EFFECT OF UNCERTAINTY ON CORPORATE INVESTMENT: EVIDENCE FROM KENYA'S NSE LISTED FIRMS

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DECLARATION

I declare that this project is my original work and has not been submitted for the award of a degree in any other university or institution.

KIMAIYO KOMEN TIMOTHY

SIGNATURE……. DATE…….

This research paper is submitted for examination with my approval as the university supervisor.

DR. OWEN NYANG'ORO

SIGNATURE…… DATE…….

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DEDICATION

To my parents Samuel and Rose, and my brother Edwin.

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The views expressed in this paper are my own and I solely bear responsibility for any errors and or omissions.

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ABSTRACT

This study examines the effects of uncertainty on corporate investment in Kenya. The main motivation of the study is to test whether uncertainty depresses or accelerates investments based on the real option and strategic growth theories. The study uses firm-level data of non-financial listed firms from company's financial reports and Nairobi Securities Exchange (NSE) for the period 2000-2016. Standard panel data estimators are used to examine the effects over the period. Uncertainty being a variable of interest is obtained from daily stock market prices by applying the Generalized Autoregressive Heteroscedasticity, GARCH (1,1) technique. The study also uses the standard deviation of daily stock market prices to model uncertainty for robustness purposes. Use of daily stock market prices to model uncertainty is informed by the efficient market hypothesis. Our estimates result suggest that uncertainty has a positive effect on investments. This result is consistent with the strategic growth options theory of investment.

Keywords: Uncertainty, Investment, Panel Data, Kenya

JEL Codes: D81, G11, C23

CHAPTER ONE

INTRODUCTION

1.0 Background

Assessment of the effects of uncertainty on investment has concerned economists for a long time. Before the work of Knight (1921) on risk, uncertainty, and profit, the term risk and uncertainty were used interchangeably in the economic literature. However, according to Knight (1921), whereas risk can be described in probability terms, uncertainty cannot. Uncertainty is, therefore, perverse in the economic environment and as such, it greatly influences the behavior and decisions of economic agents.

Investment decision is one of the critical decisions that are made by corporate firms[1]. The decision on whether, when and what investment project to undertake is often at the epicenter of maximizing the value of a firm. Economic literature provides two main approaches used by firms in determining optimal investments. First, the deterministic approach which is founded on the conventional net present value calculations. In this approach, firms focus on calculating and comparing the present values of expected cash flows and a cash outlay of an investment project. According to this approach, an investment project is undertaken if the present value of its expected cash-flow exceeds the investment costs. However, in reality, this deterministic method faces major setbacks in evaluating investment projects; it overlooks fundamental investment aspects such as investment timing, irreversibility and more importantly uncertainty in the economic environment.

Second, normative approach, which is divided into two; the real options and growth options approach. The real options approach was developed by Bernanke (1980), Mcdonald and Siegel

[1]Other crucial decisions include; financing and dividend decisions.

(1986), and Dixit and Pindyck (1994) as a way of addressing inherent weaknesses of the NPV approach. According to this approach, firms' investment decision is analogized to finance call option where firms have the right but not the obligation to undertake investment projects. The approach states that during uncertain economic environment, firms depress their investment plans by applying wait and see approach until the uncertainty cloud clears. In essence, uncertainty in economic environment reduces firm level investments.

Contrary to real options approach, the strategic growth options approach developed by Kulatilaka and Perotti (1998) asserts that uncertainty in economic environment enhances firm level investments. According to this approach, uncertainty presents an opportunity for firms to undertake research and development (R&D) investments that yield more growth options to a firm leading to more investments in future. Uncertainty, therefore, according to this approach, is investment enhancing.

Empirical research and public debate over the past decade on the effects of uncertainty on corporate investments has rapidly increased. The main reasons for the renewed interest on this subject are four-fold. First, the uncertainty caused by 2008 global financial crisis. The US-originated financial crisis had global spillover effects that greatly affected economic activities and shaped economic policies in both developed and developing countries. Second, marked a rise in political tensions and terror attacks. Third, development of better proxies and methods of modeling uncertainty effects. Fourth, lack of unequivocal conclusion on the nature of the relationship between uncertainty and corporate investment. Some past studies conclude linear relationship between uncertainty and investments while others indicate the presence of non-linear, non-monotonic relationship (See for example; Lensink and Murinde, 2006; Lensink, 2002). With regard to linear relationship, some studies indicate uncertainty impedes investments (see, for instance, Wang et al., 2017) as others indicate uncertainty enhances firm level investments (Lee, 2016).

1.2 Overview of uncertainty in Kenya

The Kenyan economy has experienced a number of uncertainty shocks over the past decade. The transfer of political power from the Kenya African National Union (KANU) to National Rainbow Coalition (NARC) in 2002, post-election violence in 2007, the global financial crisis of 2007/2008, terror attacks and the heightened domestic and geopolitical events are some of the uncertainty shocks that Kenya has faced.

Theoretically, the effects of uncertainty in an economy are well captured by the stock market performance. Figure 1 shows the movements of Nairobi Stock Exchange 20-share price index[2], which acts as an indicator of stock market performance in Kenya for the period 2000 to 2015.

From figure 1, we observe that NSE 20-Share price index in Kenya generally declined during the uncertainty periods although the effects were brief. Particularly, the graph indicates that the stock prices plummeted momentarily during the electioneering period of 2007, 2013 and the 2008 global financial crisis. This declining effect was, however, immediately followed by an improved performance of the stock prices.

[2] The efficient market hypothesis (EMH) states that stock market prices capture and reflects all the information available in the economy. EMH exists in three forms, the weak form, semi-strong and strong form. In this regard, we refer to the semi-strong form which posits that prevailing stock market prices take into account all publicly available information.

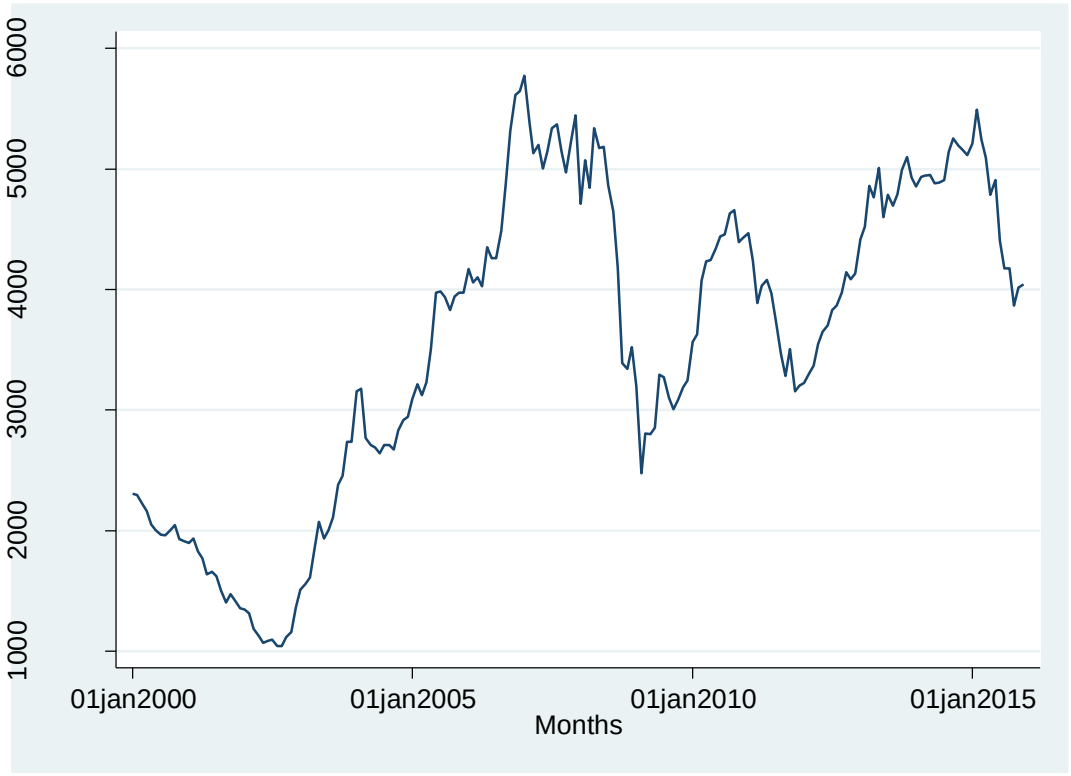

Figure 1: *Movements of monthly NSE 20-share prices index (2000-2015). Source: author's computation*

The above-mentioned examples of uncertainty shocks in the Kenyan economy were transmitted to both the macro and microeconomic indicators. The effects have been, at best mixed. At the macro level, while Kenya's real GDP per capita and net foreign direct investments inflow scaled down during the periods of high uncertainty, imports and capital formation generally showed an upward trend during the same period. Figure 2 presents the movements of some macroeconomic indicators in the Kenyan economy for the period 2000 to 2014.

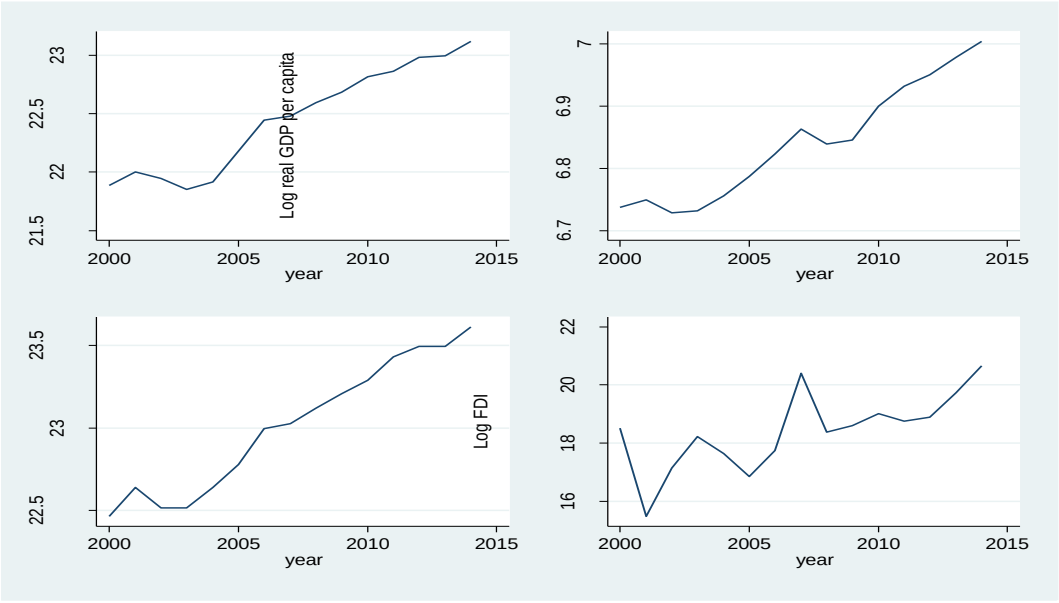

Figure 2: *Movements of key macroeconomic indicators (2000-2014). Source: author's computation*

Similarly, at the microeconomic level, the effects of uncertainty have also been largely varied. A survey of investments[3] made by some selected 23 NSE listed non-financial firms indicate variations in the investment fluctuations as presented in figure 3. In the figure, investments made by firms, on average, have been rising despite some temporary gradual decrease over the period 2000 to 2016.

[3] We measured investments by taking the sum of the change in capital stock and the depreciation. This measure was normalized by capital stock.

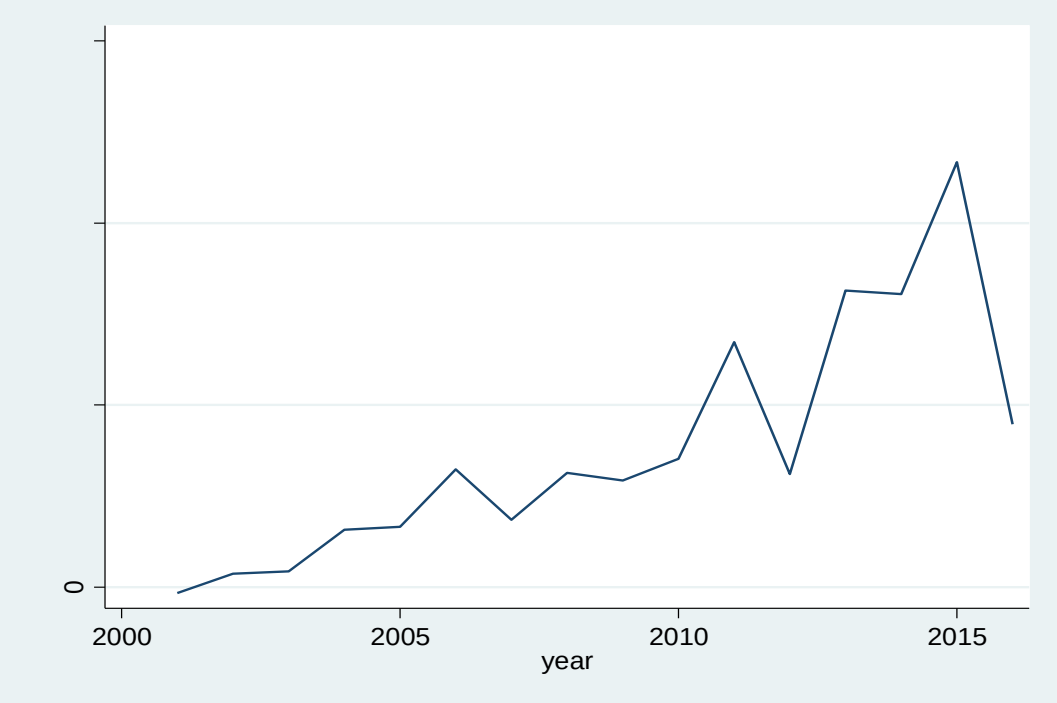

Figure 3: *Movements of average investments for 23 selected firms (2000-2016). Source: author's computation*

Economic research on the effects of uncertainty shocks in the Kenyan economy is scarce. Except for the research by Mwega (2010) on the effects of 2008 global financial crisis on the Kenyan economy and Dupas and Robinson (2010), to the author's knowledge, no documented empirical research exists on this subject. According to Mwega (2010), the 2008 global financial crisis had mixed effects on Kenya's economy. In 2005, net portfolio equity stood at a peak of US$15 million but later slumped way below US$1 million during the crisis. Similarly, the NSE 20-share index fell from 4696.22 on 31 July to 3521.18 in December 2008 leading to a 46% annual fall in share prices. This downward trend in the stock market indicators came at the backdrop of 2007 post-election violence (Mwega, 2010). Similar to the fall in capital market indicators, Kenya's current account declined during the period. The crisis led to the widening current account deficit from $1.10 billion in 2007 to $2.12 billion in 2008 mainly accredited to the fall in exports and rise in import levels. In contrast to the harmful effects of 2008 global

financial crisis, Mwega (2010) notes that Kenya experienced increased remittances and foreign aid from $573.6 and $1345 in 2007 to $611.2 and $1523 in 2008 respectively during 2008 global financial crisis.

1.3 Objectives of the study

The main objective of this study is to analyze the effects of uncertainty on corporate investment in Kenya's NSE listed firms. The specific objectives include:

i. To determine the nature of the investment-uncertainty relationship in the Kenya's NSE listed firms.
ii. To explore whether the uncertainty-corporate investment relationship mimics an inverted U-shaped curve.
iii. To draw policy implications from the findings.

1.4 Statement of the problem

Uncertainty shocks have more pronounced effects on investments as compared to consumption and government expenditure (Bloom, 2017). This observation is explained by two main reasons. First, according to Bloom (2017), investments made by firms are more influenced by uncertainty mainly because of the forward-looking nature of firms. In theory, uncertainty can either make firms to be hesitant in undertaking investment projects by adopting a wait and see approach until prospects of better economic environment become clearer or accelerate their investments to tap the growth opportunities provided by the uncertainty. Second, uncertainty presents difficulty in determining optimal investment returns due to the randomness and unpredictability of future returns caused by the uncertain economic environment (Xu, Wang, and Xin, 2010). It is argued that uncertainty effects on investments are more amplified in the case of developing economies (Bloom, 2014; World Bank Development Report, 2014).

Over the last decade, there has been renewed research and public debate on the effects of uncertainty on investments. The rise in research interest in this subject is explained by the unprecedented rise in uncertainty shocks and the evident importance of these shocks on economic activities, particularly investments. Economic research on this subject has also increased despite mixed views on how uncertainty shocks impacts investments. Two main views exist. First, the uncertainty-investment relationship is linear. This first view is further divided into those studies that find uncertainty depresses investments and those that reveal uncertainty enhances investment. Second, a non-linear relationship. Some studies report that uncertainty increases the probability of making investments to a given threshold upon which further increase in uncertainty reduces investments. Studies that hold this view suggest that uncertainty-investment relationship mimics an Inverted U-shaped curve.

Given that uncertainty has a more pronounced influence on investments, empirical evidence on this subject is mixed, and that studies done on the overall effects of uncertainty on investments in Kenya are scarce, this study seeks to analyze how uncertainty affects investments made by NSE listed firms. Kenya is a small developing economy that is vulnerable to uncertainty shocks due to lack of a well-diversified economy, dependence on imported oil, susceptible to fluctuating international commodity prices and prone to political tensions and terror attacks. In this study, we, therefore, seek to answer the following set of questions: What is the nature of the relationship between uncertainty and corporate investment in Kenya's NSE listed firms? and more importantly, does the uncertainty-investment relationship mimic inverted U-shaped curve?

1.5 Significance of the Study

This study is important in three main ways. First, there exists scant literature that studies the uncertainty effects on corporate investments in developing countries and in particular Kenya.

This in itself presents a knowledge gap that the study seeks to fill. Second, this study covers a unique period in Kenyan economy (2000 to 2016) in the manner that Kenya experienced heightened uncertainty shocks during this timeline. Some of the uncertainty shocks during this period include; transfer of political power from KANU to NARC in 2002, post-election violence in 2007, the global financial crisis of 2007/2008, terror attacks and the heightened domestic and geopolitical events. Third, analysis on this subject will be important for firm owners, investors, policymakers, and researchers as they will get more insights on the importance of uncertainty on corporate investments.

1.6 Scope of the study

This study uses firm-level data from the consolidated financial statements for a panel of non-financial firms listed on Kenya's NSE to explore the effect of uncertainty on corporate investments. The study covers the period 2000 to 2016 where the number of non-financial firms examined was determined by data availability. During this period, NSE-listed firms were required to provide full disclosures on their financial statements and other information to the public.

1.7 Organization of the study

The rest of the paper is structured as follows. Chapter 2 gives the main theories that explain the mechanisms through which uncertainty influences investment, empirical literature on the uncertainty-investment relationship and an overview of the literature on this subject. Chapter 3 discusses theoretical framework of firm investment behavior, an econometric model that links uncertainty to investments, data to be used, variables definition and measurements and lastly estimation technique. Chapter 4 discusses on data analysis and the econometric results. Chapter 5 gives the conclusions, policy recommendations, limitations and areas for further research.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This section examines the two main theories that explain the mechanisms through which uncertainty influences firms' investment decisions, the empirical literature on the uncertainty-investment relationship and an overview of the literature on this subject.

2.1 Theoretical Literature Review

2.1.1 The Real Options Theory of Investment

The real options theory of investment was developed by Bernanke (1983), Mcdonald and Siegel (1986) and Dixit and Pindyck (1994) to counter the underlying weaknesses of the deterministic NPV approach of investment determination. The theory is based on a fundamental premise of irreversible[4] investment projects and firms' ability to delay, suspend and abandon investments in the uncertain economic environment. The theory assumes firms have control over investment opportunities and they operate in a competitive market.

The real options theory of investment analogizes the financial call option[5] and treats investment opportunities as having option-like features that can be exercised optimally. According to Dixit and Pindyck (1994), firm's investment behavior is considered like a process of exercising a financial call option where the holder of an option has the right but not the obligation to exercise or "kill" the option. By the firm investing, it exercises its option to invest and losses the

[4] Irreversibility of investment project arises from the underlying problems of sunk costs attributed to the investment expenditures.

[5] A financial call option relates to a financial derivative that gives a holder of an asset the right but not an obligation to buy an asset in future.

advantages attributed to waiting for valuable information that might influence the timing and attractiveness of the investment project.

According to the theory, uncertainty depresses firm-level investment and firms should only invest if the value of the investment project exceeds its investment expenditures by an amount equal to the option value of waiting to invest (Dixit and Pindyck, 1994; Sarkar, 2000). This theory has recently been advanced by Sarkar (2000) to include determination of the probability that an investment project exceeds an endogenously determined threshold level within a specified time.

2.1.2 The Strategic Growth Options Theory of Investment

This theory was developed by Kulatilaka and Perotti (1998) in an attempt to explain investment making decisions under uncertainty in an imperfectly competitive economy. Contrary to the real options theory, this theory asserts that uncertainty in the economic environment might enhance firm level investments under imperfect competition. According to the theory, uncertainty generates growth options that can be tapped by existing firms where they undertake investment opportunities that will discourage potential market entrants leading to maintained market share and profits dominance (Kulatilaka and Perotti, 1998).

2.2 Empirical Literature Review

The empirical literature on investment-uncertainty relationship based on the real options theory of investment is twofold. First, there exists a strand of research that provides evidence of a linear, monotonic investment-uncertainty relationship. This strand of literature asserts that uncertainty can either increase or decrease investment levels. Second and the most recent, the

strand of empirical literature based on Sarkar (2000)[6] model of investment provides evidence of a non-linear, non-monotonic investment-uncertainty relationship. The empirical evidence from this strand of literature presents that investment increases at low levels of uncertainty and decreases at higher levels of uncertainty implying the presence of threshold effects of uncertainty on investments. In this section, we, therefore, analyze both strands of empirical literature.

With regards to the first strand, a study by Mohn and Misund (2009) on the effect of uncertainty on the irreversible investment projects in the international oil and gas industry found the existence of a linear investment-uncertainty relationship. In particular, their study found out that whereas macroeconomic uncertainty reduces investment in the oil and gas industry, the industry-specific uncertainty induces investment. To model uncertainty measure, Mohn and Misund (2009) go beyond the use of a single measure for uncertainty and develop an independent measure of uncertainty for macroeconomic environment proxied by the capital market returns volatility and industry-specific environment proxied by oil price volatility. Mohn and Misund (2009) base their results on estimating four different specification equations on the data derived from 115 companies over the period 1992-2005.

Morikawa (2016) studied the relationship between business uncertainty and investments made by Japanese companies using survey data for the period totaling 42 quarters, March 2004 to September 2014. The study found evidence of business uncertainty reducing companies'

[6] Sarkar (2000) model of investment is an advanced version of the seminal work of McDonald and Siegel (1986) and Dixit and Pindyck (1994) on options pricing models. Sarkar (2000) model makes two advancements of the McDonald and Siegel (1986) and Dixit and Pindyck (1994) models. First, he replaces state variable from firm value to stream earnings. Secondly, Sarkar (2000) model takes into account the systematic risk inherent in the economic environment.

investments. The study, however, didn't account for the potential endogeneity of business uncertainty in the regression model.

Kang et al., (2014) studied the effects of uncertainty on investments made by 2,700 US manufacturing firms for the period 1985 to 2010. By the using error correction model and proxying uncertainty by economic policy uncertainty (EPU) index, their study supported evidence of uncertainty depresses firm level investments. Similarly, a study by Huang et al., (2014) found evidence that uncertainty dampens investments made by Chinese listed companies. Their study covered period 2003 to 2012. In the same breath, Wang et al., (2017) show evidence of uncertainty reducing corporate R&D investments in China. Their study covered period 2009 to 2012 for 1868 Chinese listed firms.

Similarly, Xu, Wang, and Xin (2010) found in China's listed companies, there exist a linear investment-uncertainty relationship. Xu, Wang, and Xin (2010) reported that whereas a negative investment-uncertainty relationship exists for privately controlled Chinese firms, a positive investment-uncertainty relationship exists for government-controlled companies. Cukierman (1980) observes similar results of a linear and negative investment-uncertainty relationship under the assumption of a risk-neutral firm. Cukierman (1980) observes that investment decisions by a firm can be delayed by the rise in the uncertainty levels due to firms' attempts of gathering more information on the conditions for the investment project.

In contrast to those studies that reveal uncertainty depresses investment, Caballero (1991) presents evidence of investments enhancing effect from uncertainty. Caballero (1991) observes that under the competitive conditions and constant returns to scale assumptions, a positive investment-uncertainty relationship exists. Caballero (1991) argues that investment decisions rely heavily on the marginal profitability and both the current and future prices of capital. Similar results of uncertainty enhancing investments are provided by Lee (2016) in a recent

study. According to Lee (2016), the possibility of future uncertainty in the economy prompts firms to undertake research and innovation that increases firm productivity which leads to more growth options that translate to investment opportunities. Lee (2016) asserts that by firm innovating better ways of gaining from future uncertainty, their investment opportunities in turn increases. Focusing on R&D investments, Vo and Le (2017) further reveal that uncertainty enhances R&D investments. Their result is indicative of the argument that high uncertainty produces growth options that are exploited by firms through R&D investments undertakings. New R&D investments prompted by high uncertainty scares way possible new entrants leading to continuing market dominance by existing firms in terms of profits and market shares. More positive effects are evident if firms in a more competitive industry.

Different from studies that indicate linear evidence on this subject, some studies also identify non-linear evidence. Lensink and Murinde (2006) examined the effects of uncertainty on corporate investments made by 197 UK firms for the period 1995-99 and find evidence of a non-linear relationship. They find that UK firms increase their investments at low levels of uncertainty but decreases their investment undertaking when uncertainty is high in the economy. In their study, they use GARCH (1,1) modeling technique based on the information of each firm daily stock market returns to derive uncertainty variable.

Similar results on the non-linear investment-uncertainty relationships are obtained by Lensink (2002). In his analysis on the uncertainty effects on aggregate investment in a set of developed economies, Lensink (2002) find differences in the impact of low and high levels of uncertainty on aggregate investments. In the paper, Lensik (2002) estimates two sets of regression equations with and without a quadratic term for uncertainty. Lensink (2002) found that whereas the linear uncertainty term is positive and significant, the quadratic uncertainty term is significantly negative implying the presence of an Inverted U-shaped curve and the threshold

effects of uncertainty on investments. The study by Yilmaz (2014) on uncertainty effects on power plant investments in the Turkish electricity sector also confirms the non-monotonic, U-shaped investment-uncertainty relationship.

2.3 Overview of the Literature

The reviewed theories of investments under uncertainty provides the theoretical mechanisms through which uncertainty affects firm's investments. The standard real options theory of investment under uncertainty asserts uncertainty depresses investments because firms adopt a wait and see approach in uncertain times while the strategic growth option theory avers that uncertainty enhances investments as firms seize the investment opportunity created by uncertainty. The real options theory is built on two main assumptions; first, firms have a monopoly over investment opportunities and second, product markets are competitive. The strategic growth option is based on the fundamental assumption of the imperfect competitive economy.

The empirical literature reviewed largely presents mixed, inconclusive evidence on the effect of uncertainty on corporate investment. Whilst one axis of empirical evidence provides, a linear relationship, another provides a non-linear relationship. Regarding studies that indicate linear relationship, the majority of past studies reveal that uncertainty reduces firm level investments. The argument for this evidence is that higher uncertainty makes firms to adopt wait and see approach for new and better investment information and prospects. In contrast to investment reducing effects of uncertainty, some studies indicate investment enhancing effects of uncertainty. Proponents of this view argue that uncertainty stimulates firms to innovate better ways of dealing with uncertainty which increases firms' productivity which translates to more investment opportunities. Further, the literature reviewed indicates that different approaches to measuring uncertainty exist. In the recent studies done in the developed economies, the

economic policy uncertainty (EPU) index has been used to measure uncertainty. Other studies have also employed the Generalized Autoregressive Heteroscedastic (GARCH 1,1) technique in modeling uncertainty based on firm's stock prices.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter gives the theoretical framework of firm investment behavior, an econometric model that links uncertainty to investments, data to be used, variables definition and measurements and lastly estimation technique together with model diagnostic tests.

3.1 Theoretical Framework

The theoretical framework of this paper follows Bond and Van Reenen (2007) micro-econometric model of investment. In this model, firms' investments are considered as factor inputs and are therefore embedded in firms profit function. Assume a profit-maximizing function of a representative firm is given as;

$$\pi_t = P_t y_t - P_t^{\,k}[I_t + G(I_t, K_t)] \quad (1)$$

Where P_t denotes market price for output y_t, I_t is an investment good undertaken by a firm, k_t capital stock , $P_t^{\,k}$the price of capital good i.e factor price and $G(I_t, K_t)$ relates to the adjustment cost function that a firm faces while making investments and output decisions for example the transactions and installation costs other than the purchase price that a firm incurs.

We can, therefore, represent the firm's dynamic profit maximizing function as;

$$\text{Max } E_t\left[\sum_{t=0}^{\infty} \beta^i \, \pi_{t+1}(k_{t+1}, I_{t+1})\right] \quad (2)$$

Where E_t denotes an expectation parameter.

Under the assumption of a profit-maximizing firm, our representative firm seeks to maximize its profits in equation (2) subject to capital accumulation constraint stated as;

$$K_t = (1-\delta)K_{t-1} + I_t \quad (3)$$

Where δ is the rate at which capital stock depreciates. Setting up an optimization problem based on equation (2) and (3), we can obtain the first order conditions (F.O. Cs) for profit maximization written as;

$$\frac{\partial \pi}{\partial I_t} = -\lambda_t \quad (4)$$

$$\frac{\partial \pi}{\partial k_t} = \lambda_t - \beta(1-\delta)E_t[\lambda_{t+1}] \quad (5)$$

Assuming that our representative firms' production function is well-behaved and that it operates in a competitive economy, i.e factor inputs earn their marginal products, we can write the Euler equation which is obtained in our above formulation as;

$$\pi_t = K_t \frac{\partial \pi}{\partial k_t} + I \frac{\partial \pi}{\partial I_t} \quad (6)$$

Now, by substituting equation (3)- (5) into equation (6), we re-write our Euler equation as

$$\pi_t = K_t[\lambda_t - \beta(1-\delta)E_t[\lambda_{t+1}] - \lambda_t[K_t - (1-\delta)K_{t-1}] \quad (7)$$

Which can be further simplified to obtain;

$$\pi_t = \beta K_t(1-\delta)E_t[\lambda_{t+1}] + \lambda_t(1-\delta)K_{t-1} \quad (8)$$

Equation (8) can be manipulated to yield equation (9) presented as

$$\lambda_t(1-\delta)K_{t-1} = \pi + \beta E[\lambda_{t+1}(1-\delta)K_t] \quad (9)$$

Equation (9) can be solved forward to obtain the maximized value of our representative firm presented as equation (10)

$$\lambda_t(1-\delta)K_{t-1} = E_t\left[\sum_{t=0}^{\infty}\beta^i\,\pi_{t+i}\right] = V_t \quad (10)$$

Notice that from equation (5), λ_t can be interpreted as the shadow value of capital i.e the value attributed to the firm from a marginal unit of capital employed. We can therefore obtain the marginal q by dividing λ_t over ${P_t}^k$ i.e factor price of capital good to get an expression

$$\text{q} = \frac{\lambda_t}{{P_t}^k} \quad (11)$$

From equation (10), we can make λ_t the subject and substitute it to equation (11) to obtain;

$$q = \frac{V_t}{{P_t}^k(1-\delta)K_{t-1}} \quad (12)$$

The above-formulated equation (12), presents the average q. Following Summers (1981), we assume our representative firm faces a quadratic adjustment cost function in making its investment, capital and output decisions. Notice that the choice of adjustment cost specification depends on theoretical analysis under consideration as it can take any form (Gould,1968). We can, therefore, express our quadratic adjustment cost function as;

$$\text{G}(k_{t+1}, I_{t+1}) = \frac{b}{2}\left[\frac{I_t}{K_t} - a\right]^2 K_t \quad (13)$$

Where; *a* and *b* denotes parameters of adjustment cost function. The parameter *b* denotes the importance of adjustment costs while *a* denotes the threshold level where an additional investment made by firm leads to the adjustment cost being incurred i.e adjustment cost is assumed is to be costless until some normal level of investment is reached (Summers, 1981; Mohn and Misund, 2009).

From equation (13) we can obtain the incremental cost that firm faces once it makes an additional investment. This is written as

$$\frac{\partial G}{\partial I_t} = b[\frac{I_t}{K_t} - a] \quad (14)$$

Notice that we can also relate the change in firm's profit levels (equation (1)) as a result of an additional investment that a firm makes. This is expressed as equation (15)

$$\frac{\partial \pi}{\partial I_t} = -{P^k}_t - \frac{\partial G}{\partial I_t} P_t = \lambda_t \quad (15)$$

By rearranging equation (15) i.e making $\frac{\partial G}{\partial I_t}$ the subject and inserting equation (11), we obtain equation (16) stated as

$$\frac{\partial G}{\partial I_t} = (q - 1)\frac{{P^k}_t}{P_t} \quad (16)$$

Now equating (14) to (16), and replacing q with $\frac{V_t}{{P_t}^k(1-\delta)K_{t-1}}$ i.e. obtained from equation (12) we obtain;

$$\frac{I_t}{K_t} = a + b[\left(\frac{V_t}{{P_t}^k(1-\delta)K_{t-1}} - 1\right)\frac{{P^k}_t}{P_t}] \quad (17)$$

We can simplify equation (17) by replacing $\left(\frac{V_t}{{P_t}^k(1-\delta)K_{t-1}} - 1\right)\frac{{P^k}_t}{P_t}]$ with Q_t in the above formulation, to obtain our estimable equation (18) expressed as

$$\frac{I_t}{K_t} = a + bQ_t \quad (18)$$

Where Q_t represents the average Q and $\frac{I_t}{K_t}$ investment to capital stock ratio.

3.2 Econometric Model

Equation (18) can be estimated by introducing the cross-sectional units *i* i.e Kenyan firms listed on the NSE and the error component. For econometric purposes, we can, therefore, write the estimable equation (18) as;

$$\left(\frac{I}{K}\right)_{it} = \alpha_0 + \alpha_1 Q_{it} + \varepsilon_{it} \quad (19)$$

Where $\alpha's$ are the parameters to be estimated. Since the primary aim of this study is to examine the effects of uncertainty on corporate investments, we follow the approach by Lensink and Murinde (2006) in introducing uncertainty variable in our econometric model. According to Lensink and Murinde (2006), uncertainty variable can be modelled for each firm from individual firm's stock market daily return[7]. Notice that this measure of uncertainty is closely correlated with other uncertainty proxies such as firm-level dispersions of earnings and productivity growth (Bloom, 2009).

Following Lensink and Murinde (2006), uncertainty variable (UN) can be obtained by estimating a Generalized Autoregressive Conditional Heteroscedasticity, GARCH (1, 1) model. GARCH (1,1) model is used because of the tendencies of stock market daily prices to display clustering effects. The procedure of obtaining this variable is therefore stated as follows; first, we calculate the daily conditional variances of the stock market prices of each firm in the sample. Second, we compute the conditional standard deviation of stock market prices by taking the square root of its conditional variances and third, we calculate the average of the daily conditional standard deviations of the stock market returns over each year firm by firm. We, therefore, denote this uncertainty measure by (UN1). For robustness purposes, the

[7] We acknowledge that other than the GARCH and standard deviation approaches of measuring uncertainty levels in economy, economic policy uncertainty (EPU) index approach is one of the latest proxy for uncertainty. Data for EPU index is however available for developed economies only.

second proxy for uncertainty variable can be obtained by taking, for each year, the standard deviation of daily stock market returns denoted by UN2.

Now, based on this approach, our regression model is therefore written as;

$$\left(\frac{I}{K}\right)_{it} = \alpha_0 + \alpha_1 Q_{it} + \alpha_2 UN_{it} + \varepsilon_{it} \quad (20)$$

Where UN_{it} is the uncertainty variable obtained from GARCH (1, 1) model (UN1) or proxied by standard deviation of daily stock market prices UN2.

The above-formulated equation (20) can be augmented by introducing the cash-flow variable and the lagged dependent variable. The cash-flow variable is added in our model as a liquidity variable to capture the financial constraint that firms face in making investment decisions (Audretsch and Elston, 2002). Notice that our cash-flow is obtained at the beginning of period *t.* Lagged dependent variable is also included in the model because investment decision is usually a dynamic decision-making process and as such current investments made by firms are affected by previous investment levels. Our regression equation is therefore stated as

$$\left(\frac{I}{K}\right)_{it} = \alpha_0 + \alpha_1 Q_{it} + \alpha_2 UN_{it} + \alpha_3 \frac{CF}{K}_{it} + \alpha_4 \left(\frac{I}{K}\right)_{i,t-1} + \varepsilon_{it} \quad (21)$$

Where CF denotes the cash-flow variable.

We can further augment equation (21), which is our baseline regression equation, by including the quadratic term of uncertainty variable. The aim of the quadratic term of uncertainty variable is to enable us to test for the presence of an Inverted-U shaped curve on the uncertainty-investment relationship. Our regression model is therefore written as;

$$\left(\frac{I}{K}\right)_{it} = \alpha_0 + \alpha_1 Q_{it} + \alpha_2 UN_{it} + + \alpha_3 \frac{CF}{K}_{it} + \alpha_4 \left(\frac{I}{K}\right)_{i,t-1} + \alpha_5 {UN_{it}}^2 + \varepsilon_{it} \quad (22)$$

To estimate equation (22), we further introduce control variables in our regression model. To obtain;

$$\left(\frac{I}{K}\right)_{it} = \alpha_0 + \alpha_1 Q_{it} + \alpha_2 UN_{it} + +\alpha_3 \frac{CF}{K}_{it} + \alpha_4 \left(\frac{I}{K}\right)_{i,t-1} + \alpha_5 {UN_{it}}^2 + \alpha_6 Z_{it} + \varepsilon_{it} \quad (23)$$

Where Z_{it} relates to a vector of control variables that includes; liquid assets and total debts. We include trade credit in our equation as a control because credit is the main source of investment financing. We further include total debts as a control because; debt is a central factor in firm investment decisions and behavior. Debt is particularly important as a source of external financing for firms.

Notice that we have used capital stock to scale investments, cash-flow and control variables. Scaling of these variables by capital stock is important as it helps us to bring all firms to a common scale and account for heteroscedasticity (Anderson and Kegels, (1997); Lensink and Sterken (2000)).

With regards to the expected signs in our baseline regression equation (21), the parameter for Tobin Q (α_1) is expected to be positive i.e $\alpha_1 > 0$ because firms with more growth opportunities are expected to increase their investments. The coefficient for uncertainty (α_2) can be either positive or negative as stipulated by economic theory i.e $\alpha_2 < 0 \; or > 0$. Coefficient for cash flow variable (α_3) is expected to be positive because firms which are more liquid tend to invest more i.e α_3>0. The coefficient of the lagged dependent variable (α_4) is also expected to be positive i.e. $\alpha_4 > 0$ this is because, theoretically, profitable and productive previous investments tend to improve firm's current cash-flow conditions hence increasing current investments.

3.3 Data source, measurement and description of variables

The firm-level data to be used in this study will be obtained from company's financial statements and the Nairobi Securities Exchange (NSE) for the period 2000 to 2016. The law requires all listed firms to report their financial statements. CMA collects the financial reports of all the NSE listed firms. NSE on the other hand, collects the daily stock prices returns, market capitalization, and outstanding shares among other related information for firms listed on NSE. In the study, we restrict our datasets to non-financial firms only. We present the variable measurements and descriptions in table 1.

Table 1: Variables Measurement and Definition

Variable	Measurements and definition
Capital stock (K)	Refers to the total annual fixed assets reported by firms
Investment (I)	Calculated as the sum of the changes in the total annual capital stock (K) and depreciation
Tobin (Q_{it})	Tobin Q_{it} is obtained by summing current market value of equity and long-term debt and dividing it by previous year's total assets. Tobin Q captures the growth opportunity of the firm.
Cash flow (CF)	Measured as the annual operating profits after taxes
Uncertainty (UN)	Obtained by estimating a Generalized Autoregressive Conditional Heteroscedasticity, GARCH (1, 1) based on firm's daily stock market returns. For robustness checks, annualized standard deviation of firms' daily stock market returns is also used.
Trade credit	Proxied by difference between trade receivables and trade payables
Total debt	Obtained by taking the sum of short-term and long-term debt.

3.4 Estimation techniques

There are several estimation techniques that can be applied to estimate our regression model. This study will, however, adopt standard panel data estimation approaches; fixed effects and random effects models[8]. This is because of the combination of a time-series (T) and cross-section dimension (N).

[8] Other than the fixed and random effects model, classical pooled OLS model can also be used. We will not use pooled OLS because it assumes existence of a common fixed intercept and homoscedastic error term hence its failure to incorporate parameter heterogeneity in our intended model.

In the fixed effects model, we assume that there's heterogeneity across individual firms. We will, therefore, control for this time-invariant unobserved effect by decomposing the error term into firm-specific effects and the random error terms. This is possible by assuming that correlation between the decomposed firm-specific effects and the random error term exists. Notice that fixed effects model is appropriate in this study because it mitigates the endogeneity problem in our regression[9].

For random effects model, we assume there is no correlation between the decomposed firm effects and the random error term. Random effects model, just like the pooled OLS, ignores the time-invariant component in the error term. It, however, corrects for serial correlation in the error term. The results of all these estimation techniques are presented in table 3 in our data analysis and findings for comparison purposes.

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[9] Consider our baseline regression equation (21) written in a parsimonious manner as;

$\left(\frac{I}{K}\right)_{it} = \alpha_0 + \alpha_1 X_{it} + \varepsilon_{it}$ (21, a)

Where X_{it} relates to a vector of all explanatory variables. We can decompose the error term as

$\varepsilon_{it} = v_{it} + u_{it}$

Where v_{it} is a time-invariant unobservable fixed effect. The equation (21, a) can therefore be written as

$\left(\frac{I}{K}\right)_{it} = \alpha_0 + \alpha_1 X_{it} + v_{it} + u_{it}$ (21, b)

Endogeneity is mitigated by taking the averages in both the left-hand side and right hand side to obtain

$\overline{\left(\frac{I}{K}\right)_{it}} = \alpha_0 + \alpha_1 \overline{X_{it}} + v_{it} + \overline{u_{it}}$ (21, c)

Now by subtracting (21, c) from (21, b), we get

$\left(\ddot{\frac{I}{K}}\right)_{it} = \alpha_1 \ddot{X}_{it} + \ddot{u}_{it}$ (21, d)

Where $\left(\ddot{\frac{I}{K}}\right)_{it}, \ddot{X}_{it}$ are time-demeaned variables and $\ddot{u}_{it}$ time-demeaned error term.

This transformation has eliminated v_{it} from the equation and that E ($\ddot{u}_{it}$, $\ddot{X}_{it}$)=0 hence mitigating endogeneity.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.0 Introduction

This chapter presents the empirical results of the effects of uncertainty on corporate investments of Kenya's NSE listed firms. In the chapter, we give the summary statistics, correlation matrix and the estimates of our model using various panel data estimators.

4.1 Summary Statistics

This paper uses unbalanced firm-level data from the consolidated financial statements of 23 non-financial firms listed on Kenya's NSE to explore the effect of uncertainty on corporate investments. The study covers the period 2000 to 2016.

We present the summary statistics of the variables used in our regressions in Table 1. The results indicate that our variables are not very seriously skewed since the mean and medium are almost similar. The investments to capital stock ratio is 10.7 percent while cash flow to capital stock ratio stands at 6.35 percent. During the study period, on average, the NSE listed firms had higher Tobin Q ratio, measured as the ratio of the market value of equity plus the book value of debt to the replacement cost of the capital stock of 19.32 percent. This implies that, on average, NSE listed firms had more valuable growth opportunities.

Concerning uncertainty measures, it can be seen from Table 1 that both the standard deviation and GARCH (1, 1) measures have low averages of less than 4%. This is because our uncertainty measures proxy the average uncertainty for each firm during the year[10].

[10] For emphasis, UN1 was measured by obtaining the standard deviation of daily stock market returns for each firm in the respective year. UN2 was obtained by taking the yearly average of the daily conditional deviation of the stock market returns for each firm. Similar approach was used by Lensink and Murinde (2006).

Table 1: Summary statistics for Kenya's NSE listed non-financial firms

Variable	Obs	Mean	Median	Std.Dev	Minimum	Maximum	Skewness	Kurtosis
I/K	327	0.107	0.1035	0.186	-1.522	0.729	-1.999	21.37
CF/K	327	0.0635	0.0541	0.0822	-0.228	0.310	-0.1253	4.349
Q	327	0.1932	0.1505	0.1802	.0002	0.7614	1.199	3.760
UN1	350	0.0338	0.0237	0.0619	0.00	0.627	7.951	70.03
UN2	350	0.0388	.0274	0.0425	0.0144	0.444	4.668	31.53
T/K	350	0.006	-0.0019	0.107	-0.374	0.723	0.9944	8.995
B/K	350	0.497	0.4643	0.211	0.00	1.225	0.6615	3.144

Note: I/K relates to the investment capital ratio, CF/K denotes the cash flow to capital ratio, Q is the Tobin Q, UN1 uncertainty as measured by the standard deviation, UN2 the uncertainty measured by the GARCH (1,1), T/K is the trade credit obtained by differencing trade receivables and trade payables then divided by the capital stock and B/K is the total debt over capital stock.

Since uncertainty is our variable of interest, we describe this variable more clearly. Table 2 presents the pairwise correlation matrix of the variables used in the analysis. With regards to uncertainty measures, the results indicate that standard deviation and GARCH (1,1) measure of uncertainty are positively and significantly correlated. This is indicative of the fact that the two measures can be used as alternative proxies and for robustness checks in our study. The correlation matrix further shows that cash-flow variable is positively and significantly correlated with investments made by firms. This indicates that the firms with high cash-flow level tend to invest more.

The correlation matrix further indicates that multicollinearity is not a serious problem in our estimations since all the correlation coefficients are less than 0.7. The variance inflation factors (VIF) further proves our claim of minimal collinearity issues.

Table 2: Pairwise correlation matrix

Variable	I/K	CF/K	Q	UN1	UN2	T/K	B/K
I/K	1.00						
CF/K	0.1887***	1.00					
Q	-0.0015	-0.1137**	1.00				
UN1	0.1068*	0.0240	0.0264	1.00			
UN2	0.0859	-0.0365	-0.0693	0.5074***	1.00		
T/K	-0.1522***	-0.1389**	-0.1613***	0.1274**	0.2953***	1.00	
B/K	-0.1008*	-0.2039***	0.5822***	0.0335	0.0594	-0.0241	1.00

*Note (1) *, ** and *** denote significance levels at 10, 5 and 1% respectively. (2) I/K relates to the investment capital ratio, CF/K denotes the cash flow to capital ratio, Q is the Tobin Q, UN1 uncertainty as measured by the standard deviation, UN2 the uncertainty measured by the GARCH (1,1), T/K is the difference of trade receivables and trade payables over the capital stock and B/K is the total debt over capital stock.*

4.2 Econometric Results

The econometric results of the effects of uncertainty on corporate investments are presented in Table 3. The estimates obtained are based on the standard panel data estimation techniques for the linear and non-linear equations for both model 1 (measures uncertainty by standard deviation) and model 2 (measures uncertainty by GARCH (1, 1)).

Before interpreting the results, it's important to note that, we performed the Wald test for joint significance of the model parameters. The Wald χ^2 tests for joint parameter significance are highly significant implying the entire set of parameters used in this study are valid and justified. The Hausman test was also applied to test whether the correlation between the errors and the regressors exists. From the results, we observe that the error terms are highly correlated with the regressors prompting us to use the fixed effects[11] model for interpretation purposes. Further, the R^2 of the fixed effects model indicates that 26 percent of the variations of the dependent variable is explained by the independent variables.

In table 3, we observe that cash flow variable is positive and statistically significant in all the equations as expected. This is indicative of the positive theoretical role of cash flow on investment. Increases in cash flow within a firm tend to improve future investment opportunities available for the firm and signals firms' financial soundness and ability to undertake investments. The results further indicate that Kenyan firms might be financially constrained hence cash-flow acting as a pointer of returns to investments. In particular, the estimates indicate that a one-unit increase in cash-flow to capital stock ratio increases firm-level investments by 0.469.

[11] Fixed effects model is also preferred because it mitigates the endogeneity problems perverse in investment-accelerator models estimations.

Table 3: Estimates of the nature of investments-uncertainty relationship on Kenya's NSE listed firms

Variables	Estimation methods											
	POLS				Random Effects				Fixed Effect			
	Linear Model		Non-linear		Linear		Non-Linear		Linear		Non-Linear	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Cash flow to capital ratio	0.235*	0.251*	0.240*	0.244*	0.264**	0.286**	0.264**	0.274**	0.474***	0.469***	0.482***	0.472***
	(1.73)	(1.86)	(1.75)	(1.80)	(2.00)	(2.19)	(1.98)	(2.07)	(2.69)	(2.68)	(2.73)	(2.68)
Tobin Q	0.118	0.148*	0.119	0.141*	0.075	0.105	0.075	0.097	0.184	0.207*	0.176	0.206*
	(1.55)	(1.95)	(1.57)	(1.82)	(1.03)	(1.44)	(1.03)	(1.33)	(1.56)	(1.78)	(1.49)	(1.77)
Uncertainty	0.403**	0.719***	0.637	0.391	0.541***	0.787***	0.520	0.364	0.352*	1.041**	-0.458	0.762
	(2.15)	(2.72)	(0.79)	(0.60)	(2.87)	(3.13)	(0.66)	(0.59)	(1.88)	(2.35)	(-0.56)	(0.46)
Uncertainty Squared			-0.416	1.07			0.037	1.44			1.43	0.597
			(-0.30)	(0.55)			(0.03)	(0.75)			(1.02)	(0.18)
Lagged Investment capital ratio	-0.063	-0.070	-0.063	-0.069	-0.008	-0.020	-0.008	-0.018	-0.160***	-0.164***	-0.163***	-0.164***
	(-1.10)	(-1.22)	(-1.09)	(-1.20)	(-0.15)	(-0.35)	(-0.15)	(-0.31)	(-2.76)	(-2.85)	(-2.82)	(-2.84)
Trade credit to capital ratio	-0.323***	-0.375***	-0.328***	-0.363***	-0.301***	-0.349***	-0.301***	-0.335***	-0.813***	-0.813***	-0.812***	-0.811***
	(-2.96)	(-3.36)	(-2.97)	(-3.18)	(-3.03)	(-3.41)	(-2.99)	(-3.22)	(-6.04)	(-6.06)	(-6.03)	(-6.03)
Total debt to capital ratio	-0.226***	-0.249***	-0.226***	-0.243***	-0.139**	-0.155**	-0.139**	-0.149**	-0.220**	-0.221**	-0.216**	-0.221**
	(-2.98)	(-3.25)	(-2.98)	(-3.13)	(-2.21)	(-2.43)	(-2.20)	(-2.33)	(-2.09)	(-2.11)	(-2.05)	(-2.10)
Constant	0.007	-0.006	0.0003	0.003	0.134***	0.122***	0.135***	0.133***	0.0684	0.0329	0.0884	0.0418

Variables	Estimation methods											
	POLS				Random Effects				Fixed Effect			
	Linear Model		Non-linear		Linear		Non-Linear		Linear		Non-Linear	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
	(0.12)	(-0.10)	(0.01)	(0.04)	(4.36)	(3.92)	(3.55)	(3.88)	(1.02)	(0.48)	(1.26)	(0.49)
Observations	304	304	304	304	304	304	304	304	304	304	304	304
R^2	0.208	0.215	0.208	0.216					0.254	0.260	0.257	0.260
Adjusted R^2	0.133	0.142	0.130	0.139					0.134	0.141	0.134	0.137
Control for time effects	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes
Control for industry effects	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes
Wald χ^2test	5.00***	5.51***	4.29***	4.75***	28.86***	30.52***	28.77***	31.05***	9.55***	9.95***	8.34***	8.50***
Hausman Test									45.70***	41.50***	46.62***	42.31***
No of Firms	23	23	23	23	23	23	23	23	23	23	23	23

*Notes: (i) Ratio of Investment to capital stock is the dependent variable (ii) Values for t statistic are presented in parentheses (iii) * , ** and *** denote significance levels at 10, 5 and 1% respectively (iv) In model 1, uncertainty is measured by standard deviation while for Model 2, uncertainty is measured by GARCH (1,1) technique.*

The econometric results further show that Tobin Q ratio is not consistently significant in all models. The results indicate that, on four out of twelve cases, the coefficient of Tobin Q is positive and significant at 10 percent. Contradiction on the significance of Tobin Q coefficients in literature is a well-known problem due to measurement errors involved in generating this variable (Similar evidence are found for example by; Lensink and Murinde (2006); Mohn and Misun (2009)). According to Fazzari, Hubbard, and Petersen (1988), measurement problems in Tobin Q can either emanate from the errors in measuring replacement capital stock or if the stock market is excessively volatile hindering Q to reflect market fundamentals.

Concerning the effects of total debt on investments, the estimates indicate that total debt is negative and statistically significant in all models. Specifically, the results show that a one-unit increase in debt levels reduces firm-level investments by 0.22. This result is consistent with the debt overhang problem experienced by Kenya's listed non-financial firms. The result implies that debts secured by firms are not a free resource but real financial obligations that listed firms must take into consideration. Similarly, trade credit coefficient is universally negative and statistically significant at 1 percent level across all models. The estimates indicate that a one-unit increase in trade credit reduces firm-level investments by 0.81. This result indicates that highly indebted firms might be unable to pursue attractive investment opportunities due to debt overhang problems and the pressures exerted by the suppliers for immediate payments.

Turning to the uncertainty measures, the econometric results indicate that the coefficients of the uncertainty measures are positive and significant in all the linear equation but insignificant in the non-linear models. This result is indicative of the absence of non-linearity effects of uncertainty on corporate investments made by Kenya's non-financial firms listed on NSE.[12]

[12] This evidence can be further examined, if we increase the number of firms covered and the time period of the study.

Based on the fixed effects model and the GARCH (1, 1)[13] measure of uncertainty, we observe that an increase in uncertainty increases investments made by Kenya's NSE listed firms. Particularly we see that a one-unit increase in daily stock market returns, on average, will increase the investments made by firms by 1.041. The implication of this result is that overal, if uncertainty affects investment behavior of Kenyan firms, the effect is positive[14]. Similar evidence of uncertainty enhancing investments are found, for example, by Lee (2016), Vo and le (2017), Bo and Zhang (2002).

Three theories in the conventional investment literature offer possible explanations for our economic results. First, according to Hartman (1972) and Abel (1983), under the assumption of a perfectly competitive market and constant returns to scale, investments made by firms are non-decreasing with increased uncertainty. Second, risk-taking firms tend to increase investments during uncertain periods particularly in market transition economies (see for instance; Lensink and Sterken 2000; Bo and Zhang, 2002). Third, Kulatilaka and Perotti (1998) argue that, in an imperfectly competitive environment, uncertainty generates growth options that can be tapped by strategizing firms making them seize investment opportunity that discourages potential entrants hence enhancing their market share and profits. Based on these theoretical predictions, we can, therefore, justify the results of positive effects of uncertainty on investments for Kenyan firms based on the risk-taking and strategic growth predictions. The Hartman-Abel prediction, to our opinion, fails to be applicable in the Kenyan context because of its stringent assumptions of perfectly competitive markets and production technology of degree one which generally deems not applicable to the Kenyan context.

[13] We consider interpreting the GARCH (1,1) results because a GARCH model assumes heteroscedastic error term which is a considered case for the stock market returns data (Lensink, 2002)

[14]Similar positive effects of uncertainty on investments have been found in developing and transition economies (See for example; Lensink and Sterken (2000) study on Czech Republic, Bo and Zhang (2002) in China).

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.0 Summary and Conclusion

The main objective of this paper was to establish the effects of uncertainty on corporate investments in Kenya's NSE listed non-financial firms. Specifically, the study sought to examine the nature of the uncertainty-investment relationship in Kenya's NSE listed firms and also whether the uncertainty-investments relationship mimics an inverted U-shaped.

The study used unbalanced firm-level data of 23 NSE listed firms obtained from the consolidated financial reports and the NSE for the period 2000 to 2016. Panel data estimation techniques were used to run the regressions. For interpretations purposes, the Hausman test was applied to identify the suitable model. Fixed effects model was found to be the best model to be used in estimating our regression equations.

Since uncertainty was the main variable of interest, we used the standard deviation of the daily stock market prices and the average daily conditional standard deviation of stock market returns obtained from GARCH (1,1) model as the proxies. The dependent variable in the study was investments scaled by capital stock. Investment variable was obtained from the sum of the changes in total assets and depreciation. Other predictor variables used in the model included: cash-flow, liquid assets and total debt all deflated by capital stock.

In our study, by using the standard deviation of the daily stock market returns and the average of the daily conditional standard deviations of stock market returns to represent uncertainty, we find that uncertainty is significant in explaining investments made by corporate firms in Kenya. Particularly, we observe that Kenyan firms accelerate their investments when they face

higher uncertainty. The results further indicate the absence of non-linearity effects on the uncertainty-investment relationships.

5.2 Policy Implications

From the study, we observe Kenyan firms tend to increase their investments when they face uncertainty in competitive economies contrary to the traditional view of wait and see approach during uncertainty. The implication of this finding is that increasing competition in an economy will increase firm-level investment regardless of the uncertainty companies face. Policies should, therefore, be geared towards increasing competition among firms in the economy.

5.3 Limitations

Although this study presents important findings on the effects of uncertainty on corporate investments in Kenya, our empirical result is not without some qualifications. First, data insufficiency poised a challenge in the conduct of this study. Our estimations were based on a rather small unbalanced panel data set covering only 23 firms for a period 2000 to 2016. Doing analysis on relatively few companies for a short period may give inaccurate estimates. Second, our measure of uncertainty appears to be general and might not capture the various sources of uncertainty. We notice that uncertainty, as captured by stock market returns fails to disentangle the speculative from the fundamental effects on the changes in stock market prices. Third, endogeneity problem is also not adequately addressed in this study due to lack of valid instruments and a limited dataset to undertake a Generalized Methods of Moments (GMM) estimations.

5.4 Areas for Further Study

Examination of the effects of uncertainty on investments requires relatively large sample over a considerable time period. We, therefore, recommend that future studies on this area should

extend the scope of this study to cover many firms for longer time periods. Further, firms in different sectors can respond to uncertainty effects differently, we recommend that future studies should consider examining the sectoral differential effects of uncertainty on investments made by Kenyan firms.

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