market perfections and imperfections, therefore, evidence from the developing economies must be explored separately. This study provides empirical evidence from a developing continent hence investment strategic decisions can be made based on the analysis of the developing economies peculiar characteristics. It was found that low, rising African firm's leverage levels are constraining investment. Hence the investment strategy for African firms would be to consider internal growth.

From the methodological point of view, the research extended the prior studies to deal with the problem of endogeneity in the relationship between leverage and investment using a dynamic panel model and novel estimation technique (GMM). Previous studies used the OLS estimator and pooled regression methods on cross-sectional and time series data which make the models suffer from serious endogeneity and heterogeneity issues. The model and estimation technique used in this study have not been used in prior studies.

7.5 Limitations of the study

The use of accounting data for estimation is likely to present some well-known impediments, which include the potential for 'creative accounting' by firms to reduce their tax bills, and possible inconsistencies in the timing and the use of different accounting conventions and reporting standards across African countries. The quality and accuracy of this study heavily depends on the quality and accuracy of the financial statements used in this study.

This study broadly analysed capital expenditures as a variable for investment and doesn't decompose the sources of investment for the firms. The balance sheet figures do not specify the nature of investment undertaken by the firms.

In considering the technical aspects of the investment policy, this study focused on internal factors that affect investment and didn't consider factors in the external environment such as macroeconomic, political and social factors that may affect the investment policy of a firm.

7.6 Suggestions for further research

Further studies on this subject can be considered where the investments are decomposed into organic investments, investments through mergers and acquisitions, disinvestments through divestitures and unbundling distinctly in order to ascertain the drivers of investment reported in the balance sheet figures among African firms. The analysis will also ascertain how leverage affects the specific forms of investment determinants. In addition, further studies can be done through classification of African firms by industries or regions.

REFERENCES

Aanderson, M. H. & Prezas, A. P. 1998. The interaction of investment and financing decisions under moral hazard. *International Review of Economics & Finance,* 7**,** 379-392.

Abel, A. B. 1983. Optimal investment under uncertainty. *The American Economic Review,* 73**,** 228-233.

Abor, J. 2005. The effect of capital structure on profitability: an empirical analysis of listed firms in Ghana. *The journal of risk finance,* 6**,** 438-445.

Abor, J. & Biekpe, N. 2005. What determines the capital structure of listed firms in Ghana? *African Finance Journal,* 7**,** 37-48.

Acharya, V. & Schaefer, S. 2006*. Liquidity risk and correlation risk: Implications for risk management*. London, UK *:* London Business School.

Adedeji, A. 1998. Does the pecking order hypothesis explain the dividend payout ratios of firms in the UK? *Journal of Business Finance & Accounting,* 25**,** 1127-1155.

Admati, A. & Pfleiderer, P. 2009a. The Wall Street walk and shareholder activism: exit as a form of voice. *Rev. Financ. Stud.,* 22**,** 2645-2685.

Admati, A. R. & Pfleiderer, P. 2009b. The 'Wall Street Walk ', and shareholder activism: Exit as a form of voice. *Review of Financial Studies,* 22**,** 2645-2685.

Afego, P. N. 2013. Stock price response to earnings announcements: Evidence from the Nigerian Stock Market. *Journal of African Business,* 14**,** 141-149.

African Securities Exchanges Association YearBook (2012). African Securities Exchanges Association (2015) Annual Report & Statistics.

Ahn, S. & Denis, D. J. 2004. Internal capital markets and investment policy: evidence from corporate spinoffs. *Journal of Financial economics,* 71**,** 489-516.

Ahn, S., Denis, D. J. & Denis, D. K. 2006. Leverage and investment in diversified firms. *Journal of financial Economics,* 79**,** 317-337.

Ahn, S., Denis, D.J. 2004. Interanational Capital structure and Investement policy: evidence from corporate spin offs. *Journal of Financial Ecnomics,* 71**,** 489-516.

Aivazian, V. A., Ge, Y. & Qiu, J. 2005. The impact of leverage on firm investment: Canadian evidence. *Journal of corporate finance,* 11**,** 277-291.

Aivaziana, V. A., Ying Geb & Qiuc, J. 2003a. The impact of leverage on firm investment: Canadian evidence. *Elservier, the Journal of Corporate finance,* 11 277-291.

Akhtar, S. 2005. The determinants of capital structure for Australian multinational and domestic corporations. *Australian journal of management,* 30**,** 321-341.

Akhtar, S. & Oliver, B. 2009. Determinants of capital structure for Japanese multinational and domestic corporations. *International review of finance,* 9**,** 1-26.

Al-Ajmi, J., Abo Hussain, H. & Al-Saleh, N. 2009. Decisions on capital structure in a Zakat environment with prohibition of riba: The case of Saudi Arabia. *The Journal of Risk Finance,* 10**,** 460-476.

Al-Sakran, S. A. 2001. Leverage determinants in the absence of corporate tax system: the case of non-financial publicly traded corporations in Saudi Arabia. *Managerial Finance,* 27**,** 58-86.

Alexander, G. J., Edwards, A. K. & Ferri, M. G. 2000. The determinants of trading volume of high-yield corporate bonds. *Journal of Financial Markets,* 3**,** 177-204.

Allayannis, G. & Weston, J. P. 2003. *Earnings volatility, cashflow volatility, and rm value*. [Online] Available: https://pdfs.semanticscholar.org/dacf/8f0e3f1b661b819f251b7687d699bfc5fcff.pdf

Allen, F., Otchere, I. & Senbet, L. W. 2011. African financial systems: A review. *Review of Development Finance,* 1**,** 79-113.

Almeida, H. & Campello, M. 2007. Financial constraints, asset tangibility, and corporate investment. *Review of Financial Studies,* 20**,** 1429-1460.

Almeida, H., Campello, M. & Weisbach, M. S. 2004a. The cash flow sensitivity of cash. *The Journal of Finance,* 59**,** 1777-1804.

Alti, A. 2003. How sensitive is investment to cash flow when financing is frictionless? *The Journal of Finance,* 58**,** 707-722.

Amihud, Y. 2002. Illiquidity and stock returns: cross-section and time-series effects. *Journal of financial markets,* 5**,** 31-56.

Amihud, Y. & Mendelson, H. 1986. Asset pricing and the bid-ask spread. *Journal of financial Economics,* 17**,** 223-249.

Anderson, T. W. & Hsiao, C. 1982. Formulation and estimation of dynamic models using panel data. *Journal of econometrics,* 18**,** 47-82.

Andrianaivo, Mihasonirina and Yartey, Charles Amo, Understanding the Growth of African Financial Markets (August 2009). IMF Working Papers, Vol. , pp. 1-40, 2009. Available at SSRN: https://ssrn.com/abstract=1474590

Antoniou, A., Guney, Y. & Paudyal, K. 2008. The determinants of capital structure: capital market-oriented versus bank-oriented institutions. *Journal of financial and quantitative analysis,* 43**,** 59-92.

Arellano, M. & Bond, S. 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The review of economic studies,* 58**,** 277-297.

Asquith, P. & Wizman, T. A. 1990. Event risk, covenants, and bondholder returns in leveraged buyouts. *Journal of Financial Economics,* 27**,** 195-213.

Aygun, M., Suleyman, I. & Sayim, M. 2014. The impact of Debt Structure on Firm Investments: Empirical Evidence from Turkey. *Archives of Business Research,* 2**,** 24-30.

Baglioni, A., Beccalli, E., Boitani, A. & Monticini, A. 2013. Is the leverage of European banks procyclical? *Empirical Economics,* 45**,** 1251-1266.

Baker, M., Coval, J. & Stein, J. C. 2007. Corporate financing decisions when investors take the path of least resistance. *Journal of Financial Economics,* 84**,** 266-298.

Banerjee, S. & Kremer, I. 2010. Disagreement and learning: Dynamic patterns of trade. *The Journal of Finance,* 65**,** 1269-1302.

Baños-Caballero, S., García-Teruel, P. J. & Martínez-Solano, P. 2014. Working capital management, corporate performance, and financial constraints. *Journal of Business Research,* 67**,** 332-338.

Barber, B. M. & Odean, T. 2000. Trading is hazardous to your wealth: The common stock investment performance of individual investors. *The journal of Finance,* 55**,** 773-806.

Barclay, M. J. & Smith, C. W. 1996. On financial architecture: leverage, maturity, and priority. *Journal of Applied Corporate Finance,* 8**,** 4-17.

Barth, M. E., Landsman, W. R. & Lang, M. H. 2008. International accounting standards and accounting quality. *Journal of accounting research,* 46**,** 467-498.

Bas, T., Muradoglu, G. & Phylaktis, K. 2009. *Determinants of capital structure in developing countries.* London: Cass Business School.
Baum, C. F., Barkoulas, J. T. & Caglayan, M. 2001. Nonlinear adjustment to purchasing power parity in the post-Bretton Woods era. *Journal of International Money and Finance,* 20**,** 379-399.
Baum, C. F., Caglayan, M. & Talavera, O. 2009. On the sensitivity of firms' investment to cash flow and uncertainty. *Oxford Economic Papers,* 62**,** 286-306.
Beber, A., Brandt, M. W. & Kavajecz, K. A. 2010. What Does Equity Sector Orderflow Tell us about the Economy? . *Working Paper, .* University of Amsterdam.
Benhabib, J. & Spiegel, M. M. 2000. The role of financial development in growth and investment. *Journal of economic growth,* 5**,** 341-360.
Berger, A. N. & Di Patti, E. B. 2006. Capital structure and firm performance: A new approach to testing agency theory and an application to the banking industry. *Journal of Banking & Finance,* 30**,** 1065-1102.
Berger, P. G. & Hann, R. 2003. Segment profitability and the proprietary costs of disclosure. *SSRN:ElectronicPaperCollection*.Available:https://pdfs.semanticscholar.org/3b93/0969c453e912a7f12b878df67accb3e07b38.pdf
Berry, W.D. and Feldman, S., 1985. *Multiple regression in practice* (No. 50). Sage.

Bhana, N. 2007. The market reaction to open market share repurchases announcements: The South African experience. *Investment Analysts Journal,* 36**,** 25-36.
Bhattacharya, N., Black, E. L., Christensen, T. E. & Larson, C. R. 2003. Assessing the relative informativeness and permanence of pro forma earnings and GAAP operating earnings. *Journal of Accounting and Economics,* 36**,** 285-319.
Becker-Blease, J.R. and Paul, D.L., 2006. Stock liquidity and investment opportunities: Evidence from index additions. *Financial Management, 35*(3), pp.35-51.
Bloom, N., Bond, S. & Van Reenen, J. 2007. Uncertainty and investment dynamics. *The review of economic studies,* 74**,** 391-415.
Bloomberg. (2016) *Bloomberg Professional*. [Online]. Available at: University of Kwazulu Natal Subscription Service (Accessed: July 2016)

Bloomberg L.P. "Midle East and Africa equities data for african listed firms 01/01/1996 to 31/12/2015." (2016). Bloomberg database. University of Kwazulu Natal at School of Accounting Economics and Finance, 206.

Blundell, R. & Bond, S. 1998. Initial conditions and moment restrictions in dynamic panel data models. *Journal of econometrics,* 87**,** 115-143.
Bond, S., Elston, J. A., Mairesse, J. & Mulkay, B. 2003. Financial factors and investment in Belgium, France, Germany, and the United Kingdom: A comparison using company panel data. *Review of economics and statistics,* 85**,** 153-165.
Booth, L., Aivazian, V., Demirguc-Kunt, A. & Maksimovic, V. 2001. Capital structures in developing countries. *The journal of finance,* 56**,** 87-130.
Booth, L. & Cleary, S. Cash flow volatility, financial slack, and investment decisions. EFMA 2006 Madrid Meetings Paper, 2006.
Brennan, M. J. & Schwartz, E. S. 1985. Evaluating natural resource investments. *Journal of business***,** 135-157.
Brick, I. E., Frierman, M. & Kim, Y. K. 1998. Asymmetric information concerning the variance of cash flows: The capital structure choice. *International Economic Review*, 9(3)745-761.

Butler, A. W., Grullon, G. & Weston, J. P. 2005a. Stock market liquidity and the cost of issuing equity. *Journal of Financial and Quantitative Analysis,* 40**,** 331-348.

Byoun, S. 2008. How and when do firms adjust their capital structures toward targets? *The Journal of Finance,* 63**,** 3069-3096.

Calabrese, T. D. 2011. Testing competing capital structure theories of nonprofit organizations. *Public Budgeting & Finance,* 31**,** 119-143.

Calcagnini, G. & Saltari, E. 2000. Real and financial uncertainty and investment decisions. *Journal of Macroeconomics,* 22**,** 491-514.

Calomiris, C. W. & Hubbard, R. G. 1988. *Firm Heterogeneity, Internal Finance, and Credit Rationing*. Cambridge, Mass: National Bureau of Economic Research.

Campa, J. & Goldberg, L. S. 1995. Investment in manufacturing, exchange rates and external exposure. *Journal of International Economics,* 38**,** 297-320.

Campello, M. & Giambona, E. 2011. *Capital structure and the redeployability of tangible assets*. Tinbergen Institute Discussion Paper.

Catalini, Christian and Fazio, Catherine and Murray, Fiona, *Can Equity Crowdfunding Democratize Access to Capital and Investment Opportunities?* (May 16, 2016). MIT Innovation Initiative Lab for Innovation Science and Policy Report, 2016. Available at SSRN: https://ssrn.com/abstract=2780551 or http://dx.doi.org/10.2139/ssrn.2780551

Chen, J. & Strange, R. 2005. The determinants of capital structure: Evidence from Chinese listed companies. *Economic Change and Restructuring,* 38**,** 11-35.

Chen, L. & Zhao, X. 2006. On the relation between the market-to-book ratio, growth opportunity, and leverage ratio. *Finance Research Letters,* 3**,** 253-266.

Chikan, A., Kovacs, E. & Tátrai, T. 2005. Macroeconomic characteristics and inventory investment: a multi-country study. *International Journal of Production Economics,* 93**,** 61-73.

Chipeta, C., Wolmarans, H. P. & Vermaak, F. N. 2012. Financial liberalisation and the dynamics of firm leverage in a transitional economy: evidence from South Africa. *South African Journal of Economic and Management Sciences,* 15**,** 171-189.

Clarke 2013. Economic development in Africa. *UNCTAD.* The United Nations.

Cleary, S. 2006. International corporate investment and the relationships between financial constraint measures. *Journal of banking & finance,* 30**,** 1559-1580.

Cremers, M. & Pareek, A. *Can overconfidence and biased self-attribution explain the momentum, reversal and share issuance anomalies? Evidence from short-term institutional investors*. AFA 2011 Denver Meetings Paper, 2011.

Dahou, K., Omar, H. I. & Pfister, M. *Deepening African financial markets for growth and investment.* Ministerial and Expert Meeting of the NEPAD-OECD Africa Investment Initiative, 2009.

Danso, A. & Adomako, S. 2014. The financing behaviour of firms and financial crisis. *Managerial finance,* 40**,** 1159-1174.

Darby, J., Hallett, A. H., Ireland, J. & Piscitelli, L. 1999. The impact of exchange rate uncertainty on the level of investment. *The Economic Journal,* 109**,** 55-67.

Darrough, M. N. & Stoughton, N. M. 1986. Moral hazard and adverse selection: The question of financial structure. *The Journal of Finance,* 41**,** 501-513.

Daskalakis, N. & Psillaki, M. 2008. Do country or firm factors explain capital structure? Evidence from SMEs in France and Greece. *Applied financial economics,* 18**,** 87-97.

Daskalakis, N. & Thanou, E. 2010. Capital structure of SMEs: to what extent does size matter? Available at: SSRN: https:// ssrn.com/ abstract =1683161 or http:// dx.doi.org/ 10. 2139 /ssrn. 1683161
De Miguel, A. & Pindado, J. 2001. Determinants of capital structure: new evidence from Spanish panel data. *Journal of corporate finance,* 7, 77-99.
Deangelo, H. & Masulis, R. W. 1980. Optimal capital structure under corporate and personal taxation. *Journal of financial economics,* 8, 3-29.
Deari, F. 2009. The determinants of capital structure: evidence from Macedonian listed and unlisted companies. *Analele Stiintifice ale Universitatii" Alexandru Ioan Cuza" din Iasi-Stiinte Economice,* 56, 91-102.
Degryse, H., De Goeij, P. & Kappert, P. 2012. The impact of firm and industry characteristics on small firms' capital structure. *Small Business Economics,* 38, 431-447.
Denis, D. J., Denis, D. K. & Sarin, A. 1997. Agency problems, equity ownership, and corporate diversification. *The Journal of Finance,* 52, 135-160.
Dixing, Z. 2011. Market Sentiment, R&D Expenditure and Firms Real Investment——An Empirical Study Based on the Catering Theory [J]. *Science & Technology Progress and Policy,* 9, 020.
Dolde, W. 1995. Hedging, leverage,and primitive risk. *Journal of FinancialEngineering,* 4, 187-216.
Donaldson, G. 1961. *Corporate debt capacity Harvard Business Review*, *40*(4), pp.117-131.
Donaldson, G. 1963. Financial goals: Management vs. stockholders. *Harvard Business Review,* 41, 116-129.
Dong, J., Kempf, A. & Yadav, P. K. 2007. *Resiliency, the Neglected Dimension of Market liquidity: Empirical Evidence from the New York Stock Exchange*. Available at SSRN: https://ssrn.com/abstract=967262 or http://dx.doi.org/10.2139/ssrn.967262
Driver, C. & Moreton, D. 1991. The influence of uncertainty on UK manufacturing investment. *The Economic Journal,* 101, 1452-1459.
Economic Development in Africa Report (2014) catalysing investment for transformative growth in Africa, United Nations publication, UNCTAD/ALDC/AFRICA/2014, New York and Geneva
Edmans, A. 2009. Blockholder trading, market efficiency, and managerial myopia. *The Journal of Finance,* 64, 2481-2513.
Edmans, A. & Manso, G. 2011a. Governance through trading and intervention: A theory of multiple blockholders. *Review of Financial Studies,* 24, 2395-2428.
Edmiston, K. D. 2004. Tax Uncertainty and Investment: A Cross-Country Empirical Examination. *Economic Inquiry,* 42, 425-440.
Ellili, N. O. D. & Farouk, S. 2011. Examining the capital structure determinants: empirical analysis of companies traded on Abu Dhabi Stock Exchange. *International research journal of finance and economics,* 67, 82-96.
Eyraud 2009. Econmic development in Africa *UNCTAD-2015.* New York, NY: United Nations
Fama, E. F. & French, K. R. 2002. Testing trade-off and pecking order predictions about dividends and debt. *Review of financial studies,* 15, 1-33.
Fan, H., Lai, E., L,C & Qi, H. 2011. *A model of trade with intersectorial firm heterogeneity*. Hong Kong University of Science and Technology.
Fang, V. W., Tian, X. & Tice, S. 2014. Does stock liquidity enhance or impede firm innovation? *The Journal of Finance,* 69, 2085-2125.

Fattouh, B., Harris, L. & Scaramozzino, P. 2008. Non-linearity in the determinants of capital structure: evidence from UK firms. *Empirical Economics,* 34**,** 417-438.

Fazzari, S. M., Hubbard, R. G., Petersen, B. C., Blinder, A. S. & Poterba, J. M. 1988. Financing constraints and corporate investment. *Brookings papers on economic activity,* 1988**,** 141-206.

Fazzari, S. M. & Petersen, B. C. 1993. Working capital and fixed investment: new evidence on financing constraints. *The RAND Journal of Economics***,** 24,328-342.

Ferderer, J. P. 1993. The impact of uncertainty on aggregate investment spending: an empirical analysis. *Journal of money, credit and banking,* 25**,** 30-48.

Ferreira, M. A. & Vilela, A. S. 2004. Why do firms hold cash? Evidence from EMU countries. *European Financial Management,* 10**,** 295-319.

Firth, M., Lin, C. & Wong, S. M. 2008. Leverage and investment under a state-owned bank lending environment: Evidence from China. *Journal of Corporate Finance,* 14**,** 642-653.

Firth, M., Malatesta, P. H., Xin, Q. & Xu, L. 2012. Corporate investment, government control, and financing channels: Evidence from China's Listed Companies. *Journal of Corporate Finance,* 18**,** 433-450.

Flannery, M. J. & Rangan, K. P. 2006. Partial adjustment toward target capital structures. *Journal of financial economics,* 79**,** 469-506.

Frank, M. Z. & Goyal, V. K. 2003. Testing the pecking order theory of capital structure. *Journal of financial economics,* 67**,** 217-248.

Frank, M. Z. & Goyal, V. K. 2007. Trade-off and pecking order theories of debt. *Available at SSRN 670543*.

Frank, Murray Z. and Goyal, Vidhan K., Profits and Capital Structure (March 11, 2008). AFA 2009 San Francisco Meetings Paper. Available at SSRN: https: //ssrn.com /abstract = 1104 88

Franklin John, S. & Muthusamy, K. 2011. Impact of leverage on firms investment decisiononline available at http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.301.4841 .

Froot, K., Scharfstein, D. & Stein, J. 1993a. Risk management: coordinating investment and fnancing policies. . *Journal of Finance,* 48**,** 1629-1658.

Geczy, C., Minton, B. & Schrand, C. 1997. Why rms use currency derivatives?," forthcoming in *Journal of Finance.*

Geda, A. and Kebret, H., 2008. Regional economic integration in Africa: A review of problems and prospects with a case study of COMESA. *Journal of African economies*, *17*(3), pp.357-394.

Gilchrist, Simon, Himmelberg, Charles, P., Huberman & Gur 2005a. Do stock price bubbles influences corporate investment? *J. Monet. Econ,* 52**,** 805-827.

Gilchrist, S. & Himmelberg, C. P. 1995. Evidence on the role of cash flow for investment. *Journal of monetary Economics,* 36**,** 541-572.

Gilchrist, S., Himmelberg, C. P. & Huberman, G. 2005b. Do stock price bubbles influence corporate investment? *Journal of Monetary Economics,* 52**,** 805-827.

Gill, A., Biger, N. & Mathur, N. 2011. The effect of capital structure on profitability: Evidence from the United States. *International Journal of Management,* 28**,** 3.

Goldberg, L. S. 1993. Exchange rates and investment in United States industry. *The Review of Economics and Statistics***,** 75[ISSUE NUMBER MISSING]:575-588.

Goldsmith, A. 2012. "Foreign Aid and Statehood in Africa".): 123-48. . [online] 25 March 2012. *The MIT Press 55.1 (2001).* JSTOR.

Goldsmith, A. A. 2001. Foreign aid and statehood in Africa. *International organization,* 55, 123-148.

Graham, J. R. & Harvey, C. R. 2001. The theory and practice of corporate finance: Evidence from the field. *Journal of financial economics,* 60, 187-243.

Grinblatt, M. & Keloharju, M. 2009. Sensation seeking, overconfidence, and trading activity. *The Journal of Finance,* 64, 549-578.

Grossman, S. J. & Hart, O. D. 1982. Corporate financial structure and managerial incentives. *The economics of information and uncertainty.* University of Chicago Press.

Gu, N.-K. & Chen, H. 2009. Stock Liquidity and the Determination of Capital Structure of Enterprises: Evidence from China's Listed Companies [J]. *Journal of Finance and Economics,* 8, 005.

Guiso, L. & Parigi, G. 1999. Investment and demand uncertainty. *The Quarterly Journal of Economics,* 114, 185-227.

Guo, H. Estimating Volatilities by the GARCH and the EWMA model of PetroChina and TCL in the Stock Exchange Market of China. 6th International Scientific Conference Managing and Modelling of Financial Risks, VSB-TU Ostrava, Faculty of Economics, Finance Department.(September), 2012. 191-202.

Guoming, A., H 2009. The cross section of cashflow volatility and expected stock returns. *Journal of Empirical Finance* 16, 409-429.

Guschanski, A. & Onaran, Ö. 2016. *Determinants of the wage share: a cross-country comparison using sectoral data. Working Paper Grrenwich Political economy Research centre. Available:http://www.gre.ac.uk/business/research/centres/gperc/pubreports/greenwich-papers-in-political-economy*

Gwatidzo, T. & Ojah, K. 2009. Corporate capital structure determinants: evidence for five African countries. *African Finance Journal,* 11, 1-23.

Harford, J. 1999. Corporate cash reserves and acquisitions. *The Journal of Finance,* 54, 1969-1997.

Harris, M. & Raviv, A. 1990. Capital structure and the informational role of debt. *The Journal of Finance,* 45, 321-349.

Harris, M. & Raviv, A. 1991. The theory of capital structure. *the Journal of Finance,* 46, 297-355.

Harvey, C. R., Lins, K. V. & Roper, A. H. 2004. The effect of capital structure when expected agency costs are extreme. *Journal of Financial Economics,* 74, 3-30.

Helwege, J. & Liang, N. 1996. Is there a pecking order? Evidence from a panel of IPO firms. *Journal of financial economics,* 40, 429-458.

Heyman, D., Deloof, M. & Ooghe, H. 2008. The financial structure of private held Belgian firms. *Small Business Economics,* 30, 301-313.

Hong, H. & Stein, J. C. 2007. Disagreement and the stock market. *The Journal of Economic Perspectives,* 21, 109-128.

Hoshi, T., Kashyap, A. & Scharfstein, D. 1991. Corporate structure, liquidity, and investment: Evidence from Japanese industrial groups. *The Quarterly Journal of Economics,* 106, 33-60.

Hsiao, C., 2014. *Analysis of panel data* (No. 54). Cambridge university press.

Huang, S. G. & Song, F. M. 2004. The determinants of capital structure: Evidence from China. *China Economic quarterly-Beijing-,* 3, 395-414.

Hurn, A. S. & Wright, R. E. 1994. Geology or economics? Testing models of irreversible investment using North Sea oil data. *The Economic Journal*, 104(423)363-371.

Imf 2015. Global financial stability report: vulnerabilities, legacies, and policy challenges: risks rotating to emerging markets. *In:* IMF (ed.) *Global financial stability report.* IMF. Available at<http://www.imf. org / e xternal

Islam, S. 2012. Manufacturing firms' cash holding determinants: Evidence from Bangladesh. *International Journal of Business and Management,* 7**,** 172.

Itô, S. Fundamental solutions of parabolic differential equations and boundary value problems. Japanese journal of mathematics: transactions and abstracts, 1957. *The Mathematical Society of Japan,* 55-102.

Jaisinghani, D. & Kanjilal, K. 2017. Non-linear dynamics of size, capital structure and profitability: Empirical evidence from Indian manufacturing sector. *Asia Pacific Management Review22(3): 159-165*.

Jarboe, K. P. & Ellis, I. 2010. Intangible assets: Innovative financing for innovation. *Issues in Science and Technology,* 26**,** 75-80.

Jason Kasozi, S. N. 2010. THE CAPITAL STRUCTURE PRACTICES OF LISTED FIRMS IN SOUTH AFRICA. [Online] Available: http://hdl.handle.net/10500/3439

Jensen, M. C. 1986a. Agency cost of free cash flow, corporate finance, and takeovers. *Corporate Finance, and Takeovers. American Economic Review,* 76.

Jensen, M.C., 1986. Agency costs of free cash flow, corporate finance, and takeovers. *The American economic review*, *76*(2), pp.323-329.

Jensen, M. C. 1986b. Agency costs of free cash flow, corporate finance, and takeovers. *The American economic review,* 76**,** 323-329.

Jensen, M. C. & Meckling, W. H. 1976. Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of financial economics,* 3**,** 305-360.

Jensen, M. C. & Ruback, R. S. 1983. The market for corporate control: The scientific evidence. *Journal of Financial economics,* 11**,** 5-50.

Kahneman, D., 2011. *Thinking, fast and slow*. Macmillan Springer Berlin Heidelberg.

Krämer, W. Stat Papers (2014) 55: 915. https://doi.org/10.1007/s00362-013-0533-y

Kannadhasan, M., Does Financial Leverage Influence Investment Decisions? The Case of Pharmaceutical Firms in India (January 1, 2014). Available at SSRN: https://ssrn.com/abstract=2373647 or http://dx.doi.org/10.2139/ssrn.2373647

Kaplan, S. N. & Zingales, L. 2000. Investment-cash flow sensitivities are not valid measures of financing constraints. *The Quarterly Journal of Economics,* 115**,** 707-712.

Kargbo11, S. M. & Adamu, P. A. 2009. *Financial development and economic growth in Sierra Leone*. Journal of Monetary and economic intergration 9(2)

Kasozi, Stephen Jason (2013) The capital structure practises of listed firms in South Africa, University of South Africa, Pretoria, <http://hdl.handle.net/10500/3439>

Kaul, A. & Kayacetin, V. 2009. Forecasting Economic Fundamentals and Stock Returns with Equity Market Order Flows: Macro Information in Micro Measures? . *Working Paper.*

Kester, W. C. 1984. *Turning growth options into real assets*, Division of Research, Graduate School of Business Administration, Cambridge, Mas.: Harvard University.

Kester, W. C. 1986. Capital and ownership structure: A comparison of United States and Japanese manufacturing corporations. *Financial management***,** 5-16.

Khanna, N. & Sonti, R. 2004. Value creating stock manipulation: feedback effect of stock prices on firm value. *Journal of financial markets,* 7**,** 237-270.

Kim, E. H. 1978. A mean-variance theory of optimal capital structure and corporate debt capacity. *The Journal of Finance,* 33**,** 45-63.

Kim, M. & Kross, W. 2005. The ability of earnings to predict future operating cash flows has been increasing—not decreasing. *Journal of Accounting Research,* 43**,** 753-780.

Köksal, B., Orman, C. & Oduncu, A. 2013. Determinants of capital structure: evidence from a major emerging market economy. *MPRA Paper,* 48415.

Kovacs, G. 2005. „Financing local investments by issuing municipal bonds. *Atalakulasi folyamatok KozepYEuropaban. u: szechenyi Istvan Egyetem Multidiszciplinaris Tarsadalomtudomanyi Doktori Iskola, Gyor***,** 107-113.

Kramer, G. 2015. *Growing, Fast and Slow*. Stat Papers (2014) 55: 915. https://doi.org/10.1007/s00362-013-0533-y

Kraus, A. & Litzenberger, R. H. 1973. A state-preference model of optimal financial leverage. *The journal of finance,* 28**,** 911-922.

Kwenda, F. 2017. Working Capital Investment and Firm Value Relationship: A Non-Linear Perspective. *Journal of Insurance and Financial Management,* 3(4), pp.44-65.

Kyle, A. S. & Vila, J.-L. 1991. Noise trading and takeovers. *The RAND Journal of Economics***, 22(1)** 54-71.

La Rocca, M., La Rocca, T., Gerace, D. & Smark, C. 2009. Effect of diversification on capital structure. *Accounting & Finance,* 49**,** 799-826.

Lamont, O. 1997. Cash flow and investment: Evidence from internal capital markets. *The Journal of Finance,* 52**,** 83-109.

Lang, L., Ofek, E. & Stulz, R. 1996a. Leverage, investment, and firm growth. *Journal of financial Economics,* 40**,** 3-29.

Lang, L. E., Ofek, E. & Stulz, R. 1996b. Leverage, investmentand firm growth. *Journal of Financial Economics,* 40**,** 3-29.

Leahy, J. V. & Whited, T. M. 1995. *The effect of uncertainty on investment: Some stylized facts*. (No. w4986).. National Bureau of Economic Research.

Leland, H. E. 1998. Agency costs, risk management, and capital structure. *The Journal of Finance,* 53**,** 1213-1243.

Lesmond, D. A., O'connor, P. F. & Senbet, L. W. 2008a. Capital structure and equity liquidity. *Robert H. Smith School Research Paper No. RHS***,** 06-067.

Lesmond, D. A., O'connor, P. F. & Senbet, L. W. 2008b. Capital Structure and Equity Liquidity. *Working Paper No. RHS-06-067.*

Lessard, D. 1990. Global competition and corporate fnance in the 1990s. *Journal of Applied Corporate Finance,* 3**,** 59-72.

Lessard, D. R. & Lightstone, J. B. 1990. Management of operating exposure. *A. Boris (Ed.), Management of Currency Risk, Euromoney Publications, London*, 89-96.

Lim, Steve C. and Macias, Antonio J. and Moeller, Thomas, Intangible Assets and Capital Structure (June 27, 2016). Paris December 2016 Finance Meeting EUROFIDAI - AFFI. AvailableatSSRN: https://ssrn.com/abstract=2514551 or http://dx.doi.org/10.2139/ssrn.2514551

Lipson, M. & Mortal, S. 2009. Liquidity and capital structure. . *J. Financ. Mark,* 12**,** 611-644.

Lipson, M. L. & Mortal, S. 2004. Capital Structure Decisions and Equity Market Liquidity. Columbia: University of Missouri.

Long, M., S, Ileen, B. & Malitz 1985. *Investment Patterns and Financial Leverage* In *Corporate capital structures in the United States* (pp. 325-352). University of Chicago Press.

Long, M. S. & Malitz, I. B. 1985. Investment patterns and financial leverage. *Corporate capital structures in the United States.* University of Chicago Press.

Loumioti, Maria, The Use of Intangible Assets as Loan Collateral (November 1, 2012). Available atSSRN:https://ssrn.com/abstract=1748675 or http://dx.doi.org/10.2139/ssrn.1748675

Mann, Catherine L. and Sanyal, Paroma, The Financial Structure of Startup Firms: The Role of Assets, Information, and Entrepreneur Characteristics (December 1, 2010). FRB of Boston Working Paper No. 10-17. Available at SSRN: https://ssrn.com/abstract=1768099 or http://dx.doi.org/10.2139/ssrn.1768099

Mark, J. F. & Hankins, W., K 2012. Estimating dynamic panel models in corporatefinance. *Journal of Corporate finance Elsevier,* 19**,** 1-19.

Marsh, P. 1982. The choice between equity and debt: An empirical study. *The Journal of finance,* 37**,** 121-144.

Martínez-Sola, C., García-Teruel, P. J. & Martínez-Solano, P. 2013. Corporate cash holding and firm value. *Applied Economics,* 45**,** 161-170.

Mcconnell, J. J. & Servaes, H. 1995. Equity ownership and the two faces of debt. *Journal of financial economics,* 39**,** 131-157.

Michael, F. 2015. Finance in Africa: Achievements and Challenges. *In:* BECK, T. (ed.). Washington,DC: The World Bank .

Miller, E. M. 1977a. Risk, uncertainty, and divergence of opinion. *The Journal of finance,* 32**,** 1151-1168.

Miller, M. H. 1977b. Debt and taxes. *the Journal of Finance,* 32**,** 261-275.

Minton, B. A. & Schrand, C. 1999 The impact of cash flow volatility on discretionary investment and the costs of debt and equity financing. *Journal of Financial Economics,* 54**,** 423-460.

Mishkin, F. S. 2007. *The economics of money, banking, and financial markets*, Pearson education.

Modigliani, F. and Miller, M.H., 1958. The cost of capital, corporation finance and the theory of investment. *The American economic review*, *48*(3), pp.261-297.

Modigliani, F. and Miller, M.H., 1959. The cost of capital, corporation finance, and the theory of investment: Reply. *The American Economic Review*, *49*(4), pp.655-669.

Modigliani, F. & Miller, M. H. 1963. Corporate income taxes and the cost of capital: a correction. *The American economic review***,** 53(3)433-443.

Moffatt, M. 2015. *Liquidity* About.com Education.

Morellec, E. 2001. Asset liquidity, capital structure, and secured debt. *Journal of financial economics,* 61**,** 173-206.

Morgado, A. & Pindado, J. 2003. The underinvestment and overinvestment hypotheses: an analysis using panel data. *European Financial Management,* 9**,** 163-177.

Mu, Y., Phelps, P. & Stotsky, J. G. 2013. Bond markets in Africa. *Review of Development Finance,* 3**,** 121-135.

Muñoz, F. 2012. Liquidity and firm investment: Evidence for Latin America. *Journal of Empirical Finance* ELSEVIER*,* 20**,** 18-29.

Murangi, R., N. 2010. *Optimal capital structure for JSE listed compoanies* University of South Africa, Pretoria, http://hdl.handle.net/2263/24438

Murungu, C. N., Marecha, M. W. & Vengesai, E. 2016. Impact of Stock Market Development on Pension Fund Performance. *International Journal of Innovative Research and Development|| ISSN 2278–0211,* 5.

Myers, S. C. 1977. Determinants of corporate borrowing. *Journal of financial economics,* 5**,** 147-175.

Myers, S. C. 1984. The capital structure puzzle. *The journal of finance,* 39**,** 574-592.

Myers, S. C. 2001. Capital structure. *The journal of economic perspectives,* 15**,** 81-102.

Myers, S. C. & Majluf, N. S. 1984. Corporate financing and investment decisions when firms have information that investors do not have. *Journal of financial economics,* 13**,** 187-221.

Norvaišienė, R., Stankevičienė, J. & Krušinskas, R. 2015. The impact of loan capital on the Baltic listed companies' investment and growth. *Engineering economics,* 57(2) 50-69.

Nwankwo, S. & Richards, D. C. 2001. Privatization-The myth of free market orthodoxy in sub-Saharan Africa. *International Journal of Public Sector Management,* 14**,** 165-180.

Ogrean, C. & Herciu, M. 2012. Theories of the Multinational Enterprises–Two Different Approaches. Studies in Business and Economics, Lucian Blaga University of Sibiu, Faculty of Economic Sciences,7(1) Available :https: //www. research gate.net /profile /Claudia_ Ogrean /publication/235334379_THEORIES_OF_THE_MULTINATIONAL_ENTERPRISES_TWO_DIFFERENT_APPROACHES/links/0912f510f988332bb6000000/ pdf.

Okechukwu, D. A. 2013. Trends in stock market in Sub-Saharan Africa. *J. Eco. ,* 4**,** 62-78.

Omet, G. & Mashharawe, F. The capital structure choice in tax contrasting environments: Evidence from the Jordanian. Kuwaiti, Omani and Saudi Corporate Sectors, paper presented at the 10th Annual Conference, Arab Economic Research Conference, Morocco, 2003.

Oosthuyse, D., Chataika, T. & Edwards, C. *Building African financial markets.* 2014.

Opler, T., Pinkowitz, L., Stulz, R. & Williamson, R. 1999. The determinants and implications of corporate cash holdings. *Journal of financial economics,* 52**,** 3-46.

Orpurt, S. F. & Zang, Y. 2009. Do direct cash flow disclosures help predict future operating cash flows and earnings? *The Accounting Review,* 84**,** 893-935.

Ovtchinnikov, A. V. 2010. Capital structure decisions: Evidence from deregulated industries. *Journal of financial economics,* 95**,** 249-274.

Pan, C.-M. 2005. Market structure and profitability in the international tourist hotel industry. *Tourism Management,* 26**,** 845-850.

Parsons, C. & Titman, S. 2009. Empirical capital structure: A review. *Foundations and Trends® in Finance,* 3**,** 1-93.

Pástor, Ľ. & Stambaugh, R. F. 2003. Liquidity risk and expected stock returns. *Journal of Political economy,* 111**,** 642-685.

Patel, Z., McKay, D., Van Rensburg, N.J. and Bhagwan, N., 2013. Investing in Africa: A practical perspective for the South African institutional investor available at http://www.africanagenda.com/convention2013registration/papers/

Pesaran, H.H., Shin, Y. (1998) Generalized impulse response analysis in linear multivariate models, Economics letters, 58: 17-29.

Polk, C. & Sapienza, P. 2008. The stock market and corporate investment: A test of catering theory. *The Review of Financial Studies,* 22**,** 187-217.

Porter, M. E. 1992. Capital choices: Changing the way America invests in industry. *Journal of Applied Corporate Finance,* 5**,** 4-16.

PricewaterhouseCoopers (PwC) (2015) Africa Capital Markets Watch available at https://www.pwc.co.za/en/assets/pdf/africa-capital-markets-watch-2015.pdf

PricewaterhouseCoopers (PwC) (2016) Africa Capital Markets Watch. Available at

PricewaterhouseCoopers (PwC) (2016) Africa Capital Markets Watch. Available at https://www.pwc.co.za/en/publications/africa-capital-markets-watch.htm

Qiu, M. & La, B. 2010. Firm characteristics as determinants of capital structures in Australia. *International journal of the Economics of Business,* 17**,** 277-287.

Rajan, R. G. & Zingales, L. 1995. What do we know about capital structure? Some evidence from international data. *The journal of Finance,* 50**,** 1421-1460.

Rasa, N., Stan, K. & Rytis, K. 2008a. *The Impact of Loan Capital on the Baltic Listed Companies' Investment and Growth*.

Norvaišienė, R., Stankevičienė, J. and Krušinskas, R., 2008. The impact of loan capital on the Baltic listed companies' investment and growth. *Engineering economics*, *57*(2).

Ravid, S. A. 1988. On interactions of production and financial decisions. *Financial Management***, 17(3)** 87-99.

Ray, A. & Dutta, A. 2014. Information Imbalance: A Case Study of Print Media in India. *International Journal of Scientific and Research Publications***,** 7(4) 572.

Richardson, S. 2006. Over-investment of free cash flow. *Review of accounting studies,* 11**,** 159-189.

Richard Armand DeFusco and Association for Investment Management, 2004. *Quantitative methods for investment analysis*. CFA Inst.

Riddick, L. A. & Whited, T. M. 2009. The corporate propensity to save. *The Journal of Finance,* 64**,** 1729-1766.

Rod, C., Felix, F. & Z, M. 2015. Global financial stability report: vulnerabilities, legacies, and policy challenges: risks rotating to emerging markets *International Monetary Fund | October 2015,* IMF.

Rodov, I. & Leliaert, P. 2002. FiMIAM: financial method of intangible assets measurement. *Journal of intellectual capital,* 3**,** 323-336.

Roodman, D. 2006a. How to do xtabond2: An introduction to difference and system GMM in Stata. *Center for Global Development working paper*. Working Paper No. 103. Available atSSRN: https://ssrn.com/abstract=982943 or http://dx.doi.org/10.2139/ssrn.982943

Ross, S. A. 1977. The determination of financial structure: the incentive-signalling approach. *The bell journal of economics***,** 8(1)23-40.

Sadka, R. & Scherbina, A. 2007. Analyst disagreement, mispricing, and liquidity. *The Journal of Finance,* 62**,** 2367-2403.

Sahay, R., Čihák, M., N'diaye, P. & Barajas, A. 2015. Rethinking financial deepening: Stability and growth in emerging markets. *Revista de Economía Institucional,* 17**,** 73-107.

Sajid, M., Mahmood, A. & Sabir, H. M. 2016. Does financial leverage influence investment decisions? Empirical evidence from KSE-30 index of Pakistan. *Asian Journal of Economic Modelling,* 4**,** 82-89.

Sally, F. 2013. Financial Integration in African Emerging Markets. *Regional Integration In Africa.* Johannesburg, South Africa.

Šarlija, N. & Harc, M. 2012. The impact of liquidity on the capital structure: a case study of Croatian firms. *Business systems research journal: international journal of the Society for Advancing Business & Information Technology (BIT),* 3**,** 30-36.

Scott Jr, J. H. 1976. A theory of optimal capital structure. *The Bell Journal of Economics*, 7(1) 33-54.

Seifert, B. & Gonenc, H. 2010. Pecking order behavior in emerging markets. *Journal of International Financial Management & Accounting,* 21**,** 1-31.
Sengupta, Kunal and Dasgupta, Sudipto, Financial Constraints, Investment and Capital Structure: Implications from a Multi-Period Model (January, 2002). Hong Kong University of Science and Technology Working Paper; EFA 2002 Berlin Meetings Discussion Paper. Available at SSRN: https://ssrn.com/abstract=298320 or http://dx.doi.org/10.2139/ssrn.298320
Seoungpil, A., David, J., Denis, D. & Denis, K. 2005. Leverege and Investment in diversified firms. *Journal of Financial Ecnomics,* 79**,** 317-337.
Servén, L. 2003. Real-exchange-rate uncertainty and private investment in LDCs. *The Review of Economics and Statistics,* 85**,** 212-218.
Shapiro, A. & Titman, S. 1986. *An integrated approach to corporate risk management. In: ,* NewYork.NY: BasilBlackwell.
Shyam-Sunder, L. & Myers, S. C. 1999. Testing static tradeoff against pecking order models of capital structure. *Journal of financial economics,* 51**,** 219-244.
Smith, C. W. 1986. Investment banking and the capital acquisition process. *Journal of Financial Economics,* 15**,** 3-29.
Solomon, E. 1963. The theory of financial management.
Song, H.-S. 2005. *Capital structure determinants an empirical study of Swedish companies*. KTH Royal Institute of Technology.
Souza, L. M. V. D., Ellis, C. & 2015. Private leverage trends in developed and developing economies. *Global Credit Research:* Moody.
Stein, J. 1989. Efficient capital market, inefficient firms: a model of myopic corporate behavior. . *Q. J. Econ.,* 104**,** 665.
Stein, J. C. 1988. Takeover threats and managerial myopia. *Journal of Political Economy,* 96**,** 61-80.
Stiglitz, J. E. & Weiss, A. 1981. Credit rationing in markets with imperfect information. *The American economic review,* 71**,** 393-410.
Stulz, R. 1982. Options on the minimum or the maximum of two risky assets: analysis and applications. *Journal of Financial Economics,* 10**,** 161-185.
Stulz, R. 1990. Managerial discretion and optimal financing policies. *Journal of financial Economics,* 26**,** 3-27.
Svirydzenka, K. 2016. *Introducing a New broad-based Index of financial development*. IMF Working Paper No. 16/5. Available at SSRN: https://ssrn.com/abstract=2754950
Thakor, A. V. & Whited, T. M. 2010. Shareholder-manager disagreement and corporate investment. *Review of Finance,* 15**,** 277-300.
Tufano, P. 1996. Who manages risk? An empirical examination of risk management practices in the gold mining industry. *the Journal of Finance,* 51**,** 1097-1137.
Umutlu, M. 2010. Firm leverage and investment decisions in an emerging market. *Quality & Quantity,* 44**,** 1005-1013.
Venables, A. J. 2010. Economic geography and African development. *Papers in Regional Science,* 89**,** 469-483.
Vilasuso, J. & Minkler, A. 2001. Agency costs, asset specificity, and the capital structure of the firm. *Journal of Economic Behavior & Organization,* 44**,** 55-69.
Vogt, S. C. 1994. The cash flow/investment relationship: evidence from US manufacturing firms. *Financial management***,** 3-20.

Weinberg, John A., Firm Size, Finance, and Investment (1994). FRB Richmond Economic Quarterly, vol. 80, no. 1, Winter 1994, pp. 19-40. Available at SSRN: https://ssrn.com/abstract=2125388

Whited, T. M. 1992. Debt, liquidity constraints, and corporate investment: Evidence from panel data. *The Journal of Finance,* 47**,** 1425-1460.

Whittington, G., Saporta, V. & Singh, A. 1997. *The effects of hyper-inflation on accounting ratios: financing corporate growth in industrial economies*, Washington DC: World Bank Publications.

World Bank. 2016. *World Development Indicators 2016. Washington, DC. © World Bank. https://openknowledge.worldbank.org/handle/10986/23969 License: CC BY 3.0 IGO."*

World Bank. 2015. *World Development Indicators 2016. Washington, DC. © World Bank.* https://data.worldbank.org/data-catalog/world-development-indicators

Wyatt, E. 2011. New Capital Rules for Banks. December 20, 2011 ed. *The New York Times.*

Xiong, J. 2016. Stock Liquidity and Frim Investment—Evidence from Chinese Listed Companies. *Journal of Business Theory and Practice,* 4**,** 25.

Yae, Seung M., Variable Information Quality, Ambiguity, and Stock Returns (July 28, 2012). AvailableatSSRN: https://ssrn.com/abstract=2021464 or http://dx.doi.org/10.2139/ssrn.2021464

Yartey, C.A., 2009. The stock market and the financing of corporate growth in Africa: the case of Ghana. *Emerging Markets Finance and Trade*, *45*(4), pp.53-68.

Yartey, C. A. & Adjasi, C. K. 2007. *Stock market development in Sub-Saharan Africa: Critical issues and challenges*, International Monetary Fund available: https://books.google.co.za/books?id=upHn_6t4WBoC

Young, A. 1998. Towards an interim statistical framework: selecting the core components of intangible investment. *Measuring Intangible Investment, OECD, Paris (*http://www1*. oecd. org/dsti/sti/industry/indcomp/prod/intang. htm)*.

Yuan & Motohashib 2014. Impact of Leverage on Investment by Major Shareholders: Evidence from Listed Firms in China*China Economic Journal,,* Vol. 7**,,** 299-319.

Zamfir, L. 2016. Growth of Africa. *Members' Research Service January 2016 — PE 573.891.* European Parliamentary Research Service.

Zane, G. 2012. Corporate finance theories. challenges and trajectories. *Management & Marketing Challenges for the Knowledge Society,* 7**,** 277-294.

Zarutskie, R. 2006. Evidence on the effects of bank competition on firm borrowing and investment. *Journal of Financial Economics,* 81**,** 503-537.

APPENDICES

Appendix A: list of African countries and sample construction

Country	Total securities	Non Financial	No data & < 5 years data	Final sample
Botswana		20	4	16
Cape Verde		4	0	4
Egypt		167	47	120
Ghana		29	2	27
Kenya		51	2	49
Malawi		6	1	5
Mauritius		69	6	63
Morrocco		3	1	2
Mozambique		67	13	54
Namibia		21	2	19
Nigeria		122	31	91
Rwanda		3	0	3
Sierra Leon		0	0	0
South Africa		279	50	229
Swaziland		3	2	1
Tanzania		13	1	12
Tunisia		126	46	46
Uganda		8	1	7
Zambia		22	6	16
Zimbabwe		61	10	51
AFRICA		**1074**	**259**	**815**

Source Own construction based on data obtained from Bloomberg Online Database.

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

11 July 2017

Mr Edson Vengesai (215082581)
School of Accounting, Economics & Finance
Westville Campus

Dear Mr Vengesai,

Protocol reference number: HSS/1029/017D
Project title: Essays on Leverage, Investment, Liquidity and Cash-Flow Volatility: African Evidence

Approval Notification – Expedited Application

In response to your application received on 07 June 2017, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol has been granted **FULL APPROVAL.**

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number.

PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

[redacted]
Dr Shamila Naidoo (Deputy Chair)

/ms

Cc Supervisor: Dr Kwenda Farai
Cc Academic Leader Research: Dr Harold Ngalawa
Cc School Administrator: Ms Seshni Naidoo

Humanities & Social Sciences Research Ethics Committee
Dr Shenuka Singh (Chair)
Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban 4000
Telephone: +27 (0) 31 260 3587/8350/4557 **Facsimile:** +27 (0) 31 260 4609 **Email:** ximbap@ukzn.ac.za / snymanm@ukzn.ac.za / mohunp@ukzn.ac.za
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