AN ANALYSIS OF THE DETERMINANTS OF PRIVATE SECTOR INVESTMENT IN KENYA USING THE AUTOREGRESSIVE DISTRIBUTED LAG (ARDL) APPROACH

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DECLARATION

This research project is my original work and has not been submitted for award of a degree in any other university.

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DEDICATION

This project is dedicated to Almighty God, Family, Friends and Colleagues.

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ABSTRACT

The study sought to analyze the determinants of private investment in Kenya. The problem of ambiguous results of existing studies, mainly stemming from inappropriate econometric methods, called for further study of methodology and empirical model building. Results from numerous studies that have employed autoregressive distributed lag (ARDL) approaches are more likely to be persuasive than their predecessors. Primary objectives of the study were investigation of determinants of private sector investment and determination of the causal relationship between private sector investment and real gross domestic product. Various specific economic indicators were the data type of interest since the study was purely of economic nature. The study used secondary data, sourced from World Bank and International Monetary Fund. An advanced econometric technique, the ARDL model, was employed in data analysis to help in addressing the objectives that the study sought to address. The study found that real Gross Domestic Product (GDP) and trade openness were the main determinants of private investment in the long run. However, in the short run, real GDP remained an important variable in explaining variations in private investment while openness was no longer important switching with inflation which was found to be important. There is a unidirectional causality effect where private investment granger causes real GDP and not vice versa recommending deeper understanding of factors that influence GDP in the long run and short run. Gross domestic product being a major determinant of private sector investment informs and guides policy makers in quest to providing stable macroeconomic conditions in the economy. Moreover, to ensure sustainable economic development it’s upon policy makers to ensure that local industries are protected since the results indicate an inverse relationship between private investment and trade openness which is a proxy to liberalization.

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ACRONYMS AND ABBREVIATIONS

ADF	:	Augmented Dickey Fuller
AIC	:	Akaike Information Criterion
ARCH	:	Autoregressive Conditional Heteroskedasticity
ARDL	:	Autoregressive Distributed Lag
CPI	:	Consumer Price Index
CUSUM	:	Cumulative Sum
EAC	:	East African Community
FDI	:	Foreign Direct Investment
FPE	:	Final Prediction Error
GDP	:	Gross Domestic Product
HQ	:	Hannan-Quinn Criterion
IMF	:	International Financial Statistics
KNBS	:	Kenya National Bureau of Statistics
LM	:	Lagrange Multiplier
OLS	:	Ordinary Least Squares
SBC	:	Schwartz Bayesian Criterion
SMEs	:	Small and Medium Enterprises
SSA	:	Sub-Saharan African
TSLS	:	Two-Stage Least Squares
U.S	:	United States

OPERATIONAL DEFINITION OF TERMS

Economic performance : This is used with respect to a country's GDP level and its sustainability over the years

Economic growth : This is the percentage change in gross domestic product (either nominal or real as will be indicated) from one year to another

Private investment : This is taken to mean, the gross fixed capital formation

CHAPTER ONE

INTRODUCTION

1.1 Introduction

Kenya's economic performance has been declining rather sharply since independence in 1963. Annual gross domestic product (GDP) growth rates have dropped from an average of 6.7 percent in the 1960s and 70s to an all time low of two percent in the 1990s. Per capita income has declined from United States (U.S.) $350 in 1980s to U.S. $280 in 1999 with about 50 percent of the total population (37.7 million, 2013) living below the poverty line. One of the modern ways of reducing poverty is to improve economic performance through increased investment which is believed to be the engine of economic growth to the developing economies.

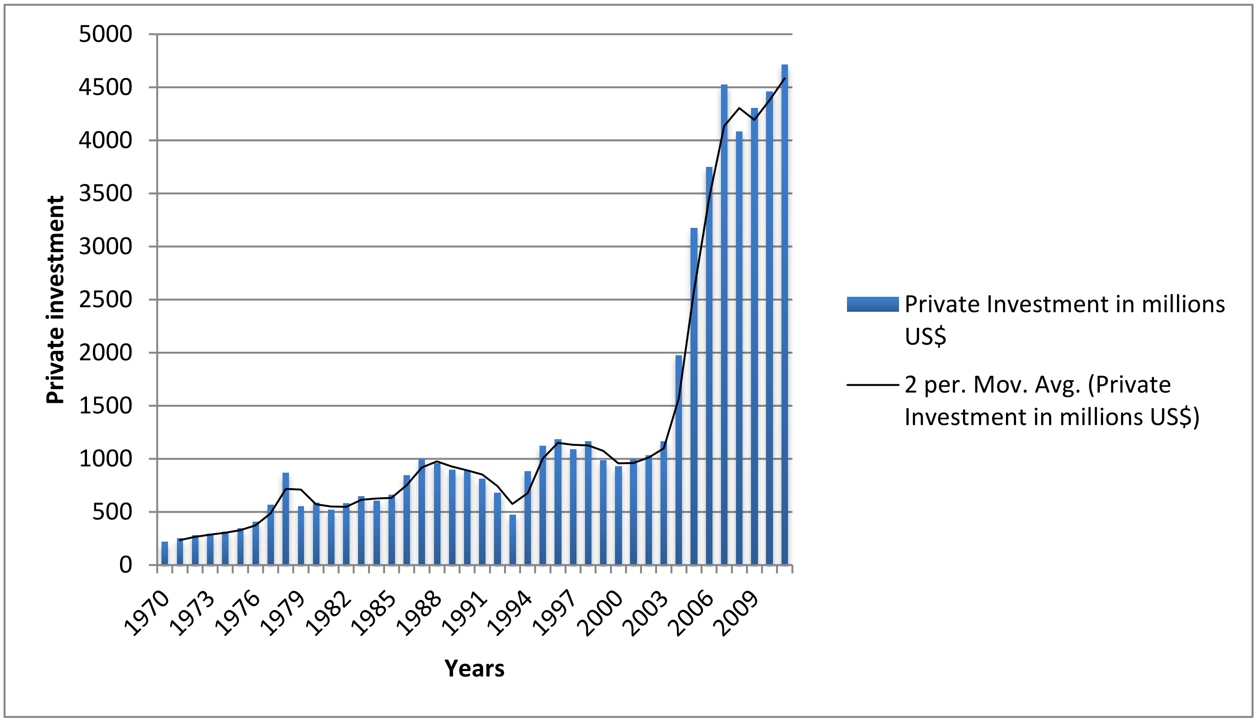
Economic growth and development depend essentially on a country's ability to invest and make efficient and productive use of its resources. In this regard, the role of private sector is important both in terms of its contribution to the quantity of gross domestic investment and its ability to allocate and employ resources efficiently. Private investment, as a proxy for a dynamic private sector, has not only been seen as an engine for job and income creation, but it also has a role to play in the provision of both infrastructure and social services. The level of Gross Domestic Product spending on fixed capital formation has been below 20 per cent for the period under study relatively low compared to developed economies. Private investment is treated as an engine to economic growth and development due to its sustainability nature and efficiency allocation of resources which forms the basis of study of its determinants to warrant improvement (Economic Survey, KNBS-2012).

Briefly, there cannot be adequate growth without investment of sufficient amount and quality. In fact, investment is both a result and cause of economic growth. A critical challenge is to ensure the necessary internal conditions for mobilizing enough domestic savings to sustain adequate levels of investment in productive and human capacities are satisfied. This responsibility involves creating the conditions that make it possible to secure the needed financial resources for investment which include macroeconomic and microeconomic policies, public finance, conditions of the financial system and other basic elements of a country's economic environment.

A good investment climate provides opportunities and incentives for firms to invest productively, create jobs, and expand, therefore promoting economic growth and poverty reduction (World Bank, 2005). It's clear that macroeconomic stability, well defined property rights, sound judicial and contracting system, reasonable level of certainty about government policies, well functioning financial markets, good physical, social and technology infrastructure and educated healthy individuals are all ingredients of a sound investment climate. In addition, access to international markets is important for investment since better integration with the world economy facilities the flow of goods, capital, technology and ideas.

According to the Institute of Economic Affairs (2000), Kenya's worst economic performance has been in the decade of the 1990s with annual GDP growth rate averaging about two percent. It is indeed ironical that this dismal record took place when Kenya's economy was being liberalized- a policy move that was intended to stimulate productivity and capital accumulation through private investment and public investment. It has been argued that the gains that could have been made through macroeconomic policy liberalization have been cancelled by other hidden costs that have increased the transaction costs such as infrastructure, inefficient bureaucracy and political uncertainty.

The trend of private investment in Kenya over the period 1970 – 2011 is illustrated by figure 1.1.



Source: Author 2012

Figure 1.1: Private Investment in Kenya for the period 1970 to 2011 in Million US Dollars

From Figure 1.1, though private investment generally shows an upward trend over the period 1970 to 2011, there are a number of fluctuations in these trends. Some of these fluctuations occurred around 1979, 1993, 1999 and 2008 while investment stagnated during early 1980s, late 1990s and early 2000s. This could be explained by 1982 coup attempt and post election effects on economy in 1993 after the government financed elections through printing of local currency. Financial crisis of 2008 that emanated from U.S real estate sector could perhaps be linked to the fluctuation seen during the same period in Kenya. It is therefore important to understand these fluctuations in investments in Kenya to better economic management.

According to Frimpong *et al*. (2010) private investment have an important role in making the growth process more socially and geographically inclusive and successful mobilization is thus increasingly important in job creation, growth expansion and poverty reduction. Investment is one of the important constituents that matters in macroeconomics and as pointed out by Khan and Reinhart (1990), in developing countries its necessary to distinguish between private and public investment since from past studies, for example Sakr, K. (1993), Ronge *et al*. (1997) and Were, M. (2001) it has been revealed that private investment plays a greater role in economic growth and development as compared to public investment. Collier and Gunning (1999) found that only private investment may be related positively to the profit rate and to the expected real interest rate within the range of low real interest rates observed in many developing countries.

1.2 Statement of the Problem

Private investment is fundamental to sustainable long-term economic growth because despite the shortage of empirical literature on domestic investment and its determinants, most of literature shows both domestic and foreign investment lead to high economic growth rate. Khan and Reinhart (1990), and Devarajan, Easterly, and Pack (2001) findings supported this relationship for Botswana. Based on an understanding of the determinants of private investment, policy makers can better control private investment in the desired direction to foster economic growth in the economy. It is quite clear from previous governments that Kenya has undoubtedly focused on the policy of a private sector-led growth strategy.

Several empirical studies (for example, Frimpong *et al* (2010), Asante (2000) and Kazeem *et al* (2012)) have been carried out on the relationship between domestic investment in developing countries and its determinants, although the results are mixed. The ambiguous results of existing studies call for further study of methodology and empirical model building. The results from the autoregressive distributed lag (ARDL) approaches according to Pesaran *et al*. (2009) are more likely to be more persuasive than their predecessors. Some of the variables that affect private sector investment include private sector credit availability, inflation, external indebtedness, openness of the economy, the foreign exchange rate and foreign direct investment. It is therefore important to correctly understand the extent to which these variables have affected private investment in Kenya under a modern cointegration test autoregressive distributed lag (ARDL), approach in order to improve the literature available as well as knowledge in the private investment sector. Lack of an empirical study using ARDL approach creates a gap that calls for the need to fill as the study aims to shed more light on the study under focus. The study aims to cover this gap using Kenyan data for the period 1970-2011.

1.3 Objectives of the Study

The broad objective of this study is to analyse the determinants of private investment in Kenya from 1970 to 2011

The specific objectives are:

i. To investigate the determinants of private sector investment

ii. To determine the causal relationship between private sector investment and real GDP

1.4 Significance of the Study

The study is significant because of the importance that private investment plays in any economy's growth and therefore should be given priority if a nation must eliminate high levels of unemployment and poverty in order to improve social welfare. Private investment is expected to lead to growth that is sustainable in the long run especially if it comprises of a high proportion of domestic investors relative to foreign investors. This is because foreign investors can switch between countries when investment conditions changes while domestic investors are there to stay and improve the lives of communities.

The study will improve on existing literature and provide a different perspective to policy makers based on a different econometric technique of analyzing private investment which the study has employed. It's meant to benefit policy makers and scholars especially those pursuing their postgraduate studies.

1.5 Scope of the study

The study covers the period from 1970 - 2011. The choice of the period for study is based on time, resource constraints and specific focus on structural reforms of public sector (for example, privatization in 1990's). It's within this period that major privatization of public sector institutions took place and therefore analysis on possible impact will be of paramount importance in understanding Private Investment in Kenya. The study is meant to study only the determinants of private sector investment in Kenya and therefore the findings applications are limited to Kenyan case.

1.6 Limitation of the Study

The research focuses on private investment and not every variable that influence decisions to invest was included. As such, some of the variables such as infrastructure and political uncertainty were excluded to narrow down the scope of the study to manageable dimensions. Moreover, the research focuses on the economic hub of East Africa-Kenya, which leads other economies in the region in terms of economic development and infrastructure growth. It is indeed an interesting economy to study and could tell a lot about East Africa, especially to interested investors. It is a requirement that all variables to be used in the model be either integrated of order zero or one for the applicability of ARDL approach of analysis which is not obvious. Problem of multicollinearlity, for example, between public investment and real GDP is expected but the good thing is that there is a remedy for it.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents the theoretical and empirical review of the literature on the determinants of private investment. The chapter seeks to identify and explain the various relevant theories to this study and review various empirical studies that will provide a comparative basis of analysis and better understanding of Kenyan economy on conventional interaction behavior of variables into play.

2.2 Theoretical Literature Review

Theoretical literature on private investment is quite rich and some of the approaches commonly used to explain investment include; the simple accelerator theory, Tobin's Q theory, neoclassical theory/flexible accelerator model and liquidity theory of investment behavior. Keynes (1936) developed a theory of investment which was dominated by two main ideas, that is, marginal efficiency of capital and liquidity preference.

According to Keynes (1936), the idea of marginal efficiency of capital could be interpreted as the internal rate of return that is used to equate the projected cash receipts and payments to their present values. Investment takes place if the marginal efficiency of capital of a project is greater or equal to its financing costs. Keynes further acknowledges the presence of uncertainties by varying the marginal efficiency of capital. On the other hand the liquidity preference is concerned with the rate of interest as illustrated by Keynes (1936) theory. Once the willingness of a community to hold money balances is known and the supply of money is also known then interest rate can be determined.

Keynes (1936) identified three basic motives for holding money, namely; transaction motive, precautionary motive and speculative motive. Speculative motive is concerned with changes in interest rate, for example, if security prices are expected to decline then the demand for liquidity will increase and vice versa.

The accelerator model assumes that firms' desired capital-output ratio is roughly constant. This theory is not commonly used due to the fact that it assumes firms respond to changes in demand such that investment is always sufficient to keep the desired capital stock equal to the actual capital stock. To account for the weaknesses of the accelerator model, a general form model known as the flexible accelerator model was developed. This model assumes that the larger the gap between the desired and existing capital stock of a firm, the more is the firm's rate of investments. In other words, in this theory, net investment is seen as a fraction of the gap between the existing level of investment of a firm and its desired level of investment. Within this framework, output, internal funds, cost of external financing and other variables are treated as the determinants of desired capital (Ghura *et al*., 2000).

Another theory of investment was developed by Tobin (1969) known as the Tobin's Q theory of investment. This theory developed a ration called the Q ratio, which is the ratio of the market value for the existing capital stock to its replacement cost. This Q ratio is the main force driving investment. Therefore firms would invest if the Q ratio increases, that is, if the market value of an additional unit of existing capital is greater than the replacement cost.

Another version of the flexible accelerator model is the neoclassical investment theory model which was developed by Jorgenson in 1971. Jorgenson (1971) stipulates that desired capital is proportional to output and the user cost of capital. The user cost of capital in turn depends on the rate of interest, rate of depreciation, tax structure and price of capital goods.

Based on what theories say about investment behavior in any economy, the study will seek to either confirm them or fail to confirm. Tobins Q theory depends mostly on the market structure of the economy; therefore the study puts into consideration those factors that affect market systems in the economy. On the other hand Keynes theory of investment depends mostly on interest rate and uncertainty level in the economy. With accelerator principle theory incorporating output level and user cost of capital in its modeling gives the study a better starting point in the process of private investment analysis.

Neoclassical accelerator model has been criticized for its shortcomings in estimating investment function for developing countries. These criticisms are related to lack of readily available methods of measuring capital stock and returns to capital. In that regard, the study will consider the accelerator investment model for the same reason.

2.3 Empirical Literature Review

The purpose of this section is to offer an overview of and background on significant research literature published on particular topics which are related to the study under review. Various studies are reviewed and critiqued for the purpose of having a deeper understanding of the subject matter of the study as a whole.

Sakr (1993) found a positive influence of savings, GDP growth and public investment on the behavior of private investors in Kenya. The study's findings also indicated that output growth did not affect private investment while monetary policy played a less significant role.
Further, the paper found that credit provided to private sector, public investment and GDP growth had a significant impact on private investment.

Restrictions on investment financing are a problem broadly documented in the literature on the determinants of investment. Loungani and Rush (1995) suggested that some agents, typically small and medium enterprises (SMEs), are unable to get financing directly through open market debt. Hence, these agents are strongly dependent on bank credit, a market that is usually characterized by imperfections due to asymmetric information between lenders and borrowers. In developing countries like Argentina, this problem of access to credit is critical, due to the absence of markets and poor access to long term financing. The evolution of the credit amounts destined for the private sector would be a good indicator of the restrictions operating in the domestic financing of investment.

Ronge and Kimuyu (1997) examined the determinants of private sector investment for Kenya using data over the period 1964-1996. A double-logarithmic form of the investment equation was estimated using ordinary least squares (OLS). The results indicated that both the availability of credit and foreign exchange exerts significant positive effects on private investment confirming the results in most empirical studies. Private investment, however, was adversely affected by the stock of debt. Specifically, a one percent increase in the lagged debt to GDP ratio reduced private investment by 0.3 percent. The study also establishes a negative effect of exchange rate depreciation on investment while public investment crowded in private investment, contrasting the results of Were (2001) where crowding-out was found. Interest rate was also found to be less important in determining the level of private investment in Kenya.

Asante (2000) investigated the determinants of private investment in Ghana using time series and cross-section data. The survey data comprised of 116 manufacturing firms in Ghana sought to capture the determinants of private investment that are not captured in time series analysis, for example, political instability and policy uncertainties. The study had nine variables in total which included GDP growth rate, Balance of Payment, Credit to the private sector, Public investment as a percentage of GDP, Private investment as a percentage of GDP, Inflation rate, Budget Deficits as a percentage of GDP, Real Exchange Rate and Foreign Direct Investment which is also a percentage of GDP. The study found that public investment had a crowd in effect on private investment while credit to the private sector has a positive influence on private investment. Further, the study found coefficients of the proxies for macroeconomic instability, that is, the real exchange rate, the debt burden, the black market premium, and the inflation rate to be statistically insignificant in explaining private investment. However, the overall indicator of instability was found to have negative effect on private investment in Ghana.

Kazeem *et al* (2012) in the study which covered the period 1970 to 2010 used advanced econometric technique of ARDL bounds testing approach in modeling long run determinants of domestic private investment. Findings from the study showed clearly that difference exist between long and short run determinants. Interest rate, real GDP, exchange rate, terms of trade, external debts, public investments, credit to the private investment and reforms dummy are the key long run determinants of domestic private investment while real GDP, public investment and terms of trade are statistically significant in the short run. Kazeem *et al* (2012) recommended that necessary infrastructures to complement domestic private investment should be put in place and that external debts reduced to the barest minimum and negative effects of external shocks endangered by foreign direct investment uncertainty and deficit terms of trade should be prevented all together.

Frimpong *et al* (2010) carried out a study seeking to present an empirical assessment of factors that have either stimulated or dampened private sector investment in Ghana using ARDL framework covering the period 1970 to 2002. From the results it emerges that private investment is determined in the short-run by public investment, inflation, real interest rate, openness, real exchange rate and a regime of constitutional rule, while real GDP, inflation, external debt, real interest rate, real exchange rate and openness significantly influenced private investment response in the long-run. On the policy front, the study indicate that improving the productivity of sectors such as agriculture and manufacturing by providing more efficient advanced technologies as input subsidies could go a long way to increase private investment levels and growth in output.

In Fiji, Seruvatu *et al*. (2001) investigated the determinants of private investment using time series technique. Specifically the study employed unrestricted error correction model for the period 1966 to 1998 to analyze the long run and short run determinants of private investment. The study found real GDP growth, real lending rate, real private sector investment, real effective exchange rate index, terms of trade index and real unit labor cost to weakly explain private investment with only 35 percent of the variations in private investment being explained by the independent variables. The paper justifies this poor fit of the model by highlighting factors such as perceived inadequacies in the legal system, failure to enforce contractual obligations and property rights, land issues, and uncertainties due to possible civil unrest as the main risks to investments.

Mbanga (2002) investigated the impact of external debt on private investment in Cameroon from 1970-1999 using time series data and found out that investment accelerator effect was in existence since a significant positive real GDP-private investment relationship was found. The ‘‘debt overhang” hypothesis was also confirmed in the case of Cameroon as well as the ‘‘crowding-out” effect of debt service ratio. Public investment however crowded-in private investment while the investment climate, captured by the lagged value of private investment, stimulates current levels of investment. There was also a confirmed positive and significant relationship between credit expansion and private investment whereas deteriorating terms of trade and depreciating real exchange rate had negative effects on private investment.

Badawi (2004) investigated the impact of macroeconomic policies on private investment in Sudan employing annual data over the period 1969-1998. The results suggested significant crowding-out effect of public investment on private investment in Sudan, devaluation policies also contributed to discouraging private sector capital expansion.

Ouattara (2004) employed the ARDL modeling for the period 1970 to 2000 to analyze the determinants of private investment in Senegal. Further, the paper employed Johansen co integration and ARDL bounds approach to estimate the long run relationship between private investment, public sector investment, real GDP, credit to the private sector, foreign aid and terms of trade. The paper found that private investment was positively influenced by public investment, real income and foreign aid flows, but negatively influenced by credit to private sector and terms of trade.

Acosta *et al*. (2005) investigated the short run and long run determinants of private investment in Argentina for the period 1970 to 2000. The results from the ARDL model revealed that exchange rate, inflation, trade liberalization and shocks in the aggregate demand were the main determinants of private investment in the short run. Further, public investment was found to have a crowding effect on private investment in Argentina. In the case of the long run, external debt and domestic credit markets were found to determine private investment.

Foreign direct investment (FDI) in any economy brings with it technology, income through taxes, reduces unemployment and if the products it produces are meant for export it earns foreign exchange to the country. Mutenyo *et al*. (2010) examined the link between FDI and private investment using a panel level of 34 Sub-Saharan African (SSA) countries from 1990-2003 and accounted for the endogeneity of variables using two-stage least squares (TSLS) econometric technique. The study will incorporate FDI as one of the variables it will be studying to assess its effects if any in the behavior of private investment in Kenya.

2.4 Overview of Literature Review

The literature reviewed shows a number of theories have been developed to explain investment while empirical evidence shows mixed results of determinants of private investment. Based on equation 2.2, inclusion of gross savings in this study, like other studies have done, will only complicate the understanding of macroeconomics upon which the study is underlying. It is worth noting that, no study in Kenya has employed ARDL approach in investigating the determinants of private investment and thus the gap that the study seeks to fill. Borrowing from earlier studies within and outside the country plus of course being guided by investment theories, the study includes the following variables in its study; real GDP, credit to the private sector, inflation, external indebtedness, openness of the economy, the level of the exchange rate, public investment, real interest rate and foreign direct investment

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter is divided into six sections. Section 3.2 presents the research design, section 3.3 presents theoretical framework, section 3.4 presents definition of variables and their measurements, section 3.5 presents estimation technique, section 3.6 presents specification and diagnostic tests and finally section 3.7 presents data analysis.

3.2 Research Design

The study adopts quantitative research design to meet the expectation of the course and in addition uses secondary data which is readily available for convenience, in terms of time available. In this design the study utilizes economic variables commonly known as indicators under the literature with the utilization of statistical techniques embedded in GRETL to study the long term as well as the short term relationships between these variables of interest.

3.3 Theoretical framework

The accelerator model has desired capital stock k* proportion to real output, y:

$$K^* = \alpha y \tag{3.1}$$

This can be expressed in terms of desired ratio of net investment to output

(I/Y)*:

$$(I/Y)^* = \alpha \gamma \tag{3.2}$$

Where I is gross domestic investment in current prices, Y denotes GDP in current prices and γ is the growth rate of real GDP. A partial adjustment mechanism allows the actual investment rate to adjust to the difference between the desired investment rate and the investment rate in previous period:

$\Delta(I/Y) = \delta[(I/Y)^* - (I/Y)_{t-1}]$

Or

$$I/Y = \delta(I/Y)^* + (1-\delta)(I/Y)_{t-1} \tag{3.3}$$

Where, δ denotes the coefficient of adjustment. The flexible accelerator model allows economic conditions to influence the adjustment coefficient δ.

Specifically:

$$[\{\Delta\beta_0 + \beta_1 Z_1 + \beta_2 Z_2 + \beta_3 Z_3 + \ldots\} / \{(I/y)^* - (I/Y)_{t-1}\}] \tag{3.4}$$

Where Z_i are the variables (include an intercept term for constant depreciation rate) that affect δ rate and β_i are their respective coefficients.

3.4 Definition of Variables and their measurement

This subsection presents the definition of variables used in the analysis and how they are measured.

3.4.1 Private Investment

Private sector's gross domestic investment is defined as all additions to the stocks of assets (purchases and own-account capital formation), less any sales of second-hand and scrapped assets. The data is in current U.S. dollars but is converted to real using the GDP deflator and then transformed into logarithm.

3.4.2 Real Gross Domestic Product

GDP of a country is the sum of gross value added by all resident producers in the economy plus any product taxes minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. The data which is in current U.S. dollars and is recorded yearly is transformed into real GDP by dividing with GDP deflator. The GDP series is transformed into logarithm using the natural logarithm function and is used as a proxy for the demand conditions in a country. The a priori expectation was that real GDP is positively related to private investments.

3.4.3 Public Investments

Public sectors' gross domestic investment comprises of all additions to the stocks of assets (purchases and own-account capital formation), less any sales of second-hand and scrapped assets measured at constant prices, done by government units and non-financial public enterprises. Most outlays by government on military equipment are excluded. The data is transformed into logarithm in order to reduce Heteroskedasticity. Theoretically the effect of public investment on private investments is ambiguous. As per the Ricardian Equivalence Theorem, public investment may crowd out private investments while on the other hand public investment may act as a catalyst to private investment through provision of necessary infrastructure.

3.4.4 Credit to the Private Sector

Domestic credit to private sector refers to financial resources provided to the private sector, such as loans, purchases of non equity securities, and trade credits and other accounts receivable, which establish a claim for repayment. Theoretically, it's expected that credit to the private sector boost private investment thus a prior expectation was that credit to the private sector has a positive effect on private investments.

3.4.5 External Debt

Total external debt is defined as debt owed to nonresidents repayable in foreign currency, goods, or services. It is the sum of public, publicly guaranteed, and private nonguaranteed long-term debt, short-term debt, and use of IMF credit. The data is in current U.S. dollars but is converted to real using the GDP deflator and then transformed into logarithm. Theoretically, high external debt may act as a disincentive for private investment since investor think that the future taxation may be used to finance the debt service leaving very few resources for investing in the domestic economy. External debt was expected to be negatively related with private investment.

3.4.6 Trade Openness

Trade openness is calculated using the formula shown in Equation (3.5). Where exports of goods and services represent the value of all goods and other market services provided to the rest of the world and imports of goods and services represent the value of all goods and other market services received from the rest of the world. Trade openness is a measure of how a country is liberalized to the rest of the world. The data is transformed using natural logarithm function.

$$\text{Openness} = \frac{\{\text{Exports} + \text{Imports}\}}{\text{GDP}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (3.5)$$

Theoretically, the effect of trade openness on private investment is ambiguous since reducing trade barriers through liberalization may boost exports thus increasing investments and increased imports of inputs to production increases productivity and competitiveness. However, liberalization exposes a country to external competition which may destroy some sectors of the economy thus creating a disincentive for investments.

3.4.7 Foreign Direct Investment

Foreign direct investment is net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments. This series shows total net, that is, net FDI in the reporting economy from foreign sources less net FDI by the reporting economy to the rest of the world. Data are in current U.S. dollars but is converted to real using the GDP deflator and then transformed into logarithm. FDI was expected to be positively related to private investment.

3.4.8 Inflation

Inflation as measured by the consumer price index (CPI) reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The CPI is measured using the Laspeyres formula. Inflation is not transformed into logarithm since it is already a rate. Theoretically, inflation acts as a proxy for macroeconomic stability hence it’s expected that high inflation creates a disincentive for private investment. A prior expectation was that high inflation has negative effect on private investments.

3.4.9 Real Interest Rate

Real interest rate is the lending interest rate adjusted for inflation as measured by the GDP deflator. Since real interest rate is already a rate, there is no need of transforming it into logarithm. For developed countries, real interest rate can be used as a proxy for user cost of capital thus it has negative effect on private investment. However, in developing countries higher real interest rate creates an incentive for banks to offer more credit thus boosting capital formation ultimately increasing private investments. Therefore, the effect of real interest rate on private investment is theoretically ambiguous.

3.4.10 Real Exchange Rate

The nominal exchange rate is computed as the local currency relative to the U.S dollars. It is then converted to annual average based on monthly averages. In this study annual averages are transformed into real by dividing the nominal exchange rate with inflation. Theoretically real exchange rate is a proxy for real cost of imports. Thus a depreciation of real exchange rate increases the cost of imports, for example, production inputs hence it acts as a disincentive to private investment in sectors that are import dependent. On the other hand, a depreciation of real exchange rate creates an incentive for more investments in the export oriented sectors since it increases competitiveness and export volumes. Therefore, the effect of real exchange rate on private investments is ambiguous.

3.5 Estimation Technique

To analyze the determinants of private investment in Kenya, the study employed the ARDL bounds testing approach developed by (Pesaran *et al*., 2001). This approach can be used to test for both long run and short run dynamics of private investments using co integration technique. However, the approach is simple to use as compared to other co integration techniques since: The ARDL bound test does not require variables to be integrated of the same order, that is, they can be either I (0) or I (1), the test also solves the serial correlation and endogeneity problems by specifying appropriate lags, the long run and short run parameters can be estimated simultaneously. Finally the ARDL bound test has superior small sample properties Pesaran *et al*. (1998) and (Pesaran *et al*., 2001).

3.6 Specification and Diagnostic Tests

In this section various methodological issues and tests are discussed before proceeding with the estimation of the ARDL model.

3.6.1 Lag Length Determination

In order to estimate the ARDL model specified above, maximum lag length of the system has to be chosen. To do this, Final Prediction Error (FPE), Akaike Information Criterion (AIC), Hannan-Quinn Criterion (HQ) and Schwartz Bayesian Criterion (SBC) can be used as shown in Equation (3.6), (3.7), (3.8) and (3.9) respectively (Gebhard *et al*., 2007).

$$FPE(p) = \left[\frac{T + kp + 1}{T - kp - 1}\right]^k |\Sigma_{\hat{u}\hat{u}}(p)| \quad (3.6)$$

$$AIC(p) = \ln|\Sigma_{\hat{u}\hat{u}}(p)| + (k + pk^2)\frac{2}{T} \quad (3.7)$$

$$HQ(p) = \ln|\Sigma_{\hat{u}\hat{u}}(p)| + (k + pk^2)\frac{2\ln(\ln(T))}{T} \quad (3.8)$$

$$SBC(p) = \ln|\Sigma_{\hat{u}\hat{u}}(p)| + (k + pk^2)\frac{\ln(T)}{T} \quad (3.9)$$

Where $|\Sigma_{\hat{u}\hat{u}}(p)|$ denotes the determinant of the variance covariance matrix of the estimated residuals while P, k and T denotes the lag order, the number of variables and the number of observations respectively. From the above four information criteria, the FPE and AIC tend to overestimate the maximum lag length.

However, HQ and SBC consistently determine the maximum lag length in ARDL models (Gebhard *et al*., 2007). Therefore to determine the maximum lag length of the ARDL model, both HQ and SBC information criteria are used.

3.6.2 Unit Root Test

Though the ARDL bound testing approach does not require all variables to be integrated of the same order, it is not applied to variables whose order of integration is greater than two I (2). Therefore, the test for the order of integration to make sure that there are no variables that are integrated of order two and above is done. This is because regressing variables of order two and above in the ARDL bound approach would lead to spurious results (Gujarati, 2003).

In this study, testing for presence of unit root is done using the Augmented Dickey Fuller (ADF) test where the null hypothesis test is that the series has unit root. Further, AIC is used to choose the maximum lag length of a series to be used in the ADF test. If a series is found to be non stationary in levels it's differenced in order to make it stationary.

3.6.3 Co-integration Test

The study follows the Pesaran *et al*. (2001) approach of testing for co integration, whereby a test for the significance of the lagged level variables using the F test is carried out. To achieve this, estimation of Equation (3.11) using the OLS is done not forgetting the Wald Test of coefficient restriction to test the joint significance of the lagged level variables. The Wald Test reports the F-statistic which is compared with the bound critical values. The hypothesis for the Wald Test of coefficient restriction can be specified as:

$$H_0 : \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = \gamma_6 = \gamma_7 = \gamma_8 = \gamma_9 = \gamma_{10} = 0$$
$$H_1 : \gamma_1 \neq \gamma_2 \neq \gamma_3 \neq \gamma_4 \neq \gamma_5 \neq \gamma_6 \neq \gamma_7 \neq \gamma_8 \neq \gamma_9 \neq \gamma_{10} \neq 0$$

The bound critical values as specified in Pesaran *et al*. (2001) Tables reports the lower and upper bound, whereby, the lower bound assumes that all the variables used in the ARDL model are I (0) while the upper bound assumes that all the variables used in ARDL model are I (1). Therefore, if the F statistic from the Wald test of coefficient restriction is greater than the upper bound critical value for a given level of significance, then the null hypothesis is rejected and conclusion that there is long run relationship with the dependent variable is made. If the F statistic is less than the lower bound critical value for a given level of significance, then there is no co integration.

Further, if the F-statistic lies between the lower and upper bound critical values, then the results are inconclusive. After prove of existence of co integration, it becomes possible to specify both long run and short run models. More so, in the specification of the short run, it's the study's expectation that the lagged coefficient of the error correction term be negative and statistically significant in order to support the existence of co integration.

3.6.4 Autocorrelation

A common problem in using time series regressions is that the estimated residuals tend to be correlated across time. For example, the residuals at time t could be correlated with the residuals in time t-1. The presence of serial correlation in OLS regressions leads to estimates that have small standard errors, inefficient, biased and inconsistent especially when lagged dependent variables are included on the right hand side of the test equation (Hamilton, 1994). This study tests for the presence of autocorrelation using the Breusch-Godfrey test.

The Breusch-Godfrey serial correlation test is used to test for autocorrelation among the errors and is applicable whether or not there are lagged dependent variables (Green, 2000). The null hypothesis is that there is no serial correlation up to a pre-specified lag order against the alternative of the presence of serial correlation. If autocorrelation is present, ARDL model is estimated using the robust standard errors to account for the presence of autocorrelation.

3.6.5 Heteroskedasticity

The classical linear regression assumes that the variance of the error term is constant over time, that is, the error term is homoskedastic. If the variance of the error term is changing over time then the assumption of homoskedastic is violated leading to heteroskedasticity. Ordinary least squares estimates are consistent in the presence of heteroskedasticity, but the conventional computed standard errors are no longer valid (Green, 2000). In this study heteroskedasticity test is conducted using the Breusch-Pagan test method where the null hypothesis is that the variance of the error term is constant. If existence of heteroskedasticity is found, ARDL model using the robust standard errors is used to account for the problem of heteroskedasticity.

3.6.6 Autoregressive Conditional Heteroskedasticity

The Autoregressive Conditional Heteroskedasticity (ARCH) test is a lagrange multiplier (LM) test used to test for conditional heteroskedasticity in the residuals. The test assesses whether the magnitude of past residuals are related to the magnitude of recent residuals. ARCH in itself does not invalidate standard OLS inference but ignoring ARCH effects may result in loss of efficiency (Green, 2000). The null hypothesis assumes that there are no ARCH effects up to some order q.

3.6.7 Model Misspecification Test

To test for model misspecification and for the stability of the ARDL model, cumulative sum (CUSUM) is used whereby the null hypothesis of this test is that the regression equation is correctly specified. If the plotted CUSUM line graph remains inside the 5 percent significance level then it's concluded that the model is correctly specified otherwise the model is misspecified.

3.7 Data Analysis

To analyze the determinants of private investment in Kenya, the study follows the model developed by Asante (2000) and applied by Frimpong *et al*. (2010) and Kazeem *et al*. (2012) but modify it as shown in Equation (3.10). The specification incorporates the Keynesian, neoclassical, neo-liberal and uncertainty variables.

PI=f (RGDP, PUI, CPS, INF, EXDT, RIR, OPP, EXCH, FDI) …………………………… (3.10)

Where:

PI denotes private investment

RGDP denotes real gross domestic product

PUI denotes public investment

CPS denotes credit to private sector

INF denotes rate of inflation

EXDT denotes external debt

RIR denotes real interest rate

OPP denotes trade liberalization

EXCH denotes real exchange rate

FDI denotes foreign direct investment

However, Equation (3.10) is a general functional form thus it was transformed into an ARDL in order to analyze the determinants of private investments in Kenya. The ARDL specification is as shown in Equation (3.11)

$$\begin{aligned} \mathrm{LnPI_t} = {} & \mathrm{C_0} + \sum_{i=1}^{q} \beta_i \mathrm{LnPI_{t-i}} + \sum_{j=0}^{J} \delta_j \mathrm{LnPUI_{t-j}} + \sum_{l=0}^{L} \phi_l \mathrm{LnRGDP_{t-l}} + \sum_{m=0}^{M} \varphi_m \mathrm{CPS_{t-m}} + \sum_{p=0}^{P} \eta_p \mathrm{LnEXDT_{t-p}} + \\ & \sum_{s=0}^{S} \lambda_s \mathrm{LnOPP_{t-s}} + \sum_{v=0}^{V} \pi_v \mathrm{LnFDI_{t-v}} + \sum_{r=0}^{R} \varpi_r RIR_{t-r} + \sum_{y=0}^{Y} \theta_y INF_{t-y} + \sum_{z=0}^{Z} \psi_z EXCH_{t-z} + \varepsilon_t \end{aligned} \quad \text{……… (3.11)}$$

Where:

PI, PUI, RGDP, CPS, EXDT, OPP, FDI, RIR, INF and EXCH are as previously defined.

$\mathrm{C_0}$ denotes the drift, q, J, L, M, P, S, V, R, Y and Z denotes the lag lengths, $\beta_i, \delta_j, \phi_l, \varphi_m, \eta_p, \lambda_s, \pi_v, \varpi_r, \theta_y$ and ψ_z are coefficients to be estimated while Ln denotes the natural logarithm and ε_t is white noise error, i, j, l, m, p, s, v, r, y and z denotes the time trend.

Since it is necessary to understand the long run and short run dynamics of the determinants of private investment, specification of the long run and short run ARDL models is done after testing for co integration of variables. Therefore, the short run model is specified as the error correction model as shown in Equation (3.12).

$$\begin{aligned} \Delta \mathrm{lnPI_t} = {} & \beta_0 + \sum_{i=1}^{q} \beta_1 \Delta \mathrm{lnPI_{t-i}} + \sum_{i=1}^{q} \beta_2 \Delta \mathrm{lnPUI_{t-i}} + \sum_{i=1}^{q} \beta_3 \Delta \mathrm{lnRGDP_{t-i}} + \sum_{i=1}^{q} \beta_4 \Delta \mathrm{lnEXDT_{t-i}} \\ & + \sum_{i=1}^{q} \beta_5 \Delta \mathrm{lnOPP_{t-i}} + \sum_{i=1}^{q} \beta_6 \Delta \mathrm{lnFDI_{t-i}} + \sum_{i=1}^{q} \beta_7 \Delta \mathrm{CPS_{t-i}} + \sum_{i=1}^{q} \beta_8 \Delta \mathrm{RIR_{t-i}} \\ & + \sum_{i=1}^{q} \beta_9 \Delta \mathrm{lnEXCH_{t-i}} + \sum_{i=1}^{q} \beta_{10} \Delta \mathrm{lnINF_{t-i}} + \theta \mathrm{ECM_{t-i}} + \varepsilon_t \end{aligned}$$

… (3.12)

Where, all the variables are as previously defined and ECM denotes the error correction term.

CHAPTER FOUR

EMPIRICAL RESULTS

4.1 Introduction

This chapter is divided into three subsections. Section 4.2 presents the descriptive statistics, section 4.3 presents the diagnostic test results and finally section 4.4 presents both the long run and short run ARDL regression results.

4.2 Descriptive Statistics

The table that follows presents the descriptive statistics.

Table 4.1: Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
Private investment	37.16	21.40	9.40	101.80
Real gross domestic product	333.54	185.10	128.99	741.36
Openness	60.22	7.34	47.70	75.10
Real interest rate	6.74	7.33	-7.50	21.10
Inflation	12.59	8.43	1.60	46.00
Credit to the private sector	27.69	4.88	15.10	38.10
Real exchange rate	33.09	41.77	0.58	158.90
Foreign direct investment	2.13	2.26	0.02	9.33
External debt	0.52	0.22	0.25	1.24
Public investment	26.35	18.81	4.05	73.96

From Table 4.1, private investment in Kenya for the period understudy had a mean of 37.16 and a standard deviation of 21.40 with a minimum and maximum of 9.40 and 101.80 respectively. Real GDP had a mean of 333.54 and a standard deviation of 185.10 with a minimum value of 128.99 and a maximum value of 741.36 for the period under study. The openness ratio had a mean of 60.22 and a standard deviation of 7.34 with a minimum of 47.70 and a maximum of 75.10. Real interest rate had a mean of 6.74 and a standard deviation of 7.33 with a minimum and maximum value of -7.50 and 21.10 respectively while inflation had a mean of 12.59 and a standard deviation of 8.43 with a minimum and maximum value of 1.60 and 46.00 respectively.

Credit to the private sector on the other hand had a mean of 27.69 and a standard deviation of 4.88 with a minimum and maximum value of 15.10 and 38.10 respectively. The official exchange rate had a mean of 33.09 and a standard deviation of 41.77 with a minimum value of 0.58 and a maximum value of 158.90. Foreign direct Investment had a mean of 2.13 and a standard deviation of 2.26 with a minimum and maximum value of 0.02 and 9.33 respectively.

The external debt had a mean of 0.52 and a standard deviation of 0.22 with a minimum value of 0.25 and maximum value of 1.24. Finally, the mean of public investment was 26.35 and a standard deviation of 18.81 with a minimum and maximum value of 4.05 and 73.96 respectively for the period understudy.

4.3 Diagnostic Tests Results

The study determined the lag length of each variable by specifying the longest lag and testing for the significance of each lagged value of that variable until the lags that are significant were found. For each variable it was found that the first lags were statistically significant. Further SBC information criteria was used to choose the maximum lag for the ARDL model and the results showed that the maximum lag length for the ARDL system was one.

The study conducted the unit root test using the Augmented Dickey Fuller test and the results are presented in table A3. Presence of unit root is tested for each variable both at levels and at first difference specifying the inclusion of intercept or intercept and trend. From the results; private investment, real gross domestic product, openness, credit to the private sector, exchange rate, foreign direct investments, external debt, real interest rate and public investment all had unit root at levels but became stationary after the first difference implying that they are all integrated of order one. On the other hand, inflation rate was stationary at levels and even after first difference it was still stationary implying that it is integrated of order zero. Therefore, all the variables are integrated of either order zero or order one making it possible for the study to employ ARDL bound testing approach. This is because running the ARDL bound test with variables with order of integration of two or more leads to spurious results.

Further the study tested for the presence of co integration using Wald test of coefficient restriction and the results are presented in table A5 in the appendix. The test reports F-statistic with a value of 7.11 and a P-value of 0.00. The study thus compares this F-statistic with the bound critical values from Table A4. The results show that the F-statistic is greater than the upper bound critical values at all conventional levels of significance implying that there is long run relationship between the dependent variable and the independent variables.

The study tested for serial correlation using the Breusch-Godfrey test and the result is presented in table A5 which contains all the diagnostic tests of the study. The test reports the F-statistic with a value of 1.29 and a P-value of 0.30 implying that the study fails to reject the null hypothesis of no serial correlation at all conventional levels of significance. Further, Ljung-Box Q' test also rejected the presence of autocorrelation in the data. Hence, there is no serial correlation in the data.

The result from the Breusch-Pagan Test for heteroskedasticity has LM statistic with a value of 26.76 and a P-value of 0.08 implying that the LM statistic is insignificant at 5 percent level of significance. Therefore failing to reject the null hypothesis of constant variance and concluding that heteroskedasticity is not present in the data.

The study also tested for ARCH effects using the ARCH test. The test reports an LM statistic with a value of 4.07and a P-value of 0.04 implying that the null hypothesis of no ARCH effects in the data is rejected. Thus it is found that, autoregressive conditional heteroskedasticity effect is present in the data.

Finally the study tested for model misspecification and stability of the ARDL model using the CUSUM test as shown in the figure A1. The result shows that the graph of the plotted CUSUM lies inside the 95 percent confidence level and that the Harvey-Collier test statistic has a t-value of - 2.35 and a P-value 0.29 implying that the ARDL model is correctly specified and parameters are stable.

4.4 ARDL Regression Results

To analyze the determinants of private investment in Kenya, the study first ran an ARDL regression of Equation (3.11) taking into account heteroskedasticity and ARCH effects by specifying robust standard errors and the results are presented in table A6. The results show that the coefficients of real GDP and its first lag are statistically significant at 1 percent and 5 percent respectively. The coefficient of public investment is statistically significant at 5 percent while the coefficient of external debt is significant at 10 percent. The coefficient of the lag of credit to the private sector is statistically significant at 5 percent while the coefficient of the lag of exchange rate is significant at 10 percent. Finally, the coefficient of the lag of private investment is statistically significant in explaining private investments in Kenya. Coefficients of foreign direct investment, openness, real interest rate and inflation together with their first lags are all statistically insignificant. However, in the ARDL models it is important to understand the behavior of variables in both long run and short run. Therefore, long run model and short run model are done and results discussed in sections 4.4.1 and 4.4.2, respectively.

4.4.1 Long Run ARDL Regression Results

The table that follows presents the long-run ARDL results

Table 4.2: Long Run ARDL Results

Observations 1970-2011 (T = 42) Dependent variable: Natural logarithm of private investment				
HAC standard errors, bandwidth 2 (Bartlett kernel)				
Variable	*Coefficient*	*t-ratio*	*p-value*	
Credit to the private sector	-0.007	-0.336	0.739	
Inflation	0.002	0.451	0.655	
Real exchange rate	0.001	0.170	0.866	
Real interest rate	-0.005	-0.748	0.459	
Log Gross domestic product	1.195	3.248	0.003	***
Log public investment	-0.212	-1.091	0.283	
Log foreign direct investment	0.032	1.161	0.254	
Log external debt	-0.183	-0.485	0.631	
Log openness	-0.646	-2.164	0.038	**

Mean dependent var	3.427	S.D. dependent var	0.655
Sum squared resid	2.269	S.E. of regression	0.262
R-squared	0.996	Adjusted R-squared	0.994
F(9, 33)	1995.619	P-value(F)	0.000
Log-likelihood	1.687	Akaike criterion	14.626
Schwarz criterion	30.266	Hannan-Quinn	20.359
Rho	0.493	Durbin-Watson	1.010
Where (**) and (***) denotes 5% and 1% level of significance			

The results for long run ARDL regression are presented in Table 4.2. The SBC information criteria led to choosing of lag one for the variables used in the ARDL model and this is appropriate due to the short period of time used in the sample. The results from Table 4.2 shows an adjusted R-squared of 0.995 implying that about 99.5 percent of the variations in private investment are explained by the independent variables. The F-statistic is 1995.619 with a p-value of 0.000 indicating that its statistically significant meaning that, jointly, public investment, real GDP, openness, real interest rate, inflation, exchange rate, foreign direct investment, credit to the private sector and external debt determine private investments in Kenya.

Specifically, credit to the private sector has a negative and statistically insignificant coefficient of -0.007. This result contradicts the studies by Asante (2000) and Frimpong *et al.* (2010) but conforms to Oshikoya (1994) results. The coefficient of real GDP has the expected sign and it is statistically significant in explaining private investment in Kenya thus it satisfies the accelerator theory proposition. This implies that a one percentage increase in real GDP would lead to about 1.195 percentage increase in private investment in Kenya. This corroborates with the results found by Asante (2000), Frimpong *et al*. (2010) and Kazeem *et al*. (2012). The study shows that the coefficient of public investment is negative and statistically insignificant with a value of -0.212. Therefore, for the Kenyan case, crowding out effect is not present. This result contradicts with the results found by Aschauer (1989) and Greene *et al*., (1991).

The coefficient for FDI is positive and statistically insignificant. The FDI therefore does not explain private investment. On the other hand, external debt has a negative coefficient that is statistically insignificant with a value of -0.183. This means a one percent increase in external debt will lead to 0.183 decreases in private investment. The coefficient of trade openness is negative and statistically significant at 5 percent level of confidence with a value of -0.646. This implies that a 1 percent increase in the degree of trade openness would lead to about 0.646 decreases in private investment. This finding could be explained by the fact that the external competition would destroy most of the local industries thus liberalization should be taken carefully.

Further, the coefficient of inflation has a positive sign but statistically insignificant with a value of 0.002. The results could be explained by the fact that high inflation creates an incentive for an individual to make abnormal profit as compared to when there is low inflation, thus increasing investments in such sectors. The positive coefficient conforms to Acosta *et al.* (2005) and Frimpong *et al.* (2010) results.

Finally, the coefficient of real exchange rate has a negative sign and is statistically insignificant with a value of 0.001 while the coefficient of real interest rate has a negative sign and is statistically insignificant with a value of -0.005 implying that exchange rate and real interest rate do not determine private investment in the long run in Kenya.

4.4.2 Short Run ARDL Regression Results

The table that follows presents the short-run ARDL results.

Table 4.3: Short Run ARDL Results

Observations 1971-2011 (T = 41) Dependent variable: First difference of log of private investment HAC standard errors, bandwidth 2 (Bartlett kernel)				
Variable	*Coefficient*	*t-ratio*	*p-value*	
First difference of log of gross domestic product	1.289	4.997	0.000	***
First difference of log of public investment	-0.137	-0.974	0.338	
First difference of log of foreign direct investment	-0.001	-0.059	0.953	
First difference of log of external debt	-0.052	-0.234	0.817	
First difference of log of openness	0.244	0.892	0.379	
First difference of inflation	-0.004	-1.748	0.090	*
Log of credit to the private sector	0.003	0.339	0.737	
First difference of exchange rate	-0.002	-0.632	0.532	
First difference of real interest rate	0.003	0.636	0.529	
First lag of residuals	-0.325	-2.495	0.018	**

Mean dependent var	-0.017	S.D. dependent var	0.229
Sum squared resid	0.842	S.E. of regression	0.165
R-squared	0.600	Adjusted R-squared	0.484
F(10, 31)	57.395	P-value(F)	0.000
Log-likelihood	21.466	Akaike criterion	-22.932
Schwarz criterion	-5.797	Hannan-Quinn	-16.692
Rho	0.119	Durbin-Watson	1.728

Where (*), (**) and (***) denotes 10%, 5% and 1% level of significance

The short run ARDL regression results are presented in Table 4.3. The result from Table 4.3 shows that the coefficient for real GDP has a positive sign and is statistically significant at 1 percent level with a value of 1.289. This implies that in the short run, a one percentage increase in real GDP would lead to about 1.289 percentage increase in private investment in Kenya. Further, though the coefficient of foreign direct investment is still statistically insignificant, its sign has changed from positive in the long run to negative in the short run. Shocks in the economy normally have effects in the short run that fades away in the long run and this might have contributed to the change of sign reported above. Political uncertainty like the ones that were observed in the general election of the year 2007 can greatly affect foreign direct investment especially towards the developing economies like Kenya.

On the other hand, the coefficient of inflation has a negative sign and is statistically significant at 10 percent with a value of -0.004. This implies that inflation negatively influences private investment in the short run in Kenya. Coefficients of public investments, credit to the private sector, external debt, trade openness and real exchange rate were all statistically insignificant in the short run. However, it is important to note that the magnitudes of the effects of each variable in the short run are different from the magnitudes of the same variable in the long run. The error correction term has the expected negative sign and the coefficient is statistically significant at 5 percent level with a value of -0.325 thus confirming the existence of co integration. The coefficient of error correction term also reports the speed of adjustment from short run equilibrium to long run equilibrium.

Table 4.3 reports an adjusted R-squared of 0.484 implying that about 48.4 percent of the variations in private investment are explained by the independent variables in the short run. The F-statistic is 57.395 and is statistically significant implying that, jointly public investment, real GDP, trade openness, real interest rate, inflation, exchange rate, foreign direct investment, credit to the private sector and external debt determine private investments in Kenya in the short run. The minimum values of the SBC, AIC and HQ chosen for the estimation of ARDL short run model are -5.797, -22.932and -16.692, respectively.

4.5 Granger Causality

It's very important to understand the causal relationship of the key variables in the study because this will improve the existing literature and better still assist in proper policy making. This is the second objective of the study and it's important to focus on it. In reference to table A7, it's observed that real GDP is not different from zero when F-test of zero restriction is considered as the tool towards testing for granger causality. However, it's observed from F- test restriction results that private investment is significantly different from zero meaning if a shock is introduced in private investment sector, real GDP will be affected. Therefore it means private investment granger causes real GDP in Kenya and not the vice versa.

4.6 Summary

The study found that real gross domestic product and trade openness were the main determinants of private investment in the long run. However, the coefficients of credit to the private sector, public investment, external debt, trade openness, inflation, real exchange rate, real interest rate and foreign direct investment were found to be statistically insignificant in explaining private investments in the long run in Kenya thus not important variables. This corroborates with the results found by Asante (2000), Frimpong *et al*. (2010) and Kazeem *et al*. (2012). Further, the study found that only coefficients of real GDP and inflation were significant therefore, the variables could explain changes in private investment in the short run.

CHAPTER FIVE

SUMMARY, CONCLUSION AND POLICY IMPLICATIONS

5.1 Introduction

This chapter is divided into four sections, section 5.2 presents the summary of the study, section 5.3 conclusion of the study, section 5.4 presents policy implications and finally section 5.5 presents the areas of further research.

5.2 Summary of the study

Primary objectives of the study were; investigation of determinants of private sector investment and determination of the causal relationship between private sector investment and real gross domestic product. Various specific economic indicators were the data type of interest since the study was purely of economic nature. The study used secondary data, sourced from World Bank and International Monetary Fund. An advanced econometric technique, the ARDL model, was employed in data analysis to help in addressing the objectives that the study sought to address.

The study found that real gross domestic product and trade openness were the main determinants of private investment in the long run. However, the coefficients of credit to the private sector, public investment, external debt, trade openness, inflation, real exchange rate, real interest rate and foreign direct investment were found to be statistically insignificant. Therefore these variables do not explain private investments in the long run in Kenya.

Further, the study found that only coefficients of real GDP and inflation were significant therefore, the variables could explain changes in private investment in the short run. Coefficients of credit to the private sector, public investment, external debt, trade openness, real exchange rate, foreign direct investment and real interest rate were statistically insignificant. This means, the variables explain changes in private investment in the short run. Finally the study found that, in the long run, the signs of coefficients of credit to the private sector and inflation contradicted the prior theoretical expectation while the coefficients of the other variables corroborated the prior expectation though most of them were insignificant. Only the coefficient of foreign direct investment had a sign that contradicted the prior theoretical expectation for the model in the short run.

5.3 Conclusion

The study found out that real gross domestic product together with trade openness were the only variables that were important in explaining variations in private investment in Kenya in the long run. However, during the short run, the study found out that real gross domestic product still remained an important variable in explaining variations in private investment. Inflation became also an important variable replacing trade openness.

The other factors that were sought to be determinants of private sector investment in Kenya turned out not to be contrary to what most empirical studies suggested. This implies that the Kenyan economy is unique in the way it runs its activities internationally and domestically. Therefore this study will definitely provide that missing perspective of looking at the Kenyan economy.

5.4 Policy implication

From the analysis of the determinants of private investment in Kenya, the study recommends the following policy implications;

Since gross domestic product is an important variable that determine private investment in the Kenyan economy, it is necessary for policy makers to first seek to understand these factors that the study have found are important in the country. In other words, having proper macroeconomic stability in the economy will undoubtedly improve private investment.

For sufficient economic growth and sustainability of Kenya's economy, the government needs to protect local industries from external competition since from the study it is seen that liberalization which is proxied by trade openness is negatively related to private investment. The study further suggests that the governing authority should transform the local industries and provide basic infrastructures to these industries to enable them compete in the long run.

Inflation should be kept at a manageable level because with the uncertainties that it brings, it hurts private investment in Kenya.

5.5 Areas of further Research

This study focused on the determinants of private investments in Kenya for the period 1970 to 2011. Future studies should focus on analyzing the determinants of private investments for a longer period and include other countries especially the East African Community (EAC) in order to capture individual country effects. This is because most of the investment policies that Kenya undertakes are somehow interlinked with the investment policies undertaken at the EAC level.

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APPENDICES

Appendix 1: Data

Table A1: Raw data

Year	Private investment in US$	public investment in US$	Inflation	External debt	Nominal GDP in US$	GDP deflator	Credit to the private sector	Foreign direct investment	Openness	Real Exchange rate	Real interest rate
1970	2.2E+08	95759425	2.188527	4.78E+08	1.6E+09	4.5	15.1	13800000	60.5	0.578101	14.4
1971	2.48E+08	1.56E+08	3.780206	4.98E+08	1.78E+09	4.1	17.4	7400000	63.8	0.574771	20.1
1972	2.79E+08	1.7E+08	5.831645	5.81E+08	2.11E+09	4.1	16.5	6300000	55.3	0.589371	7.7
1973	2.94E+08	2.14E+08	9.281194	8.45E+08	2.5E+09	4.6	21.9	17260000	56.1	0.585736	-1.1
1974	3.13E+08	2.58E+08	17.80995	1.15E+09	2.97E+09	5.3	21.9	23420000	74.6	0.643348	-5.6
1975	3.42E+08	2.45E+08	19.12018	1.29E+09	3.26E+09	5.9	21.8	17158747	64.3	0.812084	-1.6
1976	4.04E+08	2.95E+08	11.44903	1.49E+09	3.47E+09	7.1	21.7	46371851	64.2	0.860931	-7.5
1977	5.66E+08	4.15E+08	14.82096	1.66E+09	4.49E+09	8.2	22.3	56545226	66.6	0.88764	-5.9
1978	8.65E+08	5.23E+08	16.93178	2.17E+09	5.3E+09	8.5	27.6	34414130	67.6	0.898753	6.7
1979	5.54E+08	6.66E+08	7.979353	2.72E+09	6.23E+09	9	27.3	84009903	57.4	0.86258	4.1
1980	5.86E+08	7.19E+08	13.85818	3.39E+09	7.27E+09	9.8	29.5	78973746	65.4	0.89376	0.9
1981	5.17E+08	6.05E+08	11.60305	3.23E+09	6.85E+09	10.9	29.4	14147557	64.3	1.228869	1.4
1982	5.78E+08	4.73E+08	20.66671	3.37E+09	6.43E+09	12.2	30	13000895	58.2	1.727942	2.6
1983	6.48E+08	3.97E+08	11.39778	3.63E+09	5.98E+09	13.6	29.3	23738843	54.2	2.021945	3.6
1984	6.04E+08	3.66E+08	10.2841	3.51E+09	6.19E+09	15	30.6	10753527	58.8	2.445224	3.8
1985	6.6E+08	4.1E+08	13.00657	4.18E+09	6.14E+09	16.2	31.5	28845949	55.4	2.75329	5.3
1986	8.45E+08	5.93E+08	2.534276	4.6E+09	7.24E+09	17.7	30.3	32725777	55.7	2.730345	4.9
1987	9.92E+08	5.67E+08	8.637673	5.78E+09	7.97E+09	18.6	29	39381344	47.7	2.946065	8.2

1988	9.58E+08	6.72E+08	12.26496	5.81E+09	8.36E+09	19.8	30.8	394431	50	3.57687	8
1989	8.92E+08	6.43E+08	13.78932	5.89E+09	8.28E+09	21.7	31.4	62189917	53.2	4.509647	6.8
1990	8.9E+08	7.94E+08	17.78181	7.06E+09	8.57E+09	24.1	32.7	57081096	57	5.61854	7.3
1991	8.11E+08	6.6E+08	20.0845	7.45E+09	8.15E+09	27.1	33.7	18830977	55.6	7.796083	5.7
1992	6.76E+08	5.43E+08	27.33236	6.9E+09	8.21E+09	32.2	34.8	6363133	52.9	11.96298	1.8
1993	4.71E+08	3.58E+08	45.97888	7.11E+09	5.75E+09	40.5	29.2	1.46E+08	72.9	32.1045	3.4
1994	8.81E+08	8.05E+08	28.81439	7.12E+09	7.15E+09	47.3	29.3	7432413	71.3	26.52507	16.4
1995	1.12E+09	6.55E+08	1.554328	7.31E+09	9.05E+09	52.7	34.5	42289248	71.7	32.67956	15.8
1996	1.18E+09	8.23E+08	8.864087	6.81E+09	1.2E+10	74.8	27	1.09E+08	57.3	33.98831	-5.8
1997	1.09E+09	8.06E+08	11.36185	6.47E+09	1.31E+10	83.3	27.9	62096810	54.1	42.15091	16.9
1998	1.17E+09	9.89E+08	6.722437	6.82E+09	1.41E+10	89.1	27.3	26548246	48.9	43.7491	21.1
1999	9.85E+08	9.54E+08	5.742001	6.53E+09	1.29E+10	92.8	29.3	51953456	48.2	53.32228	17.5
2000	9.26E+08	1.15E+09	9.980025	6.19E+09	1.27E+10	98.5	28.4	1.11E+08	53.3	60.70818	15.3
2001	9.92E+08	1.36E+09	5.738598	5.57E+09	1.3E+10	100	25.2	5302623	55.9	62.86702	17.8
2002	1.03E+09	1.28E+09	1.961308	6.18E+09	1.31E+10	101	25.9	27618447	55.2	61.88253	17.4
2003	1.16E+09	1.19E+09	9.815691	6.92E+09	1.49E+10	107.2	24.6	81738243	54.1	65.64512	9.8
2004	1.98E+09	7.03E+08	11.62404	6.98E+09	1.61E+10	114.9	26.8	46063931	59.5	72.48883	5
2005	3.17E+09	4.88E+08	10.31278	6.48E+09	1.87E+10	120.5	25.9	21211685	64.5	72.3667	7.6
2006	3.75E+09	7.14E+08	14.45373	6.68E+09	2.25E+10	129.9	26.1	50674725	64.9	76.94502	5.4
2007	4.52E+09	1.14E+09	9.75888	7.52E+09	2.72E+10	137.2	26.9	7.29E+08	64.5	74.16157	7.3
2008	4.08E+09	1.19E+09	26.23982	7.61E+09	3.05E+10	155.3	29.9	95585680	69.4	111.7896	0.7
2009	4.3E+09	1.67E+09	9.234126	8.59E+09	3.06E+10	169.6	30.3	1.16E+08	61.6	119.5661	5.1
2010	4.46E+09	1.96E+09	3.961389	8.8E+09	3.22E+10	173	33.8	1.78E+08	67.9	130.2518	12.2
2011	4.71E+09	2.12E+09	14.02155	1.03E+10	3.36E+10	194	38.1	3.35E+08	75.1	158.9028	2.6

Table A2: Refined data

Year	Real private investment	Real GDP	Real public investment	Real foreign direct investment	Real external debt	Trade Openness	Real exchange rate	Real interest rate	Credit to the private sector	Inflation
1970	48.84415138	356.3216349	21.27987232	3.066666667	0.297815203	60.5	0.578100651	14.4	15.1	2.2
1971	60.54110017	433.7539729	37.93635775	1.804878049	0.279969882	63.8	0.574770791	20.1	17.4	3.8
1972	67.93715335	513.9705261	41.58316514	1.536585366	0.275787856	55.3	0.589371291	7.7	16.5	5.8
1973	63.8563327	543.9440096	46.53434152	3.752173913	0.33759389	56.1	0.585736438	-1.1	21.9	9.3
1974	59.02153266	561.0017494	48.62461391	4.418867925	0.38767881	74.6	0.643347676	-5.6	21.9	17.8
1975	57.95543153	552.4313451	41.58082653	2.908262203	0.395853469	64.3	0.812084484	-1.6	21.8	19.1
1976	56.92445891	489.3721679	41.52471992	6.53124662	0.429791561	64.2	0.860931292	-7.5	21.7	11.4
1977	69.0603199	548.0949823	50.63666421	6.895759268	0.36910195	66.6	0.887640236	-5.9	22.3	14.8
1978	101.8014597	623.9688098	61.55185811	4.048721176	0.409850049	67.6	0.898753468	6.7	27.6	16.9
1979	61.52082537	692.7101083	73.95782157	9.334433667	0.436449368	57.4	0.86257993	4.1	27.3	8
1980	59.78592798	741.3587073	73.38957252	8.05854551	0.466161047	65.4	0.893760305	0.9	29.5	13.9
1981	47.39404125	628.852427	55.54961943	1.297941009	0.470955872	64.3	1.22886908	1.4	29.4	11.6
1982	47.34231542	527.1786358	38.75839663	1.065647131	0.523638101	58.2	1.727941714	2.6	30	20.7
1983	47.62071255	439.6469459	29.22330292	1.745503162	0.606817289	54.2	2.021944685	3.6	29.3	11.4
1984	40.28058525	412.7624713	24.38666861	0.7169018	0.567156213	58.8	2.445224258	3.8	30.6	10.3
1985	40.71633641	378.7058233	25.28528008	1.780614136	0.681552665	55.4	2.753290082	5.3	31.5	13
1986	47.73497471	408.99021	33.49287723	1.848913955	0.635931125	55.7	2.730345387	4.9	30.3	2.5
1987	53.34055783	428.5387382	30.45734458	2.117276559	0.725606226	47.7	2.946064754	8.2	29	8.6
1988	48.4011486	421.9889333	33.92854098	0.019920758	0.695318632	50	3.576869529	8	30.8	12.3

1989	41.11304798	381.7103524	29.62399025	2.865894793	0.710996316	53.2	4.509647255	6.8	31.4	13.8
1990	36.93178818	355.6995503	32.94782334	2.368510207	0.823063507	57	5.618539979	7.3	32.7	17.8
1991	29.9289986	300.7929477	24.36696781	0.69487	0.914373571	55.6	7.796083279	5.7	33.7	20.1
1992	20.9794686	254.941636	16.85098344	0.197612826	0.840309489	52.9	11.96297548	1.8	34.8	27.3
1993	11.6345488	142.0194225	8.834076277	3.596432519	1.236398789	72.9	32.10449926	3.4	29.2	46
1994	18.63033856	151.1236483	17.02291501	0.157133467	0.996679201	71.3	26.52506814	16.4	29.3	28.8
1995	21.31547682	171.6569297	12.43529455	0.802452524	0.807973943	71.7	32.6795589	15.8	34.5	1.6
1996	15.7535568	161.0409822	11.00919549	1.452846684	0.565651262	57.3	33.98830522	-5.8	27	8.9
1997	13.02638935	157.4521541	9.676851605	0.745459904	0.492932687	54.1	42.15091363	16.9	27.9	11.4
1998	13.08448061	158.1818052	11.0943158	0.297960112	0.484183238	48.9	43.74910327	21.1	27.3	6.7
1999	10.6120322	138.9656306	10.28085592	0.559843276	0.506025177	48.2	53.32228023	17.5	29.3	5.7
2000	9.400216951	128.9883264	11.63836137	1.125934518	0.487119357	53.3	60.70817945	15.3	28.4	10
2001	9.924974555	129.8599172	13.63558524	0.05302623	0.428637575	55.9	62.86702215	17.8	25.2	5.7
2002	10.2241674	130.1756134	12.70231821	0.27344997	0.469835837	55.2	61.88252895	17.4	25.9	2
2003	10.84611697	139.0345524	11.11563092	0.76248361	0.464472484	54.1	65.64512331	9.8	24.6	9.8
2004	17.19864161	140.0811282	6.116320261	0.400904534	0.433459931	59.5	72.48883017	5	26.8	11.6
2005	26.31101727	155.5012066	4.047046076	0.176030581	0.345977756	64.5	72.3667	7.6	25.9	10.3
2006	28.84810155	173.2420019	5.495177583	0.390105658	0.296857031	64.9	76.94501724	5.4	26.1	14.5
2007	32.97146997	198.5185124	8.322818557	5.313732843	0.27619539	64.5	74.1615737	7.3	26.9	9.8
2008	26.2978883	196.1718596	7.641357941	0.615490534	0.249704733	69.4	111.789566	0.7	29.9	26.2
2009	25.36271669	180.3087735	9.830258358	0.685481185	0.280882559	61.6	119.566123	5.1	30.3	9.2
2010	25.77822284	186.116481	11.33708093	1.029275185	0.273343489	67.9	130.2517572	12.2	33.8	4
2011	24.2802791	173.3024949	10.93992781	1.728092165	0.305106285	75.1	158.9028354	2.6	38.1	14

Appendix 2: Unit root test

Table A3: Augmented Dickey Fuller test

Variables	Level		First Difference		Order of Integration
	Intercept	**Intercept + Trend**	**Intercept**	**Intercept + Trend**	
Log of private investment	-1.18185 (0.6732)	-1.48819 (0.8176)	-5.33609 (7.098e-005)	-5.30339 (0.0005117)	I(1)
Log of real gross domestic product	-1.02222 (0.7476)	-2.09785 (0.5465)	-4.46224 (0.00095)	-4.38944 (0.006222)	I(1)
Log of public investment	-1.00604 (0.7423)	-3.3181 (0.07757)	-3.81385 (0.00278)	-3.75353 (0.01898)	I(1)
Credit to the private investment	-2.13555 (0.2324)	-2.30109 (0.424)	-7.61346 (1.021e-007)	-0.448972 (0.9858)	I(1)
Inflation	-3.86755 (0.00493)	-3.81816 (0.02551)	-6.59636 (3.871e-009)	-6.5407 (4.767e-008)	I(0)
Log of external debt	-1.83968 (0.3615)	-1.23304 (0.89)	-5.48443 (4.532e-005)	-5.98455 (7.13e-005)	I(1)
Real interest rate	-2.05438 (0.2636)	-3.87731 (0.02216)	-7.54304 (1.038e-011)	-7.41552 (1.432e-010)	I(1)
Log of openness	-2.80964 (0.06569)	-2.7509 (0.2229)	-2.84425 (0.05219)	-3.24196 (0.07629)	I(1)
Real exchange rate	4.2715 (1.000)	1.66373 (1.000)	-0.973846 (0.7646)	-6.89751 (4.046e-006)	I(1)
Log of foreign direct investment	-2.04211 (0.2688)	-1.65559 (0.7708)	-8.15947 (1.694e-013)	-8.08563 (1.011e-012)	I(1)

Lag length is equal to 1 and the values in parenthesis are the P values

Appendix 3: Diagnostic tests

Table A4: Diagnostic tests results

Test	**Coefficient**	**P-Value**
Breusch-Godfrey test	1.285	0.298
Breusch-Pagan test	26.761	0.084
ARCH test	4.068	0.044
Wald test	7.113	0.000
Cusum test (Harvey-Collier)	2.349	0.287

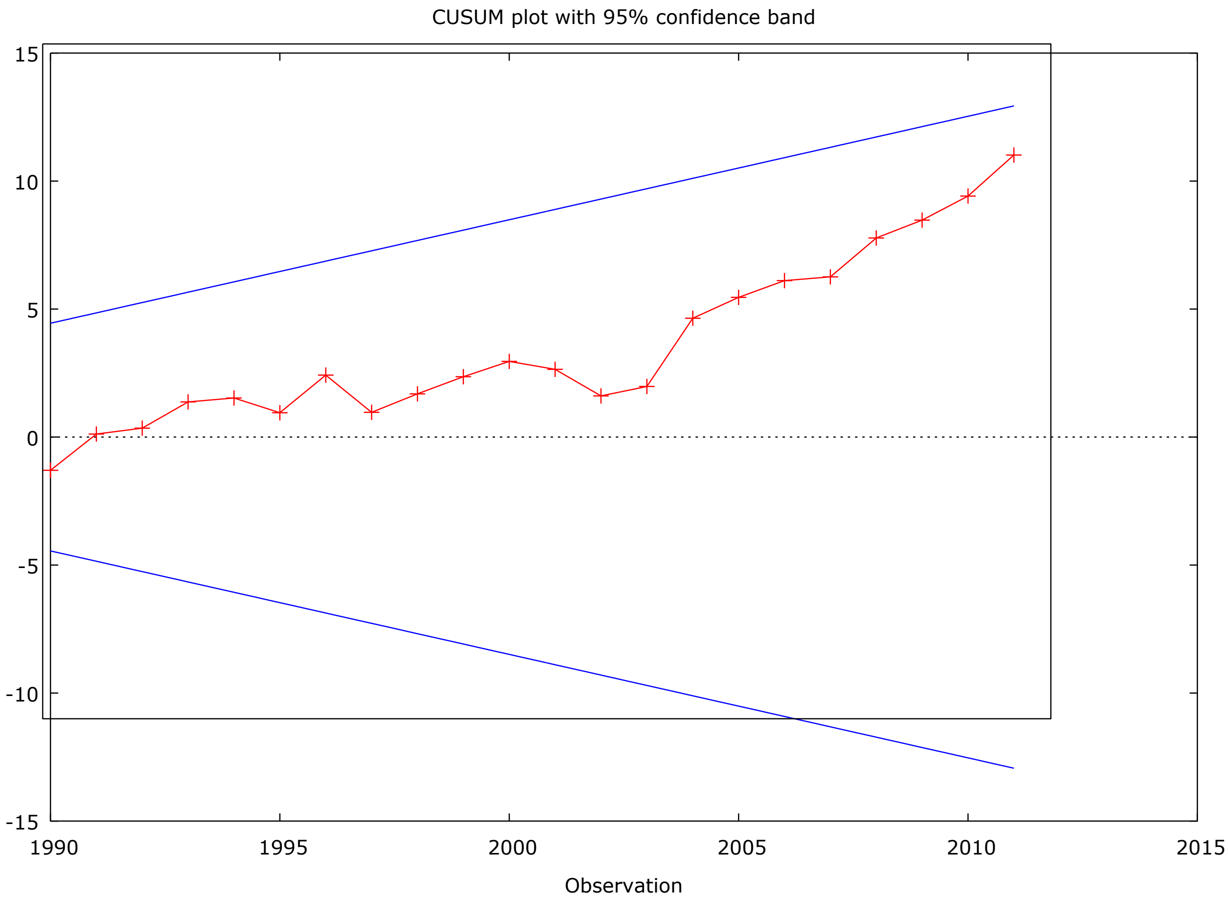

Figure A1: CUSUM test plot

Table A5: Bound Critical Values

	0.100		**0.050**		**0.025**		**0.010**	
K	I (0)	I (1)	I (0)	I (1)	I (0)	I (1)	I (0)	I (1)
10	1.83	2.94	2.06	3.24	2.28	3.50	2.54	3.86

K is the number of variables in ARDL model, I (0) denote the lower bound and I (1) denote the upper bound. 0.100, 0.050, 0.025 and 0.010 denotes the level of significance. Table extracted from (Pesaran *et al*., 2001).

Appendix 4: Regression results

Table A6: ARDL regression results

ARDL (1, 1, 1, 1, 1, 1, 1, 1, 1) OLS Results, using observations 1971-2011 (T = 41) Dependent variable: Log of private investment HAC standard errors, bandwidth 2 (Bartlett kernel)				
	Coefficient	*t-ratio*	*p-value*	
Log of GDP	1.622	4.739	0.000	***
First lag of log of GDP	-0.736	-2.247	0.035	**
Log of public investment	-0.210	-2.081	0.049	**
First lag of log of public investment	-0.089	-0.829	0.416	
Log of foreign direct investment	0.009	0.4228	0.677	
First lag of log of foreign direct investment	0.018	1.153	0.261	
Log of external debt	0.481	2.045	0.053	*
First lag of log of external debt	0.125	0.426	0.674	
Log of openness	-0.130	-0.575	0.571	
First lag of log of openness	-0.200	-1.037	0.311	
Credit to the private sector	-0.003	-0.179	0.860	
First lag of Credit to the private sector	-0.037	-2.364	0.027	**
Real interest rate	-0.003	-0.521	0.608	
First lag of real interest rate	-0.004	-0.596	0.557	
Exchange rate	-0.001	-0.253	0.803	
First lag of exchange rate	0.008	1.984	0.060	*
Inflation rate	-0.002	-0.505	0.618	
First lag of inflation rate	0.004	0.778	0.445	
First lag of log of private investment	0.600	5.548	0.000	***

Mean dependent var	3.416	S.D. dependent var	0.659
Sum squared resid	0.534	S.E. of regression	0.156
R-squared	0.999	Adjusted R-squared	0.998
F(19, 22)	7673.624	P-value(F)	0.000
Log-likelihood	30.825	Akaike criterion	-23.650
Schwarz criterion	8.908	Hannan-Quinn	-11.794
Rho	-0.035	Durbin's h	-0.305

Where (*), (**) and (***) denotes 10%, 5% and 1% level of significance

Appendix 5: Causality test

Table A7: Selected VAR results

Dependent variable	**Independent variable**	**Coefficient**	**t-ratio**	**P-value**
First difference of log of private investment	First difference of first lag of log of GDP	0.006	0.011	0.991
First difference of log of GDP	First difference of first lag of log of private investment	0.323	2.069	0.048