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COLLEGE OF ART AND SOCIAL SCIENCES

FACULTY OF SOCIAL SCIENCES

DEPARTMENT OF ECONOMICS

THE FINANCIAL DETERMINANTS OF PRIVATE INVESTMENT IN GHANA (1970 – 2010)

A THESIS SUBMITTED TO THE DEPARTMENT OF ECONOMICS, KWAME NKRUMAH UNIVERSITY OF SCIENCE & TECHNOLOGY, KUMASI IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF PHILOSOPHY DEGREE IN ECONOMICS.

BY

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DECLARATION

I declare that this thesis submitted herein is an original work I have personally undertaken under supervision, and that it has not been submitted before for any degree or examination in any other university, and that all sources I have used and quoted have been indicated and acknowledged by complete references.

…… …….

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I declare that I have supervised the above student in undertaking the study reported herein and confirm that she has my permission to submit it for assessment.

…….. ……

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DEDICATION

This work is dedicated to my mum, Ms Lily Kodiah who through her hard work, support and advice has brought me this far, and to my sister and friend, Maame Ekua Eshun.

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ABSTRACT

This study examines the financial determinants of private investment in Ghana using annual time series data from 1970 to 2010. The model specified was based on the flexible accelerator model following works by Blejer and Khan (1984) and Chhibber and Van Wijnbergen (1988). The estimation technique was based on the Autoregressive Distributed Lag (ARDL) model and the application of the Bounds Testing Procedure to test for the existence of cointegration among the variables. Subsequently, the long run and short run dynamic coefficients were estimated. On the basis of the long run estimates, the results suggested that the real interest rate, credit to the private sector, real exchange rate, inflation rate and real GDP growth rate significantly affected private investment in the long run. The findings further suggested that the real exchange rate, the inflation rate and the real GDP growth rate also significantly determines private investment in the short run. The broad money supply to GDP ratio was however found to have no significant impact on private investment in both the short run and long run. The results suggested the need for intensified supply side policies for continued and sustainable growth rates and macroeconomic stabilization policies that would be aimed at boosting private investment in Ghana. Also recommended are policies that would increase competition among financial institutions and increasing awareness of various lending rates, vis a vis intensifying policies that would eliminate the financing constraints faced by private investors.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The promotion of the private sector has become an integral part of Ghana's economic development strategy since it embarked on its Economic Recovery Program and the Structural Adjustment Program in 1983 and 1986 respectively. The private sector is made up of a very large number of small and medium-sized enterprises (SMEs) and a small number of well-established, larger firms including multinational corporations with investments in the various sectors, as well as construction and infrastructure (OECD, 2004). Private sector development, which involves the improvement of the investment climate is crucial for sustaining and expanding businesses, stimulating economic growth, and has been the backbone of most developed and growing economies of the 21st century.

Private investment is thus a powerful catalyst for economic growth and innovation as well as poverty reduction facilitator. According to the Organization for Economic Corporation and Development (OECD) Report (2006), much more investment is needed if many developing countries are to reach the Millennium Development Goals, especially that of halving the proportion of people living on less than a dollar per day by 2015. The private sector is recognized as a critical stakeholder and partner in economic development, by helping people escape poverty through the provision of jobs and income, as well as the availability of necessary goods and services needed to enhance people's standard of living (International Finance

Corporation, 2011). In this regard, the role of the private sector is important both in terms of its contribution to GDP and its ability to allocate and employ resources efficiently.

Since the 1970s, successive governments have realized the significant role of the private sector in enhancing sustainable economic growth. These governments focused their attention on long-term structural adjustment programs and sectoral reforms in a bid to provide the necessary incentives for the development of the private sector. The government in the early 1980s with financial assistance from the World Bank and the International Monetary Fund (IMF) adopted a comprehensive package of policy reforms: the Economic Recovery Program in 1983 and the Structural Adjustment Program in 1986, which was designed to promote the private sector by enhancing the investment climate of the country, alleviate poverty, and reverse the deteriorating nature of the economy. The growing concern towards the development of the private sector also necessitated the formulation of appropriate government policies geared towards the development of the private sector. These policies included the enacting of various investment codes and acts, large-scale privatization of some public enterprises, and financial sector reforms in the mid 1980s and early 1990s.

From 1970 to 1983, Ghana experienced serious economic decline characterized by lax financial management, high inflation rates, credit and interest rate ceilings, negative real interest rates, appreciating real exchange rate, high fiscal deficits, and a resort to monetary financing of the deficits which led to high monetary growth rates, inter alia. As a result of the distorted macroeconomic policies, the financial sector suffered immensely. The Bank of Ghana's monetary policy tools proved to be ineffective in the face of excessive monetary financing of the fiscal deficit which deteriorated from a deficit of 2.20 percent of GDP in 1970 to a peak of 11.30 percent in 1976 and progressively to 5.60 percent in 1982. As a result of the extensive monetary

financing, by June 1977, the level of currency issued by the Bank of Ghana increased by 110 percent, doubling the currency in circulation (Bawumia. 2010). The ratio of broad money supply to GDP, which from 1964 to 1974 had achieved relative stability of around 20 percent, rose in the mid 1970's to a peak of about 29.49 percent in 1976. By 1982, the ratio of broad money supply to GDP had fallen to about 15.5 percent.

In a bid to tighten monetary policy, the Bank of Ghana increased the cash ratio for commercial banks from 15 percent in 1969 to 30 percent by 1971, and a limit of 21 percent was set as the ceiling for credit expansion (Bawumia, 2010). Thus private sector credit and interest rates were controlled by the Central Bank by setting the lending and deposit rates based on the Bank of Ghana's discount rate (Ahiawodzi, 2012). The discount rate was increased to 8.0 percent by 1971 and then subsequently increased to 13.5 percent by 1982, with the minimum deposit rate reduced from -109.0 percent in 1977 to -113.0 percent by 1983. Lending rates varied from 6.5 percent in 1971 to -104 percent in 1977 and -108.3 percent by 1983. Throughout the 1970's, real interest rates recorded negative values which declined from -2.4 percent in 1970 to -50.01 percent in 1977, with a subsequent rise to -48.6 percent by 1983.

Credit to the private sector declined consistently from 12.58 percent in 1971 to its lowest level of 1.54 percent in 1983. The decline in credit supply was as a result of a fall in financial depth due to the negative deposit interest rates which discouraged savings combined with crowding out of government's borrowing requirements which reduced the volume of funds which banks had to lend to private sources (Brownbridge and Gockel, 1996). The period also recorded high inflationary rates which increased from 6.5 percent in 1969 to 116.5 percent by 1977 and 122 percent by 1983, in the midst of a regime of controlled prices. The justification by most policy makers of the day was that with the ceilings on interest rates, as inflation spiraled, would lower

the cost of borrowing to the various sectors. However, the policies rather succeeded in keeping potential savers away from the banking sector (Bawumia, 2010).

The high inflation rates coupled with the tight credit ceilings imposed on commercial banks' loan portfolios prior to financial liberalization made credit to the private sector very scarce which led to a decline in private investment and consequently constrained the pace of economic activity. Between 1970 and 1978, private investment declined from 8.65 percent to 1.19 percent. However, in 1979 it increased to 3.3 percent after which it declined to 2.27 percent in 1982. The period also recorded high levels of capital flight with a high level of financial deepening of 29.11 percent in 1976 but declined to 11.31 percent by 1983 (Ahiawodzi, 2012).

The deteriorating nature of the economy necessitated the need for Ghana to reform her financial system. Proponents of the reform of the financial sector argue in line with McKinnon (1973) and Shaw's (1973) premise that financial markets in developing countries are repressed, with interest rate remaining below its equilibrium market clearing rate thereby generating less than the optimal amount of savings necessary for investment and growth. In line with that, Ghana has made several attempts at reforming her financial systems with the view to foster financial development. Financial development via liberalization of interest rates and removal of credit ceilings which improves credit to the private sector, or through policies that increase liquidity is thought to cause both saving and investment to increase.

The economic adjustment programs which included financial sector reforms in 1983, the Financial Sector Adjustment Program (FINSAP) in 1988 aimed at financial liberalization, and more recently the Financial Sector Assessment Program (FSAP) in 2000 as well as the

introduction of Universal Banking in 2003 were aimed at addressing the deterioration in the financial sector by embarking on a market oriented financial sector (Frimpong and Adam, 2010).

The adoption of the FINSAP was part of a strategy to move the Ghanaian financial sector from an era of financial repression towards one of financial liberalization, which would stimulate savings and investment for growth. This included the removal of interest rate ceilings, abolishing of directed credit and credit controls, restructuring of seven financially distressed banks, improving the regulatory and supervisory framework, privatization of banks, free entry into the formal financial sector and the development of money and capital markets (Bawumia, 2010).

The economy responded positively to the financial liberalization policies under the financial sector reforms. Inflation declined from 122 percent in 1983 to 10 percent by 1992. Relative stability also returned to the foreign exchange markets with exchange rate depreciation declining from 40 percent in 1984 to 11.7 percent by 1991. However, after 1991, the depreciation of the exchange rate increased continuously from 25 percent in 1992 to 51.07 percent by 2000. There was also significant improvement in the credit provided to the private sector which increased from 2.21 percent of GDP in 1984 to 5.85 percent in 1989. By 1997 it hovered around 8.2 percent after which it increased consistently from 13.97 percent in 2000 to 15.54 percent in 2005 (African Development Indicators, 2012).

The ratio of broad money supply to GDP also increased from 11.47 percent in 1985 to 17.34 percent by 1992 and by 2000 the ratio was 23.1 percent. The lending interest rate continued to increase after 1984 from 21.16 percent to 25.58 percent by 1988. The real interest rate however continued to be negative for some periods after the reforms. It declined from 0.4 percent in 1985 to -3.1 percent by 1991, but recorded positive values for the three years before 1995 until

declining to -48.1 percent after which it increased to -4 percent by 2000 (World Bank, 2011). These however resulted in a marginal improvement in private investment which increased from 4.37 percent in 1984 to 7.53 percent by 1991. Private investment continued to increase after 1991 to 12.7 percent in 2000 and by 2010 it had attained a peak of 17.87 percent. The Ghanaian financial sector has also been profoundly transformed since the joint IMF-World Bank Financial Sector Assessment Program (FSAP) in 2000 (and its update in 2003). With the FSAP's medium-term financial-sector strategy, Ghana's financial sector development has led to an improvement in the growth rate, rising from 4.5 percent in 2002 to 6.3 percent in 2007. Also, the ratio of broad money (M2) to GDP, which is the traditional measure of financial deepening, increased from 26.7 percent in 2000, reaching 43 percent of GDP by the end of 2007, with much of the increase being funded by an increase in demand and savings deposits (Bawumia et al., 2008).

1.2 Problem Statement

Over the years, with all the various policies and reforms that have been implemented, it was expected that the Ghanaian economy would be on the path of recovery and sustainable development. However, after more than a decade of implementing market-oriented and structural reforms aimed at improving both the micro and macro environment, Ghana continues to be confronted with a number of economic constraints. Among these constraints are the low level of savings and investment that are too low to allow self-sustained growth.

According to the World Bank (1991), to move an economy on the path of sustainable growth, a major share of the additional savings and investment required must come from private sources. Although the level of savings and investment has been increasing in Ghana, it is however inadequate to fuel the growth needed to raise living standards and generate sufficient productive

employment. For instance in 1990, 2000, and 2010, the level of savings recorded as a percentage of GDP was 5.47 percent, 5.5 percent, and 9.28 percent respectively (African Development Indicators, 2012). Private investment has generally shown an upward trend from 5.4 percent of GDP in 1989 with a consistent and marginal improvement to 12.7 percent in 2000 and subsequently to 17.87 percent by 2010 (African Development Indicators, 2012). It is therefore evident that the perceptible rate of increase in the ratio of private sector investment to GDP is slow which is all the more worrying.

Also, the expected role of the private sector as an engine of growth (via liberalizing interest rates and improving credit to the private sector) has not materialized to a large extent. An improvement in the real interest rate which would help boost private investment was anticipated after the reforms, however the real interest rate continued to be negative for some period declining from -10.45 percent in 1984 to -15.56 percent in 1986. It continued to be negative throughout the rest of the 1980's till 1992, 1993, and 1994 when it attained positive values of 3.4 percent, 6.3 percent and 6.8 percent respectively (African Development Indicators, 2012). Thus what is inhibiting private sector development in Ghana? This question has aroused a lot of concern in government and to researchers about the potency of the reforms and the achievements so far.

Ghana's macroeconomic stabilization has allowed it to achieve remarkable success in developing its financial sector via financial sector liberalization policies which has led to enhanced competition (including from abroad), gradual capital account liberalization (Bawumia et al, 2008), and efficiency and profitability in the financial system. As a result, Ghana's financial sector has achieved some development with accelerated levels of investment and economic growth. However, the issue as to whether the improvement in the financial factors has induced

investment remains unanswered. Thus a substantial amount of research is needed to provide a better understanding of whether the financial factors have indeed contributed to the increased levels of investment. Imperatively, however, the present study seeks to fill in the lacuna by investigating the financial determinants of private investment in Ghana between the periods 1970 to 2010.

1.3 Objectives of the Study

Generally, the study seeks to analyze the financial determinants of private investment behaviour in Ghana from 1970 to 2010. Specifically, the objectives of this study are to:

1. Examine the trend in private investment and the selected financial variables in Ghana over the study period.
2. Investigate the long run and short run relationships between private investment, real interest rate, credit to the private sector, broad money supply (M2) and real exchange rate.
3. Investigate whether the financial factors have contributed to an improvement in private investment in Ghana.
4. Analyze the effect of other macroeconomic variables (specifically inflation rate, and real GDP growth rate) on private investment in Ghana.

1.4 Research Hypotheses

The study seeks to test and validate the following empirical hypotheses:

H_0 : Real interest rate has no significant impact on private investment

H_1 : Real interest rate has a significant impact on private investment

H_0 : Credit to the private sector has no significant impact on private investment

H_1 : Credit to the private sector has a significant impact on private investment

H_0 : Broad money supply has no significant impact on private investment

H_1 : Broad money supply has a significant impact on private investment

H_0 : Real exchange rate has no significant impact on private investment

H_1 : Real exchange rate has a significant impact on private investment

1.5 Justification for the Study

Stimulating private investment in Ghana continues to be a significant concern of policy makers in Ghana and developing countries at large. As one of its central objectives, the study attempted to provide an empirical analysis of the impact of the financial determinants on private investment in Ghana. In line with this, the study suggested ways and means through which government policies can stimulate private investment to boost economic growth. Following the implementation of various financial sector reforms vis-à-vis the adoption of different monetary policy regimes, it was envisaged by policymakers that the ensuing development of Ghana's financial system will expand the quantity and availability of investible funds and efficiently facilitate the channeling of these funds from various surplus units to the investment activities with the highest return, and thus assuage the liquidity constraints confronting most investors and entrepreneurs in the country. It was also expected that these will go a long way to dampen the overall costs and risks of investment, and boost capital accumulation.

Despite this remarkable attention devoted by policymakers to creating an enabling and congenial environment for private sector investment, available empirical literature on investment behavior in Ghana, to the researcher's best knowledge, has not yet exclusively been focused on investigating the role of financial factors in determining domestic private investment in Ghana. Worded differently, whereas researchers have shifted their attention towards the role of financial determinants in explaining investment in many countries over time, none of the previous studies on investment behavior in Ghana explored this crucial issue in the case of Ghana. This study is aimed at filling this research and knowledge gap in Ghana by assessing the effects of some selected financial development indicators on private investment in Ghana. The results of this study will have important implications for policymakers. Whilst controlling for the effect of non-financial factors, the findings would provide empirical information on how effectively the financial sector deregulation and its accompanying reforms have influenced private investment in Ghana.

1.6 Scope of the Study

Conceptually, the study seeks to find out the impact of specific financial variables on private investment in Ghana. This is because, private investment is very important in determining the level of both real output and total employment in an economy. More precisely, the study examined the impact of real interest rate, credit to the private sector, real exchange rate, ratio of broad money supply (M2) to GDP, inflation rate, and real GDP growth rate on private investment in Ghana. These indicators were chosen because they capture both the financial and non-financial factors of private investment, thus giving a true representation of investment behavior of firms in Ghana. The study period is designed to have coverage on relevant data between the years 1970 and 2010. This period

was chosen due to the availability of relevant data and yet considered reasonably long enough to provide adequate information on private investment decisions in Ghana.

1.7 Organization of the Study

The study is organized into five main chapters with each chapter further divided into sections and subsections. The general introduction of the study is discussed in chapter one, with chapter two reviewing both theoretical and empirical works on private investment, and examining a historical perspective and trend of private investment in Ghana. Chapter three deals with the methodology, which includes the model specification and estimation techniques while Chapter four analyses and discusses the findings of the study. Finally, chapter five concludes the study by summarizing the findings, and enumerating the policy implications and recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter focuses on the review of relevant literature on investment. The chapter consists of three broad sections. The first section reviews the theoretical literature on investment while the second section reviews empirical works relating to investment and its determinants. Finally, section three discusses the various policies and the general trend of private investment in Ghana.

2.1 Theoretical Literature Review

Traditional explanations of investment as an 'engine of growth' and its determinants are rooted in the Keynesian theory of investment; the accelerator theories of investment specifically, the rigid accelerator theory, the flexible accelerator theory and the neoclassical accelerator theory of investment; the adjustment cost theory; and the Tobin's Q. McKinnon and Shaw (1973) also provide both theoretical and empirical explanations on how financial repressive policies and financial liberalization impart on investment and growth in developing economies. More recent literature have also expounded on how irreversibility and uncertainty imparts on investment decisions of firms. Thus this section reviews the relevant theories of investment with the objective of identifying the key variables that would be relevant to the study.

2.1.1 The Keynesian Theory of Investment

In the General Theory, Keynes (1936) emphasized the central role of investment as the driving force of influencing aggregate output, employment, and short run fluctuations in economic activity. The Keynesian theory of investment asserts that investment is the result of firms balancing the expected return on new capital also referred to as the marginal efficiency of capital

(MEC), with the cost of capital, which depends primarily on the real interest rate. Thus investment decisions are taken by comparing the expected yield or MEC with the cost of capital which is the real interest rate. At lower rates of interest, more capital projects appear financially viable while higher interest rates lead to some projects being postponed or cancelled since the cost of borrowing to finance investment become higher.

Keynes also asserted that investment is volatile because it depends on firms' expectations of the profitability of investment. Thus so long as the expected yield on their investment exceeds the real interest rate, new investment will take place. Keynes rejected the notion that investment was based exclusively on technological conditions of capital productivity, but emphasized monetary factors and finance and uncertainty as the basic determinants of investment (Fazzari, 1989).

2.1.2 The Rigid Accelerator Theory

The simplest theory of investment demand is the rigid accelerator model formulated by Clark (1917). In its simplest form, the rigid accelerator theory of investment states that investment is proportional to the increase in output which is proxied by changes in demand in the coming period (Reinert et al, 2008). Thus, the accelerator model relates investment to changes in demand and proposes that an increase in a firm's output will require a proportionate increase in its stock of capital.

The theory's basic underlying assumption is that firms' desired capital-output ratio is roughly constant and net investment takes place when output is expected to increase. In effect, the theory implies that the level of output or the changes in aggregate demand determines investment or the change in capital stock. Mathematically, this proposition of the theory is expressed as $K_t^* = \sigma Y_t$

where σ is the desired capital-output ratio which is assumed to be constant, K_t* is the desired capital stock in period t, and Y_t is the level of output in the same period.

2.1.3 The Flexible Accelerator Theory

Koyck (1954) and Chenery (1952) developed the flexible accelerator theory as an alternative to the rigid accelerator model. The theory overcomes one of the major shortcomings of the rigid accelerator model, namely that capital stock is always optimally adjusted to meet the changes in demand (Antonakis, 1987). According to the flexible accelerator model, the rate of investment by firms is determined by the size of the gap between the existing capital stock and the desired stock needed to raise output to the desired level required to meet a demand shock. Thus the larger the gap between the existing capital stock and the desired capital stock, the greater will be a firm's rate of investment. Directly opposite to the view that investment responds immediately to changing demand conditions, the flexible accelerator theory states that firms plan to close a fraction of the gap between the desired capital stock and the actual capital stock at a time.

In closing the gap between the desired capital stock, K_t*, and the actual capital stock, K_t, in each period gives rise to a net investment equation of the form $I_t = \delta (K_t^* - K_{t-1})$ where I_t = net investment, K_t* = desired capital stock, K_{t-1} = last period's capital stock, and δ = partial adjustment coefficient. Output, internal funds, cost of external financing and other variables may be included as determinants of K_t* within the flexible accelerator model framework.

2.1.4 The Neoclassical Accelerator Theory

A more general form of the accelerator model is the neoclassical flexible accelerator model. It was further developed based on the neoclassical idea of the theory of the firm by Jorgenson (1963) which postulates that enterprises decide to invest so as to generate more profit in the

future. In this approach, the desired or optimal capital stock is proportional to output and the user cost of capital. The user cost of capital is the real rental price of capital services or the cost of holding capital which depends on the price of capital, the real rate of interest, the rate of depreciation, and the tax structure (Matlanyane, 2005). Thus firms will invest so long as the marginal benefit of doing so outweighs the additional costs.

The determinants of investment in the neoclassical flexible accelerator model includes the expected aggregate demand or accelerator, the user cost of capital, the wage rate, and the initial capital stock (Aysan et al, 2007). Therefore within the framework of the neoclassical accelerator theory, firms would invest until the marginal revenue product of capital equals the user cost of capital.

As an extension of Jorgenson's model, subsequent work under the adjustment cost theory soon recognized that, unlike many other factor inputs, changes in capital typically involved additional costs and expenditures thus the need to incorporate adjustment costs in the investment decisions of firms.

2.1.5 The Adjustment Cost Theory

Investment under adjustment costs have been developed and analyzed by Lucas (1967), Eisner and Strotz (1963), Gould (1968), Treadway (1969) and Uzawa (1969). The key assumption of the model is that firms face costs of adjusting their capital stocks, with the adjustment costs being a convex function of the rate of change of the firm's capital stock. The adjustment costs, denoted by $C(\dot{k})$ satisfy $C(0) = 0$, $C'(0) = 0$ and $C''(.) > 0$. These imply that it is costly to increase or decrease the capital stock and that the marginal adjustment cost is increasing in the

size of the adjustment**.** According to the theory, firms will invest up to the point where the cost of acquiring an extra unit of capital equals the value of the capital.

According to Mussa (1977), investment is both demand and supply determined and its form and properties are influenced by internal and external adjustment costs. The standard example of internal adjustment costs are the direct costs firms face in changing their capital stock. That is, the acquisition of new machines that may demand expensive installation procedures and time-consuming worker training sessions (Pereira, 1999). These adjustment costs are foregone resources within the firm because the machines purchased cannot be used until they have been properly installed. The installation process also requires that some of the workers stop working in the production line for sometime; hence by installing the new machines the firm foregoes some resources (Sala-i-Martin, 2005). The external adjustment costs arise when firms face a perfectly elastic supply of capital but where the price of capital goods relative to other goods adjusts so that firms do not wish to invest or disinvest at infinite rates. Thus firms face an increasing price in the amount of investment they demand although they are external to the firm.

2.1.6 Tobin's Q

In the Q theory of investment associated with Tobin (1969), he reasoned that if the market value of physical capital of a firm exceeded its replacement cost, then capital has more value in the firm than outside the firm. Tobin's Q, formally defined as the ratio of the market value of the existing capital stock to its replacement cost is the main driving force of investment. According to Tobin, firms accumulate more capital when $Q > 1$ and should draw down their capital stock when $Q < 1$. If $Q = 1$, then the market value equals the replacement cost and hence there would

be no change in the capital stock. Thus net investment in physical capital should depend on where Q is in relation to one.

2.1.7 The McKinnon-Shaw Hypothesis

The "neoliberal" view by Galbis (1979) emphasizes the importance of financial deepening and high interest rates in stimulating growth through investment. The proponents of this approach, McKinnon (1973) and Shaw (1973) offered a theoretical and empirical foundation for the relationship between financial factors and investment in developing countries. They argue that developing countries suffer from financial repression and that if these countries were liberated from their repressive conditions, savings, investment and growth would be induced to increase. The underlying assumption of the model is that saving is responsive to interest rates, thus a higher saving rates would finance a higher level of investment, leading to higher growth (Gemech and Struthers, 2003).

Financial repressive policies such as interest rate ceiling, minimum/maximum lending rates, quantity restrictions on lending, bank reserve requirements, capital controls, inter alia, cause real interest rates to be negative and unstable especially in the presence of high inflation in an economy. According to their argument, a repressed financial sector discourages both saving and investment because the rates of return are lower than what could be obtained in a competitive market. As a result, financial intermediaries do not function at their full capacity and fail to channel saving into investment efficiently, thereby hampering the development of the whole economic system (Reinert et al., 2008).

McKinnon and Shaw proposed that financial liberalization, which involves the removal or elimination of restrictions and controls on financial markets and financial institutions associated

with higher real interest rates would stimulate saving and investment by reducing the financial constraint of firms and stimulate financial intermediaries to become more efficient. All these will help to improve the efficiency of financial intermediation in a country, and contribute more to private sector investment thereby resulting in higher economic growth rates (Hermes and Lensink, 2005).

Thus in the neoliberal view, investment is positively related to the real rate of interest. The reason for this is what McKinnon calls the 'conduit effect' where a rise in interest rates increases the volume of financial savings through financial intermediaries and thereby raises investible funds. Thus, although demand for investment declines with the rise in the real rate of interest, due to the greater availability of funds, realized investment increases.

2.1.8 Uncertainty and Investment

The nature of investment projects is considered irreversible, hence most recent literature have introduced an element of uncertainty in the analysis of investment behavior (Pyndick, 1991). The key assumption in this argument is that, capital has a low resale value and mostly considered firm specific. Thus disinvestments will be very costly since employing these firm specific capital goods in other alternative projects will be virtually impossible. Due to the irreversible nature of certain investment projects, Pyndick further argues the need for the net present value (NPV) rule (which says, one should undertake investment if the value of a unit of capital is at least as large as its cost) to be modified owing to the fact that it may be costly for the firm to disinvest should market conditions change adversely.

Dixit and Pyndick (1994) in another development identified three main elements that characterize investment decisions: (1) the initial cost of investment, (2) the investor's assessment

of the probabilities of the outcomes associated with profits or loss, and (3) the timing of the investment decision. These three features characterizing the decision to undertake investment projects are tantamount in the process of determining the optimal investment decision-making.

2.2 Empirical Literature Review

In Africa, using panel data analysis, Ndikumana (2000) investigated the effects of financial development on domestic investment in a sample of 30 sub-Saharan African countries. The study was based on a dynamic serial-correlation investment model which included various indicators of financial development, and nonfinancial factors of investment. The model specified for the study was: $I_{it} = \beta I_{i,t-1} + \delta FIN_{i,t-1} + \Gamma' X_{i,t-1} + \mu_{it}$

Where I_{it} is the logarithm of investment (as a percentage of GDP) for country i at time t, FIN is an indicator of financial development, the vector X includes a list of control variables, consisting of the growth rate of real per capita GDP, government consumption, the interest rate, international trade flows, inflation, external debt, and the black market premium (all in logarithm except for GDP growth). The positive relationship between financial development and investment was documented using four indicators, credit to the private sector, total liquid liabilities of the financial system, credit provided by banks, and an index combining these three indicators. This positive relationship was consistent with the expectation that it is private investment that is most dependent on financial development. Thus higher financial development led to higher future levels of investment in the long run. The study also provided evidence on the negative effects of external debt, inflation, interest rate, black market premium, and government domestic borrowing on investment. Per capita GDP growth and international trade flows was

positively related to domestic investment. All but the coefficient of interest rate was not significant. There was however no evidence of a negative effect of government consumption on investment as predicted by theory. The findings therefore implied that financial development could stimulate economic growth through capital accumulation.

Although the study contributed to the growing literature that emphasizes the links between the financial sector and real economic activity in the growth process, issues that are relevant to the links between financial development and domestic investment were not explored. For example, the study did not investigate whether cross country differences in the structure of financial systems had an effect on the ability of financial development to stimulate domestic investment. Furthermore, since the study used aggregate data, some important aspects of the links between finance and investment were inevitably blurred in the analysis. That is, the analysis could not capture the effects of sectoral distribution of credit supply (for example, between small and large firms, services and manufacturing sectors), or the role of various forms of financing that were not recorded in the official data (like informal credit mechanisms). These limitations implied that the results of the study may underestimate the true effects of financial development on investment.

Fowowe (2011) conducted a similar study on financial sector reforms and private sector investment in some sub-Saharan African countries using panel data over the period 1980 to 2006. Constructing a financial reforms index and including other variables on the basis of the accelerator theory and uncertainty variables, the model specified was formulated as:

$$PRIVATE_{it} = \alpha_0 + \alpha_1 FINDEX_{it} + \alpha_2 GDPGROW_{it} + \alpha_3 PUBLIC_{it} + \alpha_4 VOLINFL_{it} + \varepsilon_t$$

Where PRIVATE is the ratio of gross private investment to GDP, FINDEX defined as the index of the financial reforms, GDPGROW represents the growth rate of GDP, PUBLIC is the ratio of gross public investment to GDP, and VOLINFL is the volatility of inflation. The results of the econometric estimations showed that private investment had a positive relationship with the financial sector reforms in the selected sub-Saharan African countries confirming the financial liberalization hypothesis which advocated financial reforms to boost private investment. From the results also private and public investment, rather than being complements were substitutes in the selected sub-Saharan countries. The accelerator theory was supported with the finding of a positive coefficient for output growth and also, the effect of macroeconomic uncertainty on private investment was found to be negative. An inverse relationship between private investment and inflation volatility was also confirmed in the study. The paper thus concluded that the level of private investment increased after the liberalization policy in most of the countries that were studied.

Although the study improved upon previous empirical research by developing a broad and more comprehensive data set on financial sector reforms, it however failed to explore the impact of some of the financial development indicators (credit to the private sector, ratio of liquid liabilities to GDP, banks credit to the private sector, inter alia) on investment within the period under study. Thus the study ignored the size of the financial sector and the extent of financial development since these indicators are a proxy of financial development.

Nair (2004), using a Vector Auto Regression (VAR) model, examined the major determinants of manufacturing investment in India for the period 1973 – 2002. Based on the neoclassical model of investment, Nair specified an investment model for Indian manufacturing firms of the form:

$$I_t = \delta K_{t-1} + \sum_{j=0}^{N} \theta_{1j} \Delta Y_{t-j} - \sum_{j=0}^{j_2} \theta_{2j} \Delta C_{t-j} + \mu_t$$

Where the distributed lag coefficients are an amalgam of the expectational and production parameters, namely, output, user cost of capital, lagged investment value, real bank credit, retained profit, and financial liberalization variables which are, current account liberalization, capital account liberalization, and money market liberalization. The results indicated that the estimated coefficient for the level of output was positive and significant in all the specifications. The coefficient of profit was also positive and statistically significant in all models indicating that even after the introduction of the financial sector liberalization policy, firms still depended on profit for investment. Thus the responsiveness of investment was more with output and profit than with the financial liberalization policy variables. The statistically significant and negative coefficient of the aggregate financial liberalization coefficient in the estimated regression was consistent with the view that, the financial liberalization policy in general has had a negative impact on corporate investment. Though the liberalization produced a favourable environment for investment, it was rather difficult to conclude that it had created a substantial impact on the investment behavior of firms. Nair attributed this to the fact that liquidity constraints existed and this prevented the efficient mobilization and channelization of resources even after the financial sector liberalization.

While the study attempted to empirically model the effect of financial liberalization on investment in India, it failed to measure the gradual institutional changes involved with the financial sector reforms. Rather, the study focused on other macroeconomic variables neglecting

other reform measures. According to Gibson and Tsakalatos (1994), any analysis of financial liberalization and reforms that does not take full account of the institutional changes associated with these reforms will not provide useful insight into how financial reforms have affected investment, and therefore be affected with omitted variable bias.

Ouattara (2004) in his paper investigated the long run determinants of private investment in Senegal by adopting the Johansen Cointegration technique and the ARDL bounds approach between the periods 1970 to 2000. Based on the neoclassical theory of investment, the model estimated was formulated as:

$$lnI_{p\square} = \alpha_0 + \alpha_1 lnI_{gt} + \alpha_2 ln\, RGDP_t + \alpha_3 lnPCRED_t + \alpha_4 lnAID_t + \alpha_5 lnTOT_t + \varepsilon_t$$

Where I_p represents private investment, I_g is public sector investment, $RGDP$ for real GDP, $PCRED$ stands for credit to the private sector, *AID* is foreign aid, and *TOT* for terms of trade. The findings indicated that public investment, real GDP and foreign aid flows, positively and significantly affected private investment. Thus public investment crowds in private investment while the positive impact of aid on private investment was possible because the aid was used to finance a reduction in taxation towards the private sector since high taxes was regarded by some Senegalese entrepreneurs as harmful to investment. Credit to the private sector, and the terms of trade negatively and significantly imparted on private investment. Senegal is highly dependent on energy imports and with its narrow export base private investment was highly sensitive to external shocks, thus this made the economy vulnerable to terms of trade shocks and as a result, the terms of trade influenced private investment negatively. The negative impact of credit

availability was attributed to the lack of strong business and professional organizations and lack of personnel with experience and expertise in credit analysis.

A possible limitation of the study was that, it did not consider any macroeconomic instability variable as well as the various macroeconomic stabilization policies and financial reforms undertaken by the Senegalese government within the period under study and how they have imparted on investment. Thus the variables in the model do not give a holistic picture of the determinants of private investment in Senegal.

A study conducted by Bakare (2011) in Nigeria analyzed the determinants of private investment in Nigeria using a time series data and an error correcting model between 1978 and 2008. The investment model for Nigeria based on the flexible accelerator theory was modeled as:

$$PRGDP_t = \emptyset_0 + \emptyset_1 PUBINV_t + \emptyset_2 NEXR_t + \emptyset_3 CPI_t + \emptyset_4 MINS_t + \emptyset_5 INFRAST_t + \emptyset_6 SAVR_t + \emptyset_7 D + u_t$$

Where PRGDP is the nominal private investment as a percentage of nominal GDP, PUBINV representing nominal public investment as a percentage of nominal GDP, NEXR for nominal exchange rate, CPI is the Corruption Perception index, MINS for macroeconomic instability (proxied by the inflation rate), INFRAST representing Infrastructures (proxied by power supply), SAVR is the savings rate, and D which is a dummy for political instability (proxy for investment climate). The empirical investigations showed that changes in real private investment in Nigeria were best explained by changes in the political trend (political instability), macroeconomic instability, poor infrastructure, and corruption which were all represented by a dummy. Thus these four major factors created a hostile investment climate which hindered private investment

in Nigeria. The study also found a significant and negative relationship between private investment and public investment, nominal exchange rate, the corruption perception index, and poor infrastructure. Savings and inflation were however found to be significant and positively related to private investment. Overall, the study brought out in clear terms the reason for the low levels of private investment in Nigeria.

The apparent limitation of the study was that, it only concentrated on some of the nonfinancial factors of investment, totally ignoring the role of financial factors and their impact on investment. Generally, in analyzing the determinants of private investment, both financial and nonfinancial factors are considered (Ndikumana, 2000). Bakare therefore analyzed just an aspect of the determinants of investment, thus the investment model used does not give a true representation of investment behavior by Nigerian firms.

In a similar study, Asante (2000) analyzed the determinants of private investment in Ghana using time series analysis and complementing it with a cross-sectional one from 1970 to 1992. Specifying the determinants of private investment as consisting of uncertainty, neoclassical and Keynesian variables, the model for the time series analysis was presented as:

$$PRGDP_t = \beta_0 + \beta_1 LAGPRGDP_t + \beta_2 PUBGDP_t + \beta_3 REER_t + \beta_4 RCREDGR_t + \beta_5 REGIM_t + \beta_6 MINS_t + \beta_7 RRATE_t + \beta_8 TXRAT_t + \beta_9 INVDEF_t + \beta_{10} GDPGR_t + \beta_{11} D + u_t$$

Where $PRGDP_t$ = nominal private investment as a percentage of nominal GDP, $LAGPRGDP_t$ = Lagged value of PRGDP (proxy for investment climate), $PUBGDP_t$ = Nominal public investment as a percentage of nominal GDP, $REER_t$ = real exchange rate, $RCREDGR_t$= growth rate of real credit to the private sector, $RRATE_t$ = real rate of interest rate (proxied by the real

lending rate), $MINS_t$= macroeconomic instability, $GDPGR_t$ = growth rate of real GDP, $INVDEF_t$= Investment deflator (proxy for user cost of capital), D = dummy for political instability, $TXRAT_t$ = Corporate tax as a percentage of total tax revenue, $REGIM_t$ = measure of trade regime.

The study found that the growth of real credit to the private sector, real exchange rate and public investment had a positive and statistically significant effect of 1 percent on private investment, with public investment confirming a possible complementary effect. The dummy variable representing political instability was highly significant and negatively related to private investment in all the trials. Lagged private investment to GDP ratio was also found to be positive and significant indicating a good investment climate acting as a good indicator for current investment decisions. GDP growth rate had a negative significant sign contrary to expectation but marginally significant in a few trials thus rejecting the accelerator theory of investment in Ghana. Finally, the measure of macroeconomic instability had a negative effect on private investment although significant at the 1 percent error level. The study therefore concluded that macroeconomic instability had been a major hindrance to private investment in Ghana and so policies that address only some components of macroeconomic instability may not be enough to revive private investment.

Asante, focusing on most variables of both the financial and nonfinancial factors of investment, however failed to measure the gradual institutional changes involved with the financial sector reforms implemented in Ghana in the 1980's which falls within the period under study. Rather, the study focused on the controlled and liberalized regime of trade ignoring other financial sector reforms. Thus the study, concentrating on the macroeconomic variables, did not provide insight

into how financial reforms have influenced investment behavior in Ghana within the stated period of study.

Other empirical works in Turkey, Ghana, Benin, Zimbabwe, inter alia, have also considered how private investment had been influenced over the years by delving into both financial and the general determinants of investment.

For instance, in a study to investigate whether financial development had contributed to an increase in private investment in Turkey between 1970 and 2009, Ucan and Ozturk (2011) employed four indicators to test the effect of financial development on investment by using the Vector Autoregressive (VAR) Model. The indicators used were total liquid liabilities of financial intermediaries, domestic credit to the private sector, and credit provided by banks, and a composite index combining all the three indicators. The results indicated a positive relationship between domestic investment and all four indicators of financial development. The results also confirmed the relationship between inflation, real interest rate and real per capita GDP growth. Inflation and real interest rate negatively affected private investment, while private investment was positively affected by real per capita GDP growth.

Frimpong and Marbuah (2010) employed the Auto Regressive Distributed Lag approach to model the determinants of private sector investment in Ghana from 1970 to 2002 using a time series analysis. The investment model used incorporated the accelerator, neoclassical and uncertainty (macroeconomic and political) variables. The results indicated that the coefficient of real GDP, real interest rate, external debt and inflation was statistically significant and positively related to private investment. Public (government) investment ratio and credit to the private sector had a positive but insignificant coefficient with public investment confirming a possible

crowding-in (complementarity) effect. Openness had a significant negative effect on private investment at the 5 percent significance level. Finally, constitutional regime (political instability) represented by a dummy variable came out with a positive sign albeit not significant at any of the conventional statistical levels. Overall, the results confirmed a significant accelerator theory effect on private sector investment in Ghana at the aggregate level over the period under study.

Using a capital demand function, Gnansounou (2010) analyzed the possible factors that explained the weakness of investment by private firms in Benin. The function was estimated using data from a panel of 123 firms in Benin and covering the period 1997 to 2003. The findings showed that demand uncertainty and the fluctuations in the imports of manufactured goods from Nigeria have had a negative effect on investment by private firms in Benin. The author further explained that the investment behaviour of these firms strongly hinges on the cost of capital utilization. Thus when this cost is high, it weighs negatively on the purchase and installation of new production infrastructure hence less investment. Furthermore, the magnitude of the effect of this cost of capital utilization and of the demand uncertainty which investment firms face depends on the nature of their activities.

In another comprehensive study, Jenkins (1998) using a two-step Engle-Granger approach to deal with non-stationary variables, constructed a model of private investment for Zimbabwe over the period 1969 to 1990. Over the years it had been recognized that investment in Zimbabwe was constrained by foreign exchange shortages, private capital formation, uncertainty about political development, government policy with respect to labour and price controls. The macroeconomic model of private investment behaviour in Zimbabwe showed that private investment was related, in the long run, positively to gross profits and negatively to the external debt to GDP ratio which increased uncertainty in the Zimbabwean economy. Controls, in the form of foreign exchange

allocations also affected the timing of capital expenditures rather than the desired stock of capital thus foreign exchange did not appear to be a long-run constraint. In the short-run dynamic model of private investment, changes in the availability of foreign exchange (measured as export earnings plus reserves) lagged one period, were significantly and positively related to changes in private investment. In the short run, private investment also responded negatively to changes in the relative cost of capital and positively to changes in the relative price of industrial output (measured by the ratio of the industrial price deflator to the GDP deflator).

2.3 Historical Overview and Policies of Private Investment in Ghana

At independence in 1957, with Ghana being the first African country to become independent from colonial rule, Ghana was the world's largest producer and exporter of cocoa, with a per capita income of about $490 which was exactly equal to that of South Korea's and the highest of all Sub-Saharan African countries and with an external reserves equivalent to three years of imports (Nowak et al., 1996). The country was well-endowed with natural resources and also had a potential for tourism. After independence in 1957 under the Big Push Strategy, economic policies in Ghana generally followed the dominant paradigm of that of developed economies of the time. Economic policies of the era emphasized controls over interest rates with high rates of capital formation through domestic production of import-substitutes in state-owned enterprises, controls on credit, exchange rates, and commodity prices, as the catalysts for economic development (Bawumia, 2010).

The economic policies that the government of the time embarked on took its toll on the Ghanaian economy. The external reserve position of the country deteriorated significantly from $269

million in 1957 to -$39 million in 1966. The fiscal position of the country also deteriorated as government spending increased from 9.5 percent in 1957 to 25.8 percent of GDP by 1965. The government's budget balance deteriorated from a surplus of 14.5 percent of GDP in 1954 to a deficit of 6.4 percent of GDP by 1965. Inflation also rose from zero in 1958 to 22.7 percent by 1965. With rising inflation and a fixed exchange rate, this resulted in a significant over-valuation of the currency causing exports to decline from 30 percent of GDP in 1957 to 18 percent of GDP by 1965 (Bawumia. 2010).

As an expression of public discontent over the state of the economy, with a new government coming into office in 1966, an IMF supported stabilization program was embarked on. The program was aimed at improving the adverse balance of payments, cutting the budget deficit, reducing the government sector, and stimulating private enterprise. Hitherto, successive governments have emphasized the important role of the private sector in development by providing incentives for the development of a market oriented economy and privatization of state-owned enterprises.

By 1970 to the mid 1980s, Ghana experienced dramatic economic decline characterized by lax financial management, extensive government involvement in the economy, negative growth rates, hyperinflation, food shortages, massive unemployment, deterioration of the transportation and communication networks, a weak health and social welfare system, and environmental degradation (Meng, 2004). With high inflation rates, private sector saving and investment was discouraged which constrained the pace of economic activity.

Measures were therefore put in place to provide opportunities for many investors in the private sector and to improve the investment climate in Ghana. One such effort was the Economic

Recovery Program (ERP) instituted in 1983, which broadened the institutional support for the private sector in Ghana to enjoy a liberal investment environment by offering a number of special benefits to private investors. These benefits included foreign participation of the private firms in joint-ventures and 100 percent ownership of local enterprises.

Investment incentives were also provided under various investment codes, all in an attempt to boost private sector investment. In 1981, the Investment Code under Act 437 was enacted to centralize all investment promotion functions at the Capital Investment Board and consolidate all investment legislations. In 1985, the Investment Code under PNDCL 116 established the Ghana Investment Centre as the Central Investment Promotion Agency. All these investment codes have attempted to provide a favorable investment climate by offering incentives to boost private investment. The incentives generally provided included investment allowances, exemption from import duties on machinery and equipment, accelerated depreciation allowances, tax holidays, and arrangements for profit repatriation. The National Board for Small Scale Industries (NBSSI) in 1985 under the Ministry of Trade and Industry was also established to address the needs of the private investors focusing on SMEs.

Significant legislations to provide the framework for private sector participation in the economy were enacted. These included a very liberal Investment Act which was approved in 1994 to encourage, promote and revise the laws relating to investment; the "Free Zone" Act passed in 1995 to attract direct foreign investment into sites with good infrastructure; and the National Communications Act permitting liberal entry of the private sector into the telecommunications sector was approved in 1996.

Privatization was another component of the government's strategy for boosting private investment. By the 1980s, state enterprises were suffering along with most businesses in Ghana. In particular, many were heavily subsidized and were draining much of the domestic loan capital of the country. With much pressure from the World Bank and in line with the principles of the ERP, in 1984 with 235 state enterprises in Ghana, the government began to sell these state enterprises to private investors. In 1988 thirty-two were put up for sale under what was termed the State Owned Enterprise Reform Program initiated in 1988. The Divestiture Implementation Committee was also set up in June 1988 to speed up the privatization process of the government by implementing and executing all government policies in respect of divestiture programs. By December 1990, forty-four state enterprises had been divested, followed by thirty-four enterprises that had either been partially or totally divested under the committee. Thirty four out of four were sold, additional eight were also sold partially through the issue of shares, and twenty two others were also liquidated. Also undertaken was divestiture of fifteen additional enterprises, and by 1992 plans were underway to privatize some of the nation's banks. The Statutory Corporations Act was also passed in 1995 to provide for the conversion of public corporations into companies in preparation for privatization. These legislative developments were to enlarge the scope for private sector activity by laying down the regulatory framework for private participation.

Financial sector reforms were another key component of the government's efforts to promote private sector development. As part of a comprehensive macroeconomic adjustment program with the support of the International Monetary Fund and World Bank, financial market liberalization in Ghana began in 1988, under the Financial Sector Adjustment Program (FINSAP). The adoption of the FINSAP was part of a strategy to move the Ghanaian financial

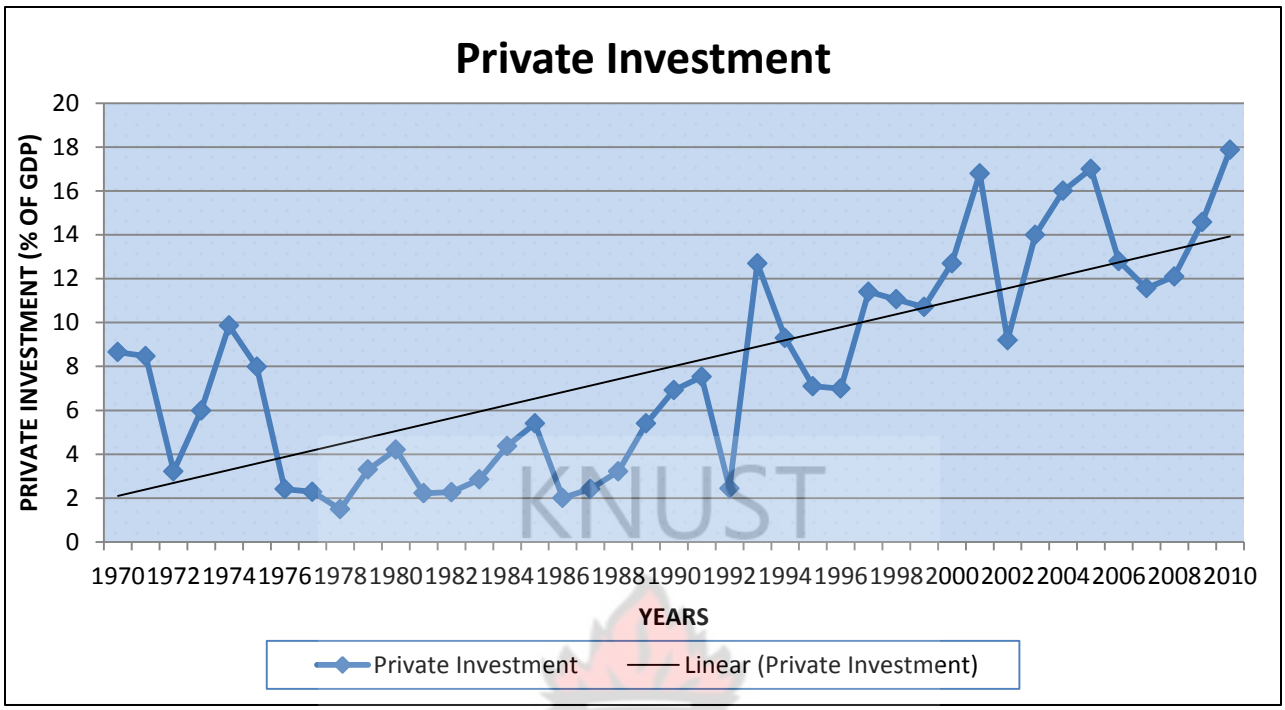
sector from an era of financial repression towards one of financial liberalization. This included the removal of interest rate ceilings, abolishing of directed credit and credit controls, improving the regulatory and supervisory framework, privatization of banks, development of money and capital markets, and the move towards indirect and market determined instruments of monetary policy (Bawumia, 2010). These were expected to speed up the rate of growth, with investment as one of the main transmission mechanisms. It was thus expected that through the reforms, and interest rate liberalization savings will increase, and more credit would be made available to private investors through the increased bank deposits. Consequently, investment will increase and as financial intermediaries allocate resources to the most efficient investments, economic growth will rise (Fowowe, 2011). A second phase of the FINSAP was implemented in 1996, with its major objectives focusing on the privatization of the public sector banks and development of non bank financial institutions to fill the gaps in the financial markets not served by the banks.

These policies undertaken were motivated by three objectives: to raise the level and pattern of private investment, and to keep interest rate both low and stable. Consequently, the financial markets have therefore been progressively liberalized in Ghana, with the liberalization involving the partial privatization of government's own banks and institutions.

2.3.1 Trends in Private Investment

A proper analysis of investment activities in Ghana could be attempted by first looking at the pattern of investment over the years using trend analysis, as shown in Figure 2.1 below. This would be of much help in an attempt to portray a better picture of private investment behavior in Ghana.

Figure 2. 1 Trend in Private Investment (as a % of GDP) from 1970 to 2010



Source: Authors drawing using data from World Bank's World Development Indicators

For the Ghanaian economy, the period between 1970 and 1983 was characterized by dramatic economic decline. This period of economic decline was characterized by a fall in GDP per capita by more than 3 percent a year, loss of monetary control which accelerated inflation from 6.5 percent in 1969 to 116.5 percent by 1977 and 122 percent by 1983, in the midst of controlled prices, negative real interest rates, and a decline in savings and investment from 12 percent to 14 percent of GDP respectively to less than 4 percent (Bawumia, 2010). Industrial production, dominated by state-owned enterprises also declined by more than 47 percent, especially in the mining and construction sectors during the same period. In 1983, a severe draught, a deterioration of the world cocoa price, the return of one million Ghanaians from Nigeria added to these problems. The tight credit ceilings imposed on commercial banks' loan portfolios, prior to

financial liberalization also made credit to the private sector very scarce, and this also led to a decline in private investment.

From figure 2.1 above, private investment is expressed as a percentage of GDP, with private investment generally showing an upward trend for the period under review. Between 1970 and 1983, private investment declined sharply, but then signs of increase in private investment were eminent after 1983, during the ERP period, which was characterized by a reversal of the downward trend. Private investment declined from 8.65 percent of GDP in 1970 to 5.99 percent of GDP in 1973. This was due partly to decreased direct foreign investment, which declined over the same period from 3.1 percent of GDP to 0.5 percent of GDP. Private investment then increased to 9.86 percent in 1974. Thereafter, it declined continuously to its lowest level of 1.49 percent in 1978. The ratio increased again to 3.3 percent the following year before declining continuously to 2.27 percent in 1982. After 1983, there was a trivial recovery of private investment. Between 1985 and 1988, the ratio hovered around 3.26 percent, reached 5.4 percent in 1989 and 6.92 percent in 1990. The recovery in private investment was attributed partly to the improvements in the transportation network and other basic economic infrastructure in the country, as well as the wider availability of foreign exchange and the gradual removal of exchange and trade restrictions (Asante, 2000).

The period between 1987 and 1991 was characterized by an improvement in the rates of private investment from 2.42 percent to 7.53 percent, but after the fiscal shock in 1992 with the general economic downturn, investment slumped as well. 1991 and 1992 was again a very difficult year for Ghana with a drop in cocoa harvest, an unbalanced government budget due to labour unrest with increased wages and salaries for government employees and a decline in external finance. The democratic system in 1992 an election year, marked by political unrest was characterized by

high government expenditure, which created macroeconomic instability and rekindled inflation. This led to a collapse in savings and investment which declined from 7.53 percent in 1991 to 2.45 percent in 1992 because of the low confidence in the banking system (Wolf, 2003).

Ghana also experienced a succession of significant terms of trade shocks between 1976 and 1993. The strong recovery in growth and the external position of the country after the introduction of the ERP was partly due to an improvement in the terms of trade. By contrast, after 1986, there was a sizeable and continued deterioration in the terms of trade which was equivalent to 8 percent of GDP between 1987 and 1991. The persistent decline in the terms of trade also contributed to the decline in savings and investment (Nowak, 1995).

After the 1996 elections until 2000, the economy stabilized to some extent. Ghana's economy was growing by around 4 percent per annum with private investment hovering around 12.7 percent and 16.8 percent of GDP in 2000 and 2001 respectively. In 1998, low rainfalls caused some problems for agriculture but above all, triggered an energy crisis as most electricity has been generated from hydroelectric power from the Volta Lake. The weak performance of the Ghanaian economy was to a large extent due to the large fiscal deficits, the adverse terms of trade shocks, and general mismanagement of the economy. Especially the failure to reduce the number of public servants that were often only reallocated from ministries to other public agencies and an increase in real wages of the public sector of 30 percent during the 1990s resulted in persistent high fiscal deficits. Consequently, there was an increase in real costs of borrowing, a high appreciated exchange rate and uncertainty and crowding out investment (CEPA, 2001).

By the year 2000, with the upcoming elections, the macroeconomic situation worsened again. High domestic government borrowing, led to high real interest rates. There was also a fall domestic savings and GDP growth was below 4 percent in 2000 (CEPA, 2000). Although Ghana has a relatively good international reputation with respect to political stability and performance of capital markets, its success in terms of the speed and strength with attracting investment has not been satisfactory. Therefore the new government that came into power in 2001 put special emphasis on private sector development and attracting foreign direct investment (FDI) by proclaiming a 'Golden age of Business' (Wolf, 2003).

Over the years, one of the major constraints for the private sector was its limited access to finance. During 1987 to 1992, the availability of credit to the private sector was around 4 percent of GDP which was much lower than in other African countries. High real interest rates made it more attractive to buy government bonds than invest in risky ventures. The banks requested for collateral which made it difficult especially for small and medium enterprises to get loans. In recent years a number of special credit programs were put in place, especially in the area of microcredit but so far they have not been sufficient to meet the demand (Aryeetey et al., 2000).

Thus there has been wide agreement that high and volatile inflation rates that were prevalent in Ghana did not only affect the capital markets but also reduced the information given by the price system leading to inefficient resource allocation. Volatility of cocoa prices and the real exchange rate not only affected the profitability of primary commodity exporters but also had negative impacts on savings and income. Thus it can be concluded that the low investment ratio in Ghana was not only caused by low savings levels but also by various risk factors (Collier and Pattillo, 2000).

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter outlines the methodology and the conceptual framework of the model specified for the study. The chapter is organized into five main sections. Section 3.1 provides the types and sources of data used for the study. The specification of the model used for the study; and the definition, measurement and expected impact of the variables relevant to the study are discussed in sections 3.2 and 3.3 respectively. Section 3.4 focuses on the estimation technique with emphasis on the stationarity test, cointegration test and the autoregressive distributed lag (ARDL) model, otherwise called the Bounds Test. Section 3.5 concludes the chapter with how the model was estimated using the ARDL Bounds testing procedure.

3.1 Data Type and Sources

The data used in this study is mainly secondary, sourced from reports and other published information on private investment in Ghana. Specifically, these sources included the World Bank's World Development Indicators, African Development Indicators, official documents of the Ghana Statistical Service, annual reports of the Bank of Ghana, and various issues of the State of the Ghanaian economy. In addition, the study employed the use of annual time series data which spanned over a forty one year period from 1970 to 2010 inclusive.

3.2 Model Specification

This section, in analyzing the financial determinants of private investment, specifies an appropriate model of private investment for Ghana. Among the various approaches considered in modeling the determinants of private investment, the flexible accelerator model appears to be the most popular and has often been applied in most empirical research in developing countries (Blejer and Khan, 1984; Ouattara, 2004).

This model is most appropriate to developing countries due to the data limitations and structural constraints faced by researchers, which is inherent in the nature and context of developing countries (Ouattara, 2004). Also, as a result of institutional and structural factors present in most developing countries, such as the absence of well functioning financial markets, the extensive role of the government in the provision of investment, foreign exchange constraints, and other market imperfections (Blejer and Khan, 1984), the flexible accelerator model is most appropriate in capturing the behavior of private investment decision making in developing countries. Thus this section derives a theoretically consistent model of private investment within the flexible accelerator framework that will allow for such resource constraints and, at the same time, incorporate other variables accounting for private investment behaviour in Ghana.

In a representation of the accelerator model, the desired stock of capital at any time period is assumed to be proportional to expected output. Mathematically, this can be expressed as:

$$K_t^* = \alpha Y_t^e \quad \text{.....3.1}$$

Where K_t^* is the desired capital stock the private sector wishes to have in place in future periods, Y_t^e is the expected level of output in period *t*, and α is a constant denoting the capital output ratio. It is necessary to accentuate the desired change in the capital stock and to highlight the component of the

replacement of worn out capital known as depreciation, by decomposing the desired capital stock into two forms, presented as:

$I_t^* = (K_t^* - K_{t-1}) + \delta K_{t-1}$ ……..3.2

Equation (3.2) can be simplified as:

$I_t^* = K_t^* - (1 - \delta) K_{t-1}$ ……...3.3

On introducing a lag operator (L), equation (3.3) can conveniently be written as:

$I_t^* = [1 - (1 - \delta)L]K_t^*$ .....…..3.4

From equation (3.1), if K_t^* is substituted into equation (3.4), the desired level of investment yields;

$I_t^* = [1 - (1 - \delta)L]\ \alpha\ Y_t^e$ ……..……...…….3.5

Where I_t^* = the desired level of investment in period t

δ = depreciation rate of the capital stock,

L = the lag operator,

In order for the model to fit the flexible accelerator mode, the desired capital stock must be affected by changing economic conditions. Lags in the adjustment of actual investment that arise because of the time it takes to plan, build, and install new capital can be introduced through a partial adjustment mechanism for the capital stock based on Nerlove's Partial Adjustment Model (PAM), whereby the actual stock of capital is assumed to adjust to the difference between the desired stock in period t and the actual stock in the previous period. The adjustment process of such investment models can be represented as:

$(I_t - I_{t-1}) = \gamma\ (I_t^* - I_{t-1})$……..…….……...……3.6

Where $(I_t - I_{t-1})$ = the level of actual investment in period *t* and *t-1* respectively

$(I_t^* - I_{t-1})$ = the desired change in the capital stock

γ = the partial adjustment coefficient (speed of adjustment, $0 \leq \gamma \leq 1$)

Since the flexible accelerator model allows economic conditions to influence the adjustment coefficient, empirical works by Blejer and Khan (1984) and Chhibber and Van Wijnbergen (1988) identified such factors as expectation of profitability, credit availability, government expenditure policies, and real interest rate as having significant impact by way of influencing the ability and initiatives of private investors to implement their investment projects. These factors were thought of as affecting the speed of adjustment. Thus attempts were made to model the speed of adjustment by incorporating the above factors in a mathematical formulation presented as:

$$\gamma = \gamma_0 + \frac{1}{(I_t^* - I_{t-1})}[\gamma_1\pi_t + \gamma_2 R_t + \gamma_3 C_t + \gamma_4 G_t] \quad \text{.....3.7}$$

Where π represents profits, R is the real interest rate, C is real credit availability, and G is government real capital expenditure. From equation (3.7), if the value of γ is substituted into equation (3.6) the resultant becomes:

$$I_t - I_{t-1} = [\gamma_0 + \frac{1}{(I_t^* - I_{t-1})}[\gamma_1\pi_t + \gamma_2 R_t + \gamma_3 C_t + \gamma_4 G_t](I_t^* - I_{t-1}) \quad \text{.....3.8}$$

Further simplification yields:

$$I_t - I_{t-1} = \gamma_0(I_t^* - I_{t-1}) + \gamma_1\pi_t + \gamma_2 R_t + \gamma_3 C_t + \gamma_4 G_t$$

$$I_t = \gamma_0 I_t^* + \gamma_1\pi_t + \gamma_2 R_t + \gamma_3 C_t + \gamma_4 G_t + (1 - \gamma_0)I_{t-1} \quad \text{.....3.9}$$

Substituting equation (3.5) into equation (3.9) yields;

$$I_t = \gamma_0[1 - (1 - \delta)L]\,\alpha\, Y_t^e + \gamma_1\pi_t + \gamma_2 R_t + \gamma_3 C_t + \gamma_4 G_t + (1 - \gamma_0)I_{t-1} \quad \text{.....3.10}$$

The model in equation (3.10) incorporates variables that best capture the behavior of private investment decision-making. Thus on the basis of the above derivations, the current study will therefore specify a private investment model as:

$$I^P = f\ (INTR, CRPV, RER, M2, INFL, GDP)$$

Where I^P = Private investment, INTR = Real interest rate, CRPV = Ratio of private sector credit to GDP, RER = Real exchange rate, M2 = Ratio of broad money supply to GDP, INFL = Inflation rate, and GDP = real GDP growth rate.

The estimable econometric model in log-linear form can be formulated as;

$$ln\, I_t^P = \gamma_0 + \gamma_1 INTR_t + \gamma_2\, lnCRPV_t + \gamma_3 ln\, RER_t + \gamma_4 ln\, M2_t + \gamma_5\, ln\, INFL_t + \gamma_6 ln\, GDP_t + \varepsilon_t \quad \text{.....3.11}$$

Equation (3.11) above represents the long run equilibrium relationship. γ_i (where i = 2 to 6) represents the elasticity coefficients, ε_t is the error term, t is time and *ln* denotes natural logarithm. All the variables to be examined are in natural logarithm except the real interest rate since negative values were recorded for some years.

The choice of the log-linear model was based on the following reason:

- Log transformation converts changes in the variables into percentage changes, which allows the regression model to estimate the percentage change in the dependent variable resulting from the percentage changes in the independent variables (Stock and Watson, 2007). The log-linear model also helps reduce the problem of heteroskedasticity because it reduces the scale in which the variables are measured from a tenfold to a twofold (Gujarati, 1995).

3.3 Definition and A priori Expectation of Variables

- **Private Investment**

Investment is the purchase of goods intended to create future benefits, or to be used in the production of future goods and services. Worded differently, investment is the sum purchases of capital equipment which includes new plants or new machines; inventories; and structures (residential investment) which includes the purchase of new houses or apartments. Investment used in the study was private investment as a percentage of GDP, which was obtained by dividing the actual investment value by GDP and multiplying by 100 percent.

- **Real Interest Rate (INTR)**

The real interest rate is the rate of interest adjusted for either current or expected inflation. It is calculated by comparing the interest rate with the current or predicted inflation rates. According to the Fisher equation, it is the nominal interest rate minus the expected rate of inflation. The effect of the real interest rate on private investment is ambiguous. Thus the coefficient of the variable representing the real rate of interest (γ_1) is expected to be negative or positive. It can be negative because, a lower rate of interest will induce private economic agents to undertake investment activities due to the low cost of borrowing investment funds. This is in line with the neoclassical investment model which treated the real interest rate as a key component of the user cost of capital and therefore affects private investment negatively.

However, the premise of the complementarity hypothesis posed by McKinnon-Shaw, postulated a positive relationship between the real interest rate and private investment. The argument is that financial markets in most developing countries are financially repressed, thus investment funds may not be readily available to potential private investors. In such a case, the only way to induce people to mobilize investment funds through savings is by offering high interest rates. This in

essence implies that the higher the interest rate offered by financial intermediaries, the more funds would be available for investment through savings and hence the higher the level of private investment. Consequently, a user cost of capital effect will imply a negative coefficient ($\gamma_1 < 0$) while a positive coefficient ($\gamma_1 > 0$) would support the complementarity hypothesis. In the Ghanaian case however, it is expected that the user cost of capital effect will be applicable since the complementarity hypothesis implicitly assumes that consumers be more sensitive to interest rate changes and save more when the interest rate rises, which is not the case for Ghana. Thus ($\gamma_1 < 0$).

- **Credit to the Private Sector (CRPV)**

Private firms in developing countries rely heavily on bank credit and other forms of credit as a source of financing (Emran and Farazi, 2008). Credit to the private sector as a percentage of GDP is an indicator and a measure of financial development via the level of activity and efficiency of financial intermediaries. It shows the extent to which the banking sector channels funds to the private sector to facilitate investment and growth. It therefore reflects a more efficient resource allocation in the economy since the private sector is able to utilize funds in a more efficient and productive manner as compared to the public sector (Kargbo and Adamu, 2012).

In emerging countries, many firms encounter restrictions in the credit market due to the information asymmetries between lenders and borrowers with the financial markets being generally repressed. As a result, most credit policies generally affect private sector investment via the stock of credit available to firms that have access to preferential interest rates. When resources of this type are available, it becomes viable to invest even when investors' own funds are insufficient to finance their projects (Ribeiro and Teixeira, 2001). Thus an increase in financial resources leads to higher private investment (Ndikumana, 2000). The effect of credit to the private

sector on private investment through the financial development indicator is therefore expected to be positive ($\gamma_2 > 0$).

- **Real Exchange Rate (RER)**

Basically, the real exchange rate can be defined as the nominal exchange rate adjusted by the price levels of the countries concerned. In terms of the Purchasing Power Parity, the real exchange rate is the nominal exchange rate (e) that is adjusted by the ratio of the foreign price level (P_f) to the domestic price level (P). Mathematically, this can be written as $r = e\frac{P_f}{P}$. Its importance stems from the fact that it can be used as an indicator of competitiveness in the foreign trade of a country, and also a component that determines the real cost of imports and exports. The impact of the real exchange rate on private investment is ambiguous. For instance, a deprecation or devaluation of the domestic currency will lead to an increase in the cost of imports in terms of the domestic currency. More specifically, the devaluation increases the cost of importing capital goods, and since the chunk of capital investment in developing countries is constituted of imported goods and machineries, this increases the cost of investment and reduces the profitability of private firms leading to a reduction in investment activities. The coefficient of the real exchange rate (RER) is thus expected to be negative in this case.

Conversely, a depreciated real exchange rate could encourage investment by raising profitability in the tradable sector, (if the tradable sector is more capital-intensive than the non tradable sector) as it increases competitiveness and the volume of exports (Montiel and Serven, 2008). A depreciated real exchange rate tends to increase the domestic saving rate, and a higher saving rate stimulates growth by increasing the rate of capital accumulation. Thus the link between a depreciated real exchange rate and the saving rate arises because a depreciated real exchange rate

tends to shift aggregate demand away from traded to non traded goods, resulting from an increase in the real rate of interest to maintain internal balance. Thus, from this perspective causation runs from the real exchange rate through the real interest rate to the saving rate and finally to capital accumulation (Montiel and Serven, 2008). Thus the effect of the real exchange rate on private investment is ambiguous ($\gamma_3 > 0$ or $\gamma_3 < 0$). In the Ghanaian case, the coefficient is expected to be negative since Ghanaian importers are more likely to respond to an increased import price resulting from a depreciation of the cedi. Thus a priori $\gamma_3 < 0$.

- **Broad Money Supply (M2) to GDP Ratio**

Ratio of broad money supply to GDP is conventionally used as a measure of financial sector deepening (Nnanna, 2006). It gauges the increased provision of financial services to the financial sector based on how liquid money is. A higher ratio implies a higher degree of monetization (more liquidity) which shows how developed the financial sector is. While a lower degree of monetization implies a backward financial sector. An increase in the money supply will ease the financing conditions of households and firms, which is reflected in lower lending rates and ultimately enhanced availability of credit to private investors which spurs investment. An increase in the money supply also has the potential of stimulating consumer spending, and firms respond to the increased sales by investing more and increasing production. Thus a priori, the coefficient of broad money supply and investment are positively related ($\gamma_4 > 0$).

- **Inflation Rate (INFL)**

Inflation is the persistent and continuous rise in the general price level of goods and services; measured by the consumer price index which reflects the annual percentage change in the cost to the average consumer of acquiring a fixed basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The coefficient of the term representing the rate of

inflation (γ_5) is expected to be ambiguous, that is, either negative or positive. High inflation rates are an indicator of macroeconomic imbalances, which can impact on private investment negatively. High and unpredictable inflation rates tend to be volatile and create uncertainty about future prices and interest rates which increases the risk associated with long term investment activities (Oshikoya, 1994). Its volatility results in unpredictable real interest rates which discourages domestic savings, and investment. In addition, inflation also erodes the purchasing power of money, so there is little incentive for people to save money in the banking system. This leads to a reduction of funds available for investment purposes through the banking system (Hassan and Salim, 2011).

High inflation rates are also often associated with financial repression, with interest rate ceilings a common phenomenon in such an environment. Such controls lead to inefficient allocations of capital that inhibit economic growth (Morley, 1971). Another popular opinion in literature is that high inflation rates results in unfavorable terms of trade which triggers an increase in the prices of imports relative to the income generated from exports. According to Oshikoya (1994), such unfavorable terms of trade may worsen the ratio of current deficit to GDP which is an indicator of the external balance and macroeconomic stability, with adverse consequences on private investment.

However, according to the Mundell-Tobin effect, 'nominal interest rates would rise less than one-for-one with inflation because in response to inflation the public would hold less in money balances and more in other assets, which would drive interest rates' (Woodward, 1992). In other words, a higher anticipated inflation rate increases the nominal interest rate and velocity of money, but decreases the real interest rate which will result to portfolio adjustment away from real money balances towards real capital. This therefore implies that higher anticipated inflation

would induce an increase in real investment activities by private economic agents. Hence, anticipated inflation is seen to have a positive impact on private investment. The coefficient of inflation is therefore expected to be either positively ($\gamma_5 > 0$) or negatively ($\gamma_5 < 0$) related to private investment.

- **Real GDP Growth Rate (GDP)**

Gross Domestic Product growth rate is the annual percentage change in GDP. It is a measure of how fast the economy is growing. GDP is the total value of goods and services produced within the borders of an economy or a country during a given period of time measured in market prices. It is calculated without making deductions for depreciation. The coefficient of the term representing GDP growth rate γ_6, is expected to be positive. If the GDP growth rate is growing, businesses will invest in new capital, more jobs would be created and personal incomes would expand. If it is slowing down, then businesses will hold off investing in new purchases and employing, to see if the economic conditions will improve. This can further depress the economy and consumers will have less money to spend on purchases. If the GDP growth rate turns negative, then the economy is heading towards or is already in a recession. Thus the study expects the coefficient of GDP growth rate to be positive ($\gamma_6 > 0$).

3.4 Estimation Technique

3.4.1 Testing for Stationarity

The stationarity properties of all variables are examined to ascertain their respective orders of integration. The rationale behind the unit roots test is to avoid spurious results due to the presence of an I(2) series, since the bounds test is based on the assumption that the variables are *I*(0) or *I*(1) series. The presence of unit root in the series indicates that the variable is non-stationary, hence

the degree or order of integration is one or higher. Conversely, the absence of unit root implies that the variables are stationary and the order of integration is zero.

According to Ekpo et al. (2011), the presence of an I(2) series renders the computed *F*-Statistic invalid thereby crushing the ARDL procedure. Hence, pre-testing for unit roots remains pertinent to the analysis. This paper therefore employed the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test proposed by Dickey and Fuller (1979) and, Phillips and Perron (1988), respectively, to test for the presence of unit roots. The ADF test is used to determine the order of integration of each series in the model. The order of integration is established by determining whether the series is stationary or non-stationary. If the series is however found to be non-stationary, then the series is differenced and the resultant differenced series is then tested to determine whether it is stationary or non-stationary. This sequence is repeated until all series are stationary.

The ADF test however assumes the errors are statistically independent and have a constant variance. Hence in applying this technique it must be ensured that the error terms are uncorrelated and have a constant variance. According to Ang (2008), the alternative approach suggested by Phillips and Perron (1988), can be viewed as a generalization of the ADF test which have been made robust to heteroscedasticity and serially correlated error terms by using the Newey-West (1989) heteroscedasticity and autocorrelation-consistent covariance matrix estimator. The Phillips-Perron test involves undertaking a non-parametric correction to the t-statistic to account for the serial correlation that might be present so that the serial correlation does not affect the asymptotic distribution of the t-statistic.

3.4.2 Cointegration Test

After performing the unit root tests for stationarity, cointegration analysis is also employed to determine the long run relationship of the variables in the private investment model. By definition, two or more series are said to be cointegrated if they exhibit a well-established long term relationship or a common trend. This normally implies that the variables must have a long-term co-movement. For times series variables that exhibit cointegration, although they may be non-stationary in levels, the regression relationship of these variables may have a valid long-run relationship. Cointegration is necessary because a valid Error Correction Model requires the presence of a cointegration set of variables. Thus testing for cointegration becomes very important when dealing with time series data in order to determine whether a group of non-stationary series is cointegrated.

The study therefore applies the ARDL Bounds Test for cointegration technique developed by Pesaran *et al* (2001) to the system of the seven variables in the private investment equation to investigate the existence or otherwise of the long-run equilibrium relationships among the variables. In the first step of the ARDL bounds testing procedure, equation (3.15) is tested for a cointegrating long-run analysis with normalization on the log of private investment. Estimation of the long-run ARDL model involves selecting the order of the model with a maximum lag order of 2 using the Scharwz Bayesian Criterion (SBC). As argued by Pesaran and Pesaran (1997), variables 'in first difference are of no direct interest' to the bounds cointegration test. Hence, any result that supports cointegration in at least one lag structure provides evidence for the existence of a long-run relationship. The F-statistic tests the joint null hypothesis that the coefficients of the lagged level variables are zero (i.e. no long-run relationship exists between them).

3.4.3 Auto Regressive Distributed Lag (ARDL) Model

Evaluating empirically the financial determinants of private investment in Ghana with particular emphasis on establishing the existence of a long-run relationship as well as the dynamic interactions among the various variables of interest, the Autoregressive Distributed Lag (ARDL) model, alternatively called the bounds testing approach as proposed by Pesaran *et al*. (2001) was used. According to Jayaraman and Choong (2011), "the ARDL bounds testing model is a general dynamic specification, which applies lags of the dependent variable and the lagged and contemporaneous values of the explanatory variables, through which the short-run impacts can be directly estimated, and the long-run relationship can be indirectly estimated, where all variables are duly transformed into their natural log". The preference for the bounds testing approach over other multivariate cointegration techniques (Engle and Granger, 1987; Johansen, 1988; Johansen and Juselius, 1990) is predicated on the following fundamental reasons:

- It enables the ARDL model to be estimated by the Ordinary Least Squares (OLS) method once the model lag order is identified, making the ARDL procedure very simple.
- The bounds test procedure does not require pre-testing of the series for unit roots to determine their order of integration since it can be applied irrespective of the order of the integration of the regressors, be it purely I(0), purely I(1) or mutually integrated.
- Endogeneity problems are addressed in this technique. According to Pesaran and Shin (1999), modeling the ARDL with the appropriate lags will correct for both serial correlation and endogeneity problems. In this approach, all the variables are assumed to be endogenous and the long run and short run parameters of the model are estimated simultaneously (Khan et al., 2005)

- Finally, the efficiency of the test is further enhanced particularly with small sample size data, as is the case for this study, with the data covering a period of 41 years which is relatively small (1970 - 2010 inclusive).

To illustrate the ARDL modeling approach by following the leads of Pesaran et al. (2001) as summarized in Choong et al. (2005), the bounds test procedure is applied by modeling equation (3.11) as a general vector autoregressive (VAR) model of order p in z_t:

$$z_t = \mu_0 + \delta t + \sum_{i=1}^{p} \emptyset_i Z_{t-i} + \varepsilon_t \quad \text{for } t = 1,2,3,4,\ldots\ldots,T \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(3.12)$$

Where μ_0 represents a (k+1) vector of intercepts (drift), and δ denoting a (k+1) vector of trend coefficients. The corresponding Vector Error Correction Model (VECM) for equation (3.12) as derived by Pesaran *et al* (2001), is modeled as:

$$\Delta Z_t = \mu_0 + \delta t + \lambda Z_{t-1} + \sum_{t=1}^{p} \theta_i \Delta Z_{t-i} + \varepsilon_t \quad \text{for } t = 1,2,3,4,\ldots\ldots,T \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots(3.13)$$

Where the (k+1) x (k+1) matrices denoted by λ and θ are vector matrices that contain the long run multipliers and the short run dynamic coefficients of the VECM respectively. With λ and θ defined as $\lambda = I_{k+1} + \sum_{i=1}^{p} \varphi_i$ and $\theta_i = -\sum_{j=i+1}^{p} \varphi_j$ respectively for i = 1,2,3,…..,p – 1. z_t is a vector of x_t and $y_t$variables respectively. Y_t is the regressand defined as lnY_t and denoted by $ln\, I_t^P$ for the purposes of the study, and X_t (representing INTR, CRPV, RER, M2, INFL, GDP) is a vector matrix of a set of regressors. As a condition, Y_t must be an I(1) variable while the X_t regressors can either be I(0) and I(1), and ε_t is a stochastic error term.

Further assuming that a unique long-run relationship exists among the variables, the conditional VECM of equation (3.13) now becomes:

$$\Delta y_t = C_{y0} + \delta t + \gamma_{yy} y_{t-1} + \gamma_{xx} x_{t-1} + \sum_{i=1}^{p-1} \theta_i \Delta y_{t-i} + \sum_{i=0}^{p-1} \theta_i \Delta x_{t-1} + \varepsilon_{yt} \quad \text{.....(3.14)}$$

Incorporating the variables of interest, the VECM of equation (3.14) can be specified as:

$$\Delta \ln I_t^p = c_0 + \gamma_1 \ln I_{t-1}^p + \gamma_2 INTR_{t-1} + \gamma_3 \ln CRPV_{t-1} + \gamma_4 \ln RER_{t-1} + \gamma_5 \ln M2_{t-1} +$$

$$+\gamma_6 \ln INFL_{t-1} + \gamma_7 \ln GDP_{t-1} + \sum_{i=1}^{p} \theta_{1i} \Delta \ln I_{t-i}^p + \sum_{j=1}^{q} \theta_{2j} \Delta INTR_{t-j} + \sum_{k=1}^{q} \theta_{3k} \Delta \ln CRPV_{t-k} +$$

$$\sum_{l=1}^{q} \theta_{4l} \Delta \ln RER_{t-l} + \sum_{m=1}^{q} \theta_{5m} \Delta \ln M2_{t-m} + \sum_{n=1}^{q} \theta_{6n} \Delta \ln INFL_{t-n} + \sum_{o=1}^{q} \theta_{7o} \Delta \ln GDP_{t-o} +$$

$$\varepsilon_t \quad \text{.....(3.15)}$$

Where Δ is the first difference operator, γ_i are the long run multipliers, θ_i are the short run dynamic coefficients, c_0 is the drift and ε_t is the error term.

3.5 ARDL Bounds Testing Procedure

The testing procedure of the Autoregressive Distributed Lag (ARDL) bounds test is performed in three steps. First, OLS is applied to equation (3.15) to test for the existence of a long-run relationship among the variables by conducting an F-test for the joint significance of the coefficients lagged levels of the variables. The ARDL bounds test procedure assumes that only one long run relationship exist between the dependent variable and the independent variables. Thus to test whether this is applicable in the model, the F-statistic has to be computed for the joint significance of all the variables in the model (Dritsakis, 2011). In so doing, the null hypothesis of no cointegration relationship is tested against the alternative hypothesis of the existence of cointegrating relationship, with both defined as:

$$H_0 = \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = \gamma_6 = \gamma_7 = 0$$

$$H_1 = \gamma_1 \neq \gamma_2 \neq \gamma_3 \neq \gamma_4 \neq \gamma_5 \neq \gamma_6 \neq \gamma_7 \neq 0$$

The test which normalizes on private investment (I^P) is denoted by:

$$F_{I^P}\ (\ I^P \mid INTR,\ CRPV, RER, M2, INFL, GDP)$$

Using the Wald Test, the computed F-statistic is then compared with the critical bounds values as reported in Pesaran *et al*. (2001). Two sets of critical values have been provided for the cointegrating test; the lower and upper bounds critical values. The lower critical bound assumes that all the regressors are I(0), meaning there is no cointegration among them, while the upper bound assumes that all the regressors are I(1). The null hypothesis of no cointegration is accepted if the computed F-statistic lies below the lower critical bound. On the other hand, if the computed F statistic is greater than the upper critical value, then the null hypothesis will be rejected suggesting that there exists a cointegrating relationship among the variables. The test is however inconclusive if the computed F-statistic lies in between the lower and upper critical values.

Once cointegration is established, the second step involves estimating the coefficients of the long run relations and making inferences about their values (Pesaran and Pesaran, 1997). The long-run ARDL ($p, q_1, q_2, q_3, q_4, q_5, q_6, q_7$) model for I^P can be specified as:

$$lnI_t^p = c_0 + \sum_{i=1}^{p} \gamma_1 \ln I_{t-i}^p + \sum_{i=0}^{q1} \gamma_2 INTR_{t-i} + \sum_{i=0}^{q2} \gamma_3 lnCRPV_{t-i} + \sum_{i=0}^{q3} \gamma_4 lnRER_{t-i} + \sum_{i=0}^{q4} \gamma_5 lnM2_{t-i} + \sum_{i=0}^{q5} \gamma_6 lnINFL_{t-i} + \sum_{i=0}^{q6} \gamma_7 lnGDP_{t-i} + \varepsilon_t \quad \text{.....(3.16)}$$

The optimal lag length for estimating equation (3.16) is selected using the Schwarz Bayesian Criterion (SBC). The SBC involves estimating $(p+1)^k$ equations, where p is the maximum number of lags to be used and k is the number of variables in the equation. The minimum value of the SBC has to be computed and the lag that gives the least value is used. Thus the smallest possible

lag length is used and therefore the process is described as more parsimonious since it ensures an absence of serial correlation in the estimated residuals (Pattnayak, 2012).

The final step involves estimating an Error Correction Model (ECM) as derived from equation (3.16) to obtain the short run dynamic parameters. The ECM generally provides the means of reconciling the short-run behaviour of an economic variable with its long-run behaviour.

Harris (2000) summarizes the four desirable features of the ECM as follows: (i) it avoids the possibility of spurious correlation among strongly trended variables; (ii) the long-run relationships that may be lost by expressing the data in differences to achieve stationarity are captured through the inclusion of lagged levels of the variables on the right-hand side; (iii) the specification attempts to distinguish between short-run (first-differences) and long-run (lagged-levels) effects; and (iv) it provides a more general lag structure, and does not impose too specific of a structure on the model.

The ECM is specified as:

$$\Delta \ln I_t^p = c_0 + \sum_{i=1}^{p} \theta_{1i} \Delta \ln I_{t-i}^p + \sum_{j=1}^{q} \theta_{2j} \Delta INTR_{t-j} + \sum_{k=1}^{q} \theta_{3k} \Delta \ln CRPV_{t-k} + \sum_{l=1}^{q} \theta_{4l} \Delta \ln RER_{t-l} + \sum_{m=1}^{q} \theta_{5m} \Delta \ln M2_{t-m} + \sum_{n=1}^{q} \theta_{7O} \Delta \ln INFL_{t-n} + \sum_{o=1}^{q} \theta_{9o} \Delta \ln GDP_{t-o} + \vartheta ECM_{t-1} + \varepsilon_t \quad \text{.....(3.17)}$$

Where θ_i are the short-run dynamic coefficients of the model's convergence to equilibrium, and ϑ which is the coefficient of the Error Correction Model, measures the speed of adjustment to restore equilibrium in the dynamic model following a disturbance. It therefore shows how slowly or quickly the variable returns to equilibrium in the event of any shock.

CHAPTER FOUR

ANALYSIS AND DISCUSSION OF RESULTS

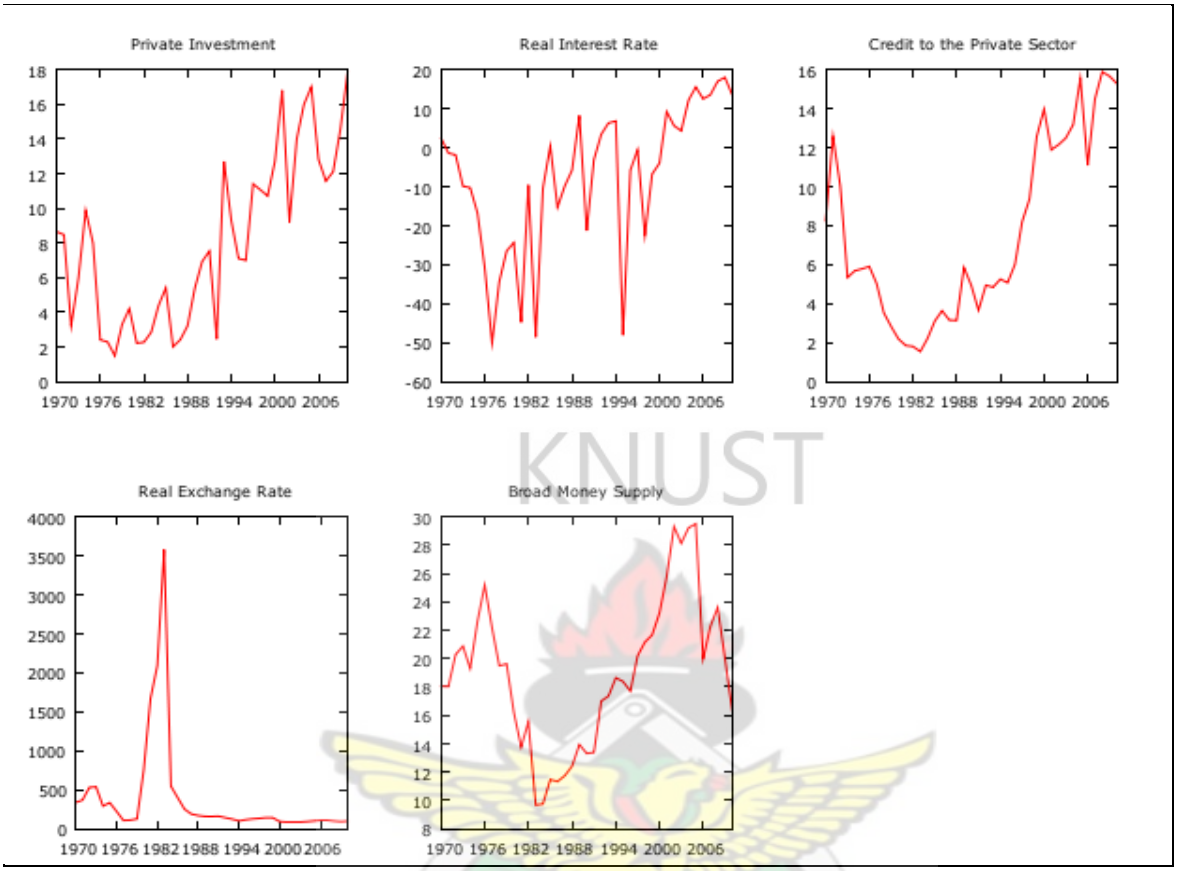
4.0 Introduction

This chapter presents an empirical analysis and discussion of the results of the study. The chapter is divided into four sections. Section one presents a trend analysis of the data on private investment and the financial variables used in the study over the period under discussion. Section two examines the time series properties of the data by presenting the Augmented Dickey-Fuller (ADF) and Phillips-Perron unit root tests and the bound test for cointegration. The third section presents and discusses the results of the diagnostic tests and the estimated long run private investment equation using the ARDL approach, while the results of the Error Correction Model for the selected ARDL model were presented and analyzed in the final section.

4.1 Stylized Facts: Trends in Private Investment and its Selected Financial Determinants in Ghana Over the period 1970 to 2010

The trend in private investment with some of its selected financial determinants used in the study over the period 1970 to 2010 is shown in the graphs displayed in Figure 4.1 below. Also shown in Table 4.1 are descriptive statistics of these selected financial indicators for the period under study.

Figure 4. 1 Trends in Private Investment and its Selected Financial Determinants in Ghana Over the period 1970 to 2010



Source: World Bank WDI Database

Table 4.1 Descriptive Statistics of Private Investment and its Selected Financial Determinants

INDICATOR	***Mean (%) (Average Size)***	***Standard Deviation***	***Minimum***	***Maximum***
Private Investment (% of GDP)	8.160	4.584	2.01	17.87
Real Interest Rate	-7.597	19.052	-50.01	18.00
Credit to the Private Sector (Credit/GDP Ratio)	7.557	4.643	1.54	15.88
Real Exchange Rate (Index)	370.025	650.406	91.49	3578.93
Broad Money Supply (M2/GDP Ratio)	18.963	5.292283269	9.68	29.49
Inflation Rate	32.742	29.10235	3.03	122.87
GDP (Annual Growth)	3.415	4.0607	-6.7	9.3

Source: Author's Calculations using data from World Bank WDI database

4.1.1 Trends in Private Investment

As shown in Figure 4.1, private investment (as a percentage of GDP) in Ghana has generally shown an upward but fluctuating trend over the period under study. In spite of the fluctuations, private investment averaged at 8.16 percent of GDP between 1970 and 2010, with a highest rate of 17.87 percent of GDP in 2010. Between 1970 and 1986, notwithstanding the volatilities, there was a consistent reduction in the rate of private investment from 8.64 percent to 2.01 percent which was the lowest recorded during the period. A major reason for this decline in private investment could be attributed to the tight financial system that was operated throughout the 1970's to the mid 1980's which was characterized by credit and interest rate ceilings imposed on commercial bank loans.

These ceilings were imposed as a form of monetary management to protect against the market imperfections and the nature of the financial system inherited from the colonial period. Thus the desired pattern of investment by raising investment levels and keeping interest rates low and stable could only be supported with extensive government intervention in the financial markets (Brownbridge and Gockel, 1996). Also remarkable within the period 1971 and 1988 was the negative real interest rates recorded amidst the high inflationary rates. These discouraged private savings and consequently led to a decline in private investment.

Private investment however accelerated after 1987 following the implementation of long term structural adjustment programs, sectoral and financial reforms, privatization of public enterprises, inter alia. These positive developments resulted in a sharp rise in the rate of private investment from 2.01 percent in 1986 to 7.53 percent in 1991. After 1991, up until 2010, private investment has generally shown a progressive trend; apart from the occasional troughs recorded in 1992, 1996, and 2000 with private investment plummeting to 2.45 percent, 6.99 percent, and

10.71 percent respectively. These years were election years marked by political unrest, and excessive government spending, which deteriorated the macroeconomic structure of the economy; high inflationary rates, a collapse in savings, low confidence in the banking system, with a subsequent decline in private investment.

4.1.2 Trends in Real Interest Rate

Quite interesting is the trend in the real interest rate which recorded negative values throughout the 1970s and part of the 1980s and 1990s. The real interest rate averaged at a rate of -7.59 percent between 1970 and 2010, with the lowest and highest rates of -50.01 percent and 18.00 percent in 1977 and 2009 respectively. This period of negative interest rates was due to excessive borrowing and spending on the part of government with dependence on the credit created by the banks. The depletion of the foreign exchange reserves by government, interest rate regulation, coupled with the adverse supply shocks and burgeoning inflation rate which peaked at 122 percent in 1983 also contributed to the possibly negative real interest rate.

4.1.3 Trends in Credit to the Private Sector

Credit to the Private Sector (measured as Credit to GDP ratio) an important determinant of private investment in Ghana, averaged at 7.55 percent over the period 1970 to 2010, with a highest of 15.88 percent of GDP recorded in 2008. The trend in private sector credit plummeted from 8.25 percent in 1970 to 1.54 percent in 1983. Investors faced severe constraints in credit during the 1970 and 1983 period as a result of the large public sector borrowing requirements which restricted the supply of bank credit to the private sector. Credit was also reduced by the credit ceilings imposed, as well as the adverse inflation rates, overvalued exchange rates and

negative real deposit interest rates which discouraged savings, thereby making less funds and credit available to private investors (Bawumia, 2010).

Credit to the private sector however picked up a positive trend between 1984 and 2010. This was due to the financial sector reforms and financial liberalization policies implemented in 1983 and 1988 respectively which were characterized by the removal of the credit and interest rate ceilings. Although there has been improvement in credit to the private sector, the cost and availability of credit however remains a major obstacle to private sector investment in Ghana.

4.1.4 Trends in Real Exchange Rate (Index)

The real exchange rate provides a measure of the relative price of domestic (Ghanaian) goods in terms of foreign goods. The real exchange rate is derived by converting the nominal exchange rate using the Purchasing Power Parity (PPP) formulation. The nominal exchange rate is thus multiplied by the ratio of foreign to domestic price indexes. That is, RER = E($\frac{Pf}{Pd}$), where E is the nominal exchange rate, P^f is an index of foreign prices and P^d is an index of domestic prices. Since the dollar is the major trading currency in Ghana, the United States of America's price index was used as the foreign price index while the Consumer Price Index (CPI) for Ghana was used as the domestic price index.

As observed by Sackey (2001), the real exchange rate changed over time depending on whether inflation was more or less rapid in Ghana than in the USA (or in the economies of Ghana's major trading partners in the case of the real effective exchange rate). With an average of 370.02 and a maximum of 3578.93, the real exchange rate index rose from 1970 to 1976 depicting a depreciation of the cedi, declined from 1977 to 1983 portraying an appreciation and generally followed an upward trend thereafter implying depreciation of the cedi.

According to Sackey (2001), from 1977 onward, the failure to adjust the official exchange rate in line with the deteriorating relative price situation strongly appreciated the real exchange rate from 1977 onwards. The extent of fluctuations in the real exchange rate for the domestic currency accentuates its unstable nature which could be explained by government's continued inability to bring inflation under control. Since the mid 1980s, however, there has been a trend towards exchange rate depreciation in Ghana.

4.1.5 Trends in Broad Money Supply (M2/GDP)

Sound financial system plays a very important role in the process of economic development. The basic role of a sound financial system is to efficiently utilize the scarce financial resources by constructing a well directed channel that enhances the flow of funds from savers to borrowers which encourage investment and give rises to economic growth. Ghana's economy since the inception of the structural adjustment programme in 1983 has undergone a period of consistent substantial financial deregulation. This culminated in increased monetization of the economy. As shown in Figure 4.1, the ratio of money supply (M2) to GDP trended upward from 13.31 percent in 1990 to 29.49 percent in 2005, averaging around 18.96 percent between 1970 and 2010. This trend was, however, reversed between the period 2005 and 2006 as contractionary monetary policy measures were adopted to curtail the rate of inflation in the economy. By 2010, the ratio of M2 to GDP rose from 19.98 percent in 2006 to 26.20 percent.

4.2 Discussion of Time Series Properties

This section discusses the results of the time series properties of the variables considered in the study. The stationarity status of all the variables using the Augmented Dickey Fuller (ADF) and Phillips-Perron tests are presented and analyzed in sections 4.2.1 and while the cointegrating long run relationship among the variables are also discussed and analyzed in section 4.2.2 using the bounds testing procedure.

4.2.1 Results of the Unit Root Test

In examining the financial determinants of private investment in Ghana, the stationarity status of all the variables (that is, private investment, real interest rate, credit to the private sector, real exchange rate, broad money supply, inflation and real GDP growth rate) in the private investment model specified for the study were determined. Though the ARDL does not require pretesting the series, the possibility of I(2) variables will crush the model, hence the need to test for unit root.

The Phillips-Perron test was applied on each variable in addition to the ADF test to check the robustness of the unit root test results. The advantage of the Phillips-Perron test over the ADF test is that it corrects for any serial correlation and heteroscedasticity in the errors non-parametrically by modifying the ADF test statistics. The results of the stationarity test based on the ADF and Phillips-Perron tests at both the log level and first difference are presented in Table 4.2. The test regression included an intercept (constant) and a linear trend for both logarithmic levels and the logarithmic first difference of the variables.

Table 4. 1 Results of the Unit Root test

Variables	ADF Test		Phillips-Perron Test	
	Constant	**Constant + Trend**	**Constant**	**Constant + Trend**
Panel A: Level				
lnI^P	-0.2901	-3.9198**	-2.1495	-3.8135**
INTR	-1.16814	-4.84015***	-3.5095**	-4.7895***
lnCRPV	-0.74808	-1.950926	-0.79515	-1.9085
lnRER	-1.160192	-3.573474**	-1.87823	-2.5029
lnM2	-1.50267	-1.500305	-1.6968	-1.7157
lnINFL	-3.9922***	-4.507914***	3.9984***	-4.5305***
lnGDP	1.997872	-4.090464***	2.47449	-0.88432
Panel B: First Difference				
$\Delta\ lnI^P$	-6.5027***	-6.6577***	-9.6519***	-11.2487***
$\Delta INTR$	-7.29341***	-7.4154***	-12.4946***	-13.9527***
$\Delta lnCRPV$	-5.76219***	-6.26816***	-5.7670***	-6.26178***
$\Delta lnRER$	-5.23251***	-5.15473***	-4.90196***	-4.8329***
$\Delta lnM2$	-6.17263***	-6.08422***	-6.2158***	-6.1396***
$\Delta lnINFL$	-5.85541***	-6.02901***	-9.2894***	-10.6270***
$\Delta lnGDP$	-4.02535***	-5.628087***	-4.32018***	-6.00017***

*Note: *,**,***, denotes the rejection of the null hypothesis of unit root at the 10%, 5% and 1% significance levels respectively. The critical values for the ADF tests statistics are -3.159, -3.46 and -4.076 at the 10%, 5% and 1% significance levels respectively. Δ is the first difference operator. The lag length selection for the Phillips-Perron test is based on Newey-West. Results were obtained from Eviews 7.0 econometric software.*

Table 4.1 shows the summary of the unit root test (for both the ADF and Phillips-Perron) of the variables used for the study at the log level and the first difference in Panel A and Panel B respectively. From the ADF unit root test result using only a constant, all variables were not stationary in levels apart from the inflation rate (INFL) which was stationary at the 1 percent significance level. However when both a trend and constant was used, all variables attained stationarity apart from the credit to the private sector (CRPV) and the broad money supply (M2). The Phillips-Perron test result also showed that only the real interest rate (INTR) and the inflation rate were stationary at the 5 percent and 1 percent significance levels respectively. Conversely when both a trend and constant was added only private investment (I^P), the real interest rate and inflation rate attained stationarity.

The variables were not stationary because the values of the test statistic with and without a linear trend are less than the critical ADF value of –2.93 (without a linear trend) and -3.50 (with a linear trend) in absolute terms at the 5 percent level of significance. Thus, the ADF unit root test results for these variables from the table indicate that the null hypothesis of non-stationarity (with and with no trend) cannot be rejected at the logarithmic levels. This means that the variables are integrated of order one or higher and have to be differenced to transform them to stationarity (Gujarati, 2003).

First differencing was done because the series were not stationary, thus the need for the series to be differenced once to attain stationarity. As shown from panel B of Table 4.1, all the variables become stationary after the first difference. This is because the test statistic values for the variables are greater than the critical ADF values of -3.159, −3.50 and -4.15 (with and with no linear trend) in absolute terms at the 10 percent, 5 percent and 1 percent significance levels respectively. Therefore, the null hypothesis of non-stationarity can be rejected. Since the series

became stationary after being differenced once, then the series are said to be integrated of order one, I(1). Thus, the first difference of the variables is integrated of order zero, I(0) indicating that they are stationary. The stationarity of all the variables in their first difference implies the absence of unit roots hence the researcher could proceed further in the application of the ARDL framework to test for cointegration among the variables as well as their long run and short run relationships.

According to Waliullah et al, (2010), albeit the ARDL framework does not require the variables to be pre-tested, the unit root test could help in determining whether or not the ARDL should be used. Thus if the order of integration of the variables is greater than one, that is, I(2) or higher, then the critical bounds provided by Pesaran et al (2000) are not valid since they are computed on the basis that the variables are I(0) or I(1). Hence testing for unit root is necessary to certify that all variables satisfy the underlying assumption of the ARDL framework before advancing to the estimation stage (Pattnayak, 2012).

4.2.2 Results of the Bounds Test for Cointegration

The bounds test procedure is used to investigate the presence of long run relationship among the variables. The first step in the Autoregressive Distributed Lag (ARDL) model procedure requires the testing of long run relationship among the variables by estimating the Vector Error Correction Model (VECM) specified in Equation 3.15 (in the preceding chapter) by the ordinary least squares method. This is done by using the F-statistic to test the joint null hypothesis that the coefficients of the lagged levels of the variables are zero meaning there is no long run relationship (I(0)) among the variables, against the joint alternative hypothesis of a long run relationship (I(1)) among the variables.

The essence of the F-test is to determine the existence or otherwise of a cointegrating relationship among the variables in the long run. The lag length of the variables was selected based on the information criterion that offered the minimum value, which in this case was the Schwarz Bayesian Criterion (SBC). Thus using the SBC, a maximum lag order of two (2) gave the least value and hence was selected. The results of the bounds test procedure for cointegration when private investment was normalized is presented in Table 4.2 below.

Table 4. 2 Results of the Bounds Test for Cointegration

Critical Bounds Value of the F-statistic				
Number of Regressors	**90% Level**		**95% Level**	
6	**Lower Bound** 2.3666	**Upper Bound** 3.6214	**Lower Bound** 2.8194	**Upper Bound** 4.2202
Calculated F-statistic: 5.5326 $F_{I^P}\ (\ I^P \mid INTR,\ CRPV, RER, M2, INFL, GDP)$				

Note: Results obtained from Microfit 5.0

From Table 4.2, the calculated F-statistic $F_{I^P}\ (\ I^P \mid INTR,\ CRPV, RER, M2, INFL, GDP)$ = 5.5326 is greater than the upper bound values of 4.2202 and 3.6214 at the 5% and 10% significance levels respectively. Since the computed F-statistic exceeds the critical upper bound values, then the null hypothesis of no cointegration is rejected at both the 5 percent and 10 percent significance levels. This therefore implies the existence of a long run relationship among the variables when private investment is normalized on the regressors.

4.2.3 Diagnostic Tests

To ascertain the goodness of fit of the ARDL model, its applicability and inference in policy making, there is the need to consider its statistical properties by conducting diagnostic and stability tests. The essence of the diagnostic test is to examine the heteroscedasticity, normality, functional form, and serial correlation associated with the model. The stability test of the coefficients is conducted by employing the cumulative residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ). The results reported in Table 4.3, suggest that the model was well specified and stable over the study period.

Table 4. 3 Diagnostic Test Results

Test	Test Statistic	Probability
Serial Correlation:		
Lagrange Multiplier Test	χ^2-statistic 1.164	0.281
	F-statistic 0.4426	0.517
Specification Error:		
Ramsey's RESET test	χ^2-statistic 1.6571	0.198
	F-statistic 0.63837	0.438
Normality:		
Jarque-Bera statistic	χ^2-statistic 2.3739	0.305
Heteroscedasticity:		
White Heteroscedasticity Test	χ^2-statistic 0.05958	0.807
	F-statistic 0.0563	0.813
Stability Test:		
Harvey-Collier Test	t-statistic -0.7778	0.4422

R-Squared = 0.86868 Adjusted R-Squared = 0.67608 F-Statistic = 5.8369 (0.000)

*Note: *,**,*** denotes the significance of 10%, 5% and 1% levels respectively. None of the tests was significant at these levels. Results obtained from Microfit 5.0*

The above diagnostics indicate that the residuals are normally distributed, serially uncorrelated and homoscedastic. The LM statistic under the Lagrange Multiplier test with a coefficient of 1.164 is an indication of the acceptance of the null hypothesis of no serial correlation in the residuals. Thus the problem of first serial correlation is eliminated. The overall regression is significant at the 1 percent and 5 percent significance levels as evident from the F statistic and R squared results. The F statistic value of 5.8369 suggests the joint statistical significance of all the regression coefficients together, while the R squared value of 0.86868 implies 86.86 percent of the variation in private investment is explained by the variation in the regressors.

The P-value of the Ramsey's RESET test statistic indicates that the alternative hypothesis of model misspecification is rejected, which implies the model is correctly specified. That is, the null hypothesis for the Ramsey's RESET is that the model is correctly specified or does not suffer from omitted variable bias, thus the P-value indicates a non rejection of the null hypothesis. The Jarque-Bera statistic confirms the residuals are normally distributed. The problem of heteroscedasticity was also eliminated as indicated by the White Heteroscedasticity test. The Harvey-Collier (1977) Recursive T-statistic rejects the hypothesis of model instability implying the parameters of the model are stable over the study period. Graphical representation of *CUSUM* and *CUSUM-Q* of recursive residuals (see Appendix II fig 1 and 2) also gives the same conclusion of stability of the model. Thus the diagnostic results reported suggest that the model was well specified and stable over the study period.

4.3 Results of the Estimated Long Run ARDL Model of Private Investment in Ghana

Once the existence of cointegration has been established as shown in section 4.2.2, the long run coefficients of the ARDL model of equation 3.16 (in chapter three) were estimated. The Schwarz Bayesian Criterion (SBC) was employed in selecting the order of the lag length with the model specification of ARDL (2, 2, 0, 2, 2, 1, 2). Table 4.4 presents the results of the long run coefficient estimates of the ARDL model.

Table 4. 4 Results of the Estimated Long Run Coefficients Using the ARDL Approach ARDL (2,2,0,2,2,1,2) Selected Based on SBC

(Dependent Variable $ln\ I_t^P$)

Regressor	Coefficient	Standard Error	T-Ratio	Probability
Constant	-31.4001	17.0216	-1.8447	0.085*
$INTR_t$	-5.2316	2.0125	-2.5995	0.031**
$ln\ CRPV_t$	0.08123	0.03427	2.3702	0.029**
$ln\ RER_t$	7.8804	2.2852	3.4484	0.004***
$ln\ M2_t$	0.08005	0.0828	0.9668	0.349
$ln\ INFL_t$	-0.0519	0.01775	-2.9236	0.010**
$ln\ GDP_t$	4.2890	2.2249	1.9278	0.073*

*Note: ***,**,* denotes the rejection of the null hypothesis at the 1%,5%, and 10% significance levels respectively. Results were obtained from Microfit 5.0*

Table 4.4 presents the results of the estimated long run coefficients using the ARDL model. All the estimated coefficients have their expected signs and are significant; with the exception of the money supply which was found to be insignificant.

The sign of the coefficient of real interest rate was negative and significant at the 5 percent significance level. Its negative sign confirms the neoclassical theory of the user cost of capital which treated the real interest rate as a key component of the user cost of capital and therefore affects private investment negatively. With a coefficient of -5.2316, a unit increase in the real interest rate will reduce private investment by 5.2316. This means that in the long run, a rise in the real interest rate has the potential of deterring private investment in Ghana. The results concur with empirical studies by Michaelides et al (2005), Gnansounou (2010), among other studies.

As evident from the results, credit to the private sector and private investment were positively related at the 5 percent level of significance. The finding is consistent with theoretical expectation that as financial resources in the form of credit are available it becomes more viable to invest. The positive elasticity coefficient means that a percentage increase in the credit to the private sector will lead to a 0.08123 percent rise in private investment. This is evident with the Ghanaian case where credit availability to the private sector has been more pronounced although marginally after the financial liberalization. The results therefore suggest that increase in the availability of credit to the private sector stimulates private investment in the long run. It also corresponds with results obtained by Asante (2000), Ucan and Ozturk (2011), etc.

The elasticity of the real exchange rate has a positive sign of 7.8804 and significant at the 1 percent level of significance. This indicates that all other things being equal a percentage depreciation or devaluation of the domestic currency has the tendency of boosting private investment by 7.8804 percent. That is a persistent depreciation of the real exchange rate can increase the domestic saving rate with a consequent rise in the rate of capital accumulation. Similarly, a depreciated real exchange rate tends to increase the volume of exports, boosting

investment in the export oriented sectors. Empirical works done by Frimpong and Marbuah (2010), Acosta and Loza (2005), Jenkins (1998), Asante (2000), inter alia, corresponds with the results of the study in line with the real exchange rate.

Consistent with theoretical expectation, the elasticity coefficient of the money supply was positive although not significant. This suggests that in the long run a 1 percent increase in the money supply causes private investment to increase by 0.08123 percent. The insignificant coefficient can be explained along the line that over the years the Bank of Ghana has operated a tight monetary policy stance, with a possible increase on the rate of interest. For instance, the Bank of Ghana in line with attaining its objective of price stability and arresting the depreciation of the cedi between 2000 and 2009 adopted open market operations (OMO) and repurchase agreements (repos) as its monetary policy instruments. In the light of these developments, the Bank of Ghana maintained a tight monetary policy stance, with the intensification of open market operations to mop up excess liquidity while the minimum primary reserve requirement for deposit money banks was raised from 8 per cent to 9 per cent in July, 2000. Money market rates, notably the 91-day Treasury bill discount rate rose sharply in June and July by 5 percentage points to 36.77 per cent and thereafter settled at 38.00 per cent till December 2000 (Bank of Ghana Annual Report, 2000). During the period, the real interest rate rose consistently from 9.2 percent in 2001 to 18 percent in 2009 which was a possible deterrent to stimulating private investment.

The long run results also reveal a negative and statistically significant coefficient of inflation at the 5 percent significance level. The result contradicts some empirical findings like that of Bakare (2011) and Frimpong and Marbuah (2010), but consistent with the work of Ndikumana (2000), and that of Ucan and Ozturk (2011) for Turkey, where a higher inflation rate was found

to discourage private investment. The elasticity coefficient of -0.0519 indicates that inflation exerts a negative influence on private investment in Ghana in the long run, hence a 1 percent rise in the rate of inflation results in a 0.0159 percentage fall in the level of private investment. This explains why prior to 1983 (prior to the implementation of the ERP and SAP) during the period of massive economic decline characterized by high inflationary rates, private sector investment was discouraged with the latter declining from 8.65 percent of GDP in 1970 to 2.27 percent of GDP by 1982.

It was however evident that after the introduction of the reforms with the consistent fall in the rate of inflation, private investment increased gradually although marginally. For instance the rate of inflation declined consistently from 122 percent in 1983 to 10 percent by 1992, while private investment also increased from 2.85 percent in 1983 to 12.68 percent by 1993. From 2000 to 2010, inflation has been declining in Ghana from 25.19 percent to 10.71 percent, with private investment also increasing from 12.70 percent in 2000 to 17.87 percent by 2010.

The anticipated positive relationship between real output growth and private investment was confirmed empirically at the 10 percent significance level. This means that in the long run an increase in GDP growth rate by 1 percent would trigger a 4.2890 percent increase in private investment. The finding is consistent with works by Fowowe (2011), Nair (2004), Ouattara (2004), Frimpong and Marbuah (2010), Michaelides et al (2005), among other works. The positive and statistically significant elasticity coefficient is an indication that as output is growing, businesses will invest in new capital, more jobs would be created and personal incomes would expand.

4.4 Results of the Error Correction Model

The third step of the bounds testing procedure is to estimate the short run dynamic parameters of within the ARDL framework. The Error Correction Model measures the speed of adjustment to restore equilibrium in the dynamic model following a disturbance, and provides the mechanism of reconciling the short run behaviour with its long run behaviour. Table 4.6 presents the result of the error correction model.

Table 4. 6 Estimated Short Run Error Correction Model

ARDL (2,2,0,2,2,1,2) Selected Based on SBC		**(Dependent Variable $ln\, I_t^P$)**		
Regressor	**Coefficient**	**Standard Error**	**T-Ratio**	**Probability**
$\Delta INTR_t$	-0.01434	0.040571	-0.35343	0.727
$\Delta lnCRPV_t$	0.14539	0.31387	0.46321	0.648
$\Delta lnRER_t$	-10.9253	3.9348	-2.7766	0.012**
$\Delta lnM2_t$	-0.35456	0.22749	-1.5586	0.135
$\Delta lnINFL_t$	-0.062458	0.02727	-2.2905	0.033**
$\Delta lnGDP_t$	27.3600	12.0148	-2.2772	0.034**
ecm (-1)	-0.6392	0.09184	-6.9599	0.000***

ecm = PIV + 5.2316*INTR -.08123*CRPV -7.8804*RER -.080050*M2 + .051915* INFL -4.2890*LNGDP1 + 31.4001*C

R-Squared	0.86868	R-Bar Squared	.67608
S.E. of Regression	1.8503	F-Stat. F(17,20)	5.8369[.000]
Mean of Dependent Variable	0.38553	S.D. of Dependent Variable	3.2511
Residual Sum of Squares	51.3545	Equation Log-likelihood	-59.6418
Akaike Info. Criterion	-82.6418	Schwarz Bayesian Criterion	-101.4741
DW-statistic	2.1642		

*Note: ***,**,* denotes the rejection of the null hypothesis at the 1%, 5% and 10% significance levels respectively. Results were obtained from Microfit 5.0*

In the short run, deviations from the long run equilibrium can occur due to shocks in any of the variables in the model. Thus all the short run coefficients show the dynamic adjustments of all the variables to their long run equilibrium (Dritsakis, 2011). The sign of the coefficients in the Error Correction Model was not quite different from that attained in the long run model, with the exception of the broad money supply and the real exchange rate which assumed a negative and positive sign respectively. The coefficients represent the elasticity of private investment with respect to all the regressors in the short run.

With a negative elasticity coefficient of -0.01434, the real interest rate was found to be statistically insignificant. The negative sign implies that an increase in the real interest rate raises the user cost of capital, thereby making private investment less profitable. Therefore the level of private investment is expected to decline as the real interest rate increases. The coefficient also implies that in the short run, a unit rise in the real interest rate offsets a 0.01434 fall in private investment. This presupposes that increases in the real interest rate could be detrimental to private investment in Ghana.

Credit to the private sector with its maintained positive sign, was however not significant in the short-run, contrary to what was obtained in the long-run. Its positive elasticity coefficient means that private investment would increase by 0.1454 percent resulting from a 1 percent increase in the amount of credit available to these investors. Nonetheless, the availability of credit in the short-run can be a key constraint facing private firms in Ghana, undoubtedly accounting for its insignificance. This empirical finding could be due to the scarce and rationed nature of credit available to private investors prior to the financial liberalization in the late 1980s.

Contrary to the long run finding, the real exchange rate was found to exert a negative influence on private investment, although significant at the 5 percent level. This is an indication that a 1 percent depreciation or devaluation of the domestic currency has the impetus of reducing private investment by approximately 10.9 percent in the short-run. This implies that a depreciation of the domestic currency increases the cost imported capital assets hence resulting in a decline in the demand for imported inputs. Since the coefficient (10.9) is highly elastic and larger than the short-run coefficient (7.88), investors would be relatively more responsive to changes in the value of the cedi in the short-run than in the long-run. This situation was evident in the Ghanaian case by the end of year 2001 when the cedi depreciated by 13.2 percent against the US dollar, by 23.6 percent against the euro, and by 20.4 percent against the pound sterling, which resulted in a sharp decline in private investment from16.71 in 2001 to 9.19 in the beginning of 2002.

From the results, the ratio of broad money supply with an elasticity coefficient of -0.35456 was not significant. The sign was however contrary to what was obtained in the long run case. The result implies that in the short-run, a percentage increase in the ratio of broad money supply will elicit a 3.54 percent fall in private investment.

Consistent with the long-run finding, the elasticity coefficient of inflation was found to be negative and significant at the 5 percent level in the short-run. Inflation, which is a sign of macroeconomic instability, has the potential of driving down private investment by 0.0625 percent following a percentage rise in its rate. Thus in both the short-run and long-run, inflation has the potential of deterring private sector investment. A high domestic inflation raises the cost of production of locally produced goods via high cost of inputs. Foreign produced goods will

become relatively cheaper than the locally produced goods which have become expensive, thereby affecting the demand for the local products and reducing and discouraging investment towards such productions.

The results show that a 1 percent increase in GDP in the short run will lead to a 27.36 percent increase in private investment, significant at the 5 percent level. Since it is highly elastic, then it is expected that private investment would respond more to changes in GDP in the short run. Thus a unit change in the level of aggregate output or income in the economy would stimulate a more than proportionate change (27.36 percent change) in the same direction in the level of investment undertaken by firms in Ghana. This result contradicts empirical work by Hassan and Salim (2011) whose finding concluded GDP to exert an inelastic influence on private investment in the short run. The finding however concurs with work by Ribeiro and Teixeira (2001).

The ECM represents the speed of adjustment to restore equilibrium in the dynamic model following a disturbance. The estimated coefficient of the ECM which equals -0.6392 suggests a relatively quick speed of adjustment back to the long-run equilibrium. The coefficient is highly significant at the 1 percent significance level and appropriately signed. According to Verma (2007), a highly significant error correction term is further proof of the existence of a stable long-term relationship. The result suggests that about 63.92 percent of the deviation between the actual and the long-run equilibrium value of private investment is corrected each year. That is approximately more than 63.92 percent of the disequilibria from the previous year's shock converge back to the long-run equilibrium in the current year.

CHAPTER FIVE

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter provides the general conclusion of the study while summarizing the major findings with their implications. The chapter further provides and discusses the recommendations based on the findings obtained.

5.1 Summary of Findings

After thoroughly analyzing (by using both economic and econometric tools) the financial determinants with their respective impact on private investment, the following summarized findings were obtained from both the long run and short run estimated results of the study:

- The study established a negative long run relationship between real interest rate and private investment at the 5 percent significance level. More specifically, a unit increase in real interest rate reduces private investment by 5.23 in the long run. The short run result obtained with an elasticity coefficient of -0.01434 was however not significant. The coefficient implied that a unit increase in the real interest rate offsets a fall in private investment by 1.434. The result in general confirmed the neoclassical theory of the user cost of capital which identified the real interest rate as the main determinant of private investment.

- Consistent with theoretical expectations, credit to the private sector was found to be positively related to private investment in both the long run and short run, albeit not significant in the short run. In the long run, significant at the 5 percent level, private investment increases by 0.08123 percent following a 1 percent rise in private sector credit. A percentage rise in private sector credit also stimulates private investment by 1.4539 percent in the short run but not significant. This was mainly attributed to the financing and credit constraints faced by investors in Ghana, which likely reduces the volume of private investment.

- The coefficients of the real exchange rate were significant at 1 percent and 5 percent significance levels in both the long run and short run respectively, but with opposing signs. The sign was positive in the long run implying a percentage depreciation of the currency stimulates private investment in Ghana by 7.88 percent, while the negative coefficient in the short run which was highly elastic implied a fall in private investment by 10.9 percent following a 1 percent depreciation in the domestic currency.

- Quite interesting was the broad money supply to GDP ratio (M2) which was found to be insignificant in both the long run and short run but with a positive and negative coefficient respectively. The insignificant coefficients were ascribed to the tight and contractionary monetary policy stance that was adopted by the Bank of Ghana with a potential rise in the real interest rate. Accordingly, private investment is expected to fall. A percentage rise in M2 increases private investment by 8.123 percent in the long run while in the short run private investment falls by 35.4 percent.

- From the results of the study, the inflation rate and private investment were negatively related. The estimated results were -0.0519 and -0.0625 in the long run and short run respectively and significant at the 5 percent level in both periods. Thus higher inflation rates tend to discourage private investment in Ghana in both the long run and short run.

- The study confirmed the positive relationship between real GDP growth rate and private investment in both the long run and short run. Significant at the 10 percent level, a percentage increase in the real GDP growth rate increases private investment by 4.289 percent in the long run. The coefficient, significant at the 5 percent level was highly elastic in the short run with a percentage increase in the real GDP growth rate leading to an upsurge in private investment by 27.36 percent. This positive relationship provides strong evidence of the flexible accelerator theory of investment which postulated a positive relationship between the growth in the capital stock and changes in real output

5.2 Policy Implications and Recommendations

The findings of the study as explained in the previous chapter and highlighted above, provide evidence that private investment in Ghana, like in other developing countries is affected by important financial and macroeconomic variables. The empirical evidence however has certain important policy implications, and in view of that recommendations have also been provided, in an attempt to help boost and stimulate private investment in Ghana.

The empirical evidence from the study on the real interest rate implies that in both periods, further increases in the real interest rate will increase the user cost of capital so much so that net profits of investors become negative. It is therefore recommended that economic policies to reduce the rate of inflation and prevent excessive fluctuations in the exchange rate should be intensified. In that way the Bank of Ghana can reduce the prime rate for the commercial banks to borrow at a lower cost and be in a position to lend to investors and businesses at a lower rate. Hitherto, commercial banks have not been responsive to the central bank's reduction in the prime rate by lowering their own lending rate. Thus the central bank can introduce policies that would increase competition among the financial institutions so as to induce them to reduce their lending rates. Periodically, the Bank of Ghana has been publishing the interest rates, however the way in which the information is disseminated is not well known, hence there is the need for increased awareness of these interest rates to enable investors identify which financial institutions are giving lower rates, so as to induce them to go in for such cheaper loans, in so doing, the competition among the financial institutions would also be enhanced.

The empirical results also implied that private investment would decline in both the short run and long run if investors face severe financing constraints when credit is made scarce to the sector. The private sector would be able to contribute more to economic development by providing jobs and income and broadening the export base of the country, the more accessible credit is to their investment financing decisions. The importance of credit thus necessitates a stable macroeconomic environment, adequate and well functioning financial structures, to ensure easy channeling of funds from savers to investors to expand the frontier for private investment finance. Financial institutions lack data on private investors' characteristics and performance

perpetuating the general perception that they might be risky ventures to invest in, thus making it difficult for the financial institutions to grant them credit. Since this is a significant barrier to investors in acquiring financial aid, periodic auditing of financial statements of the private businesses is key for financial institutions to be conscious of the financial potential of the investors. Also vital is building a database of private investors to track their performance and make data on them readily accessible to the creditors to reduce asymmetric information and to obscure the perception that private businesses are risky ventures to invest in.

Government action is also fundamental in the regulation and supervision of investors and private credit financers, ensuring effective performance and credit reporting for easy access to information and credit. The authorities can enforce this by putting in place public credit registries as sources of credit information and easy access to credit reports. Since access to collateral and financing requirements are some of the major barriers private investors face in acquiring funds in Ghana, institutions interested in facilitating capital access for investors could provide guarantees to commercial banks to cover any losses on private investments. Reducing their credit risk would encourage the banks to make capital available to the private firms.

As evident from the results, a depreciation of the cedi in the short run will depress private investment by increasing the cost of imported capital inputs thus reducing import demand of capital and intermediate goods for investment purposes. Contrary to the short run result, a depreciation of the cedi in the long run will increase the rate of capital accumulation via boosting investment in the export oriented sectors. The depreciation is also likely to result in an upsurge in the domestic saving rate through a rise in the real interest rate. Exchange rate stabilization

policies are therefore pertinent in addressing and remedying the possible volatilities and effects of the depreciation of the exchange rate on private investment. Exchange rate policies such as expenditure changing policies could be introduced via expansionary monetary policies which would increase the interest rate and subsequently lead to a depreciation of the domestic currency, to boost investment. Occasionally, the central bank of Ghana has been embarking on managed (dirty) floats in order to achieve a certain reserve target. These managed floats could be intensified by the bank occasionally intervening in the foreign exchange market to influence the value of the currency. This measure would act as a buffer against any external economic shock before its rippling effect on the economy. The Bank of Ghana could facilitate this through an auction system of buying and selling foreign exchange to prevent excessive fluctuations in the exchange rate thereby stabilizing it. To do so, the Bank of Ghana can buy the domestic currency from the public with by drawing down on its reserves when the exchange rate is depreciating; and sell domestic currency to buy foreign currency from the public when the exchange rate is appreciating, thereby dampening its rise, to cause a fall in the value of the domestic currency. The stability of the exchange rate would allay the uncertainties associated with investment by reducing transaction cost involved with hedging foreign exchange risk, thus private investors would be able to trade with more certainty and enhance the competitiveness of the country's domestic export products.

Contrary to a priori expectations, the broad money supply to GDP ratio negatively influences private investment in the short run, while in the long run its effect on private investment is positive. This presupposes that in the long run, an increase in the money supply which would be reflected in lower lending rates will reduce the financing constraints of private firms by

enhancing the availability of credit, and consequently increasing investment. The short run result implied that the resultant fall in the real interest rate proceeding from an increase in the money supply is expected to reduce private investment via reduced savings, confirming McKinnon's complementarity hypothesis. Due to the opposing effects of the money supply on private investment in the long run and short run, it is recommended that monetary policy authorities should establish the threshold interest rate at which increases in the money supply would not lead to a further fall in the real interest rate to prevent private investment from falling per the dictate of the complementarity hypothesis.

Establishing a negative relationship between the rate of inflation and private investment, it is recommended that adopting only a contractionary monetary policy via higher prime rate would not be enough and have some ramifications on the economy by reducing investment through higher lending rates. Thus a monetary-fiscal policy mix would be recommended by reducing the prime rate and supplementing it with a fiscal contraction. The contraction in fiscal policy should be supplemented by an expansionary monetary policy since a reduction in fiscal deficit dampens output and aggregate demand and ultimately prices. The rationale is to avoid a decline in output following the contractionary fiscal policy which would result in lower prices. The low prices would reduce the cost of inputs and production and subsequently boost demand. Exports would also become relatively cheaper to enhance competition among the export production sectors.

The positive relationship between the GDP growth rate and private investment in both periods is an indication that the bigger the growth rate, the more investment would be stimulated in the economy. Policies to promote economic stability and growth should be intensified since economic stability facilitates the achievement of other macroeconomic objectives such as stable price, job creation, balance of payment stability and sustainable growth rate. These would be possible because stability creates certainty and boosts confidence in investment. Sustainable growth can occur through increases in aggregate demand and supply. Nonetheless, long term sustainable growth will ultimately depend on improvement in supply side policies since price hikes are less likely to be a problem when factor productivity improves.

Supply side policies such as technology policies should be enforced where government would provide incentives in the form of cheap loans or tax reliefs to private firms to encourage them to invest in new technology to hasten the production process and output. Investment in human capital is also critical to enhancing productivity and efficiency. Human development policies by allocating more resources to education and training should be strengthened to provide key skills and knowledge that would help to increase output. Barriers to entry into new markets should also be reduced to encourage the new markets to exploit new technology and production methods to promote competition while increasing production.

5.3 Conclusion

The study investigated the financial determinants of private investment in Ghana by specifying a private investment model based on the flexible accelerator model. The objective of the study was to determine whether the financial factors have undeniably contributed to boosting private investment in Ghana as per the objectives spelt out in the objectives of the ERP, SAP and the

financial reform policies of the 1980's. Using annual time series data from 1970 to 2010, the model was estimated using the Autoregressive Distributed Lag (ARDL) model where the short run and long run effects were established.

The stationarity status of all the variables were tested prior to estimation using the Augmented Dickey Fuller (ADF) test and Phillips-Perron test to ensure none of the variables was integrated of order two I(2) or higher. The results of the unit root test revealed that all the variables were stationary, that is I(1). Using the Bounds Testing Approach, cointegration was established when private investment was normalized on all the variables.

The empirical results of the study suggested that in the short run only the real GDP growth rate and credit to the private sector affected private investment positively albeit the latter was not significant. In the long run however, only the rate of inflation and the real interest rate significantly affected private investment negatively with all the other variables exerting a positive influence. It was therefore recommended that policies that would eliminate the financing constraints face by the private investors should be intensified to improve upon private sector credit. Supply side policies should also be enhanced to promote sustainable growth to encourage increases in private investment. Exchange rate stabilization policies such as a dirty float could also be introduced occasionally by the government to prevent excessive volatilities in the exchange rate.

5.4 Limitations of the Study and Issues for Further Research

The apparent limitation of the study was that it concentrated on using only macroeconomic variables and aggregative data, but failed to consider the impact of non economic factors on private investment. This implies that there are other equally important factors that also affect

private investment decisions apart from the macroeconomic variables. Since this is not addressed in the study, then this controversy in itself will be an area of further research that the researcher would like to explore to complement the findings of the study. Incorporating non economic factors and disaggregated data may generate outcomes different from the results achieved.

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APPENDIX I

RESULTS OF THE ARDL ESTIMATES

Autoregressive Distributed Lag Estimates
ARDL(2,2,0,2,2,1,2) selected based on Schwarz Bayesian Criterion
****
Dependent variable is PIV
38 observations used for estimation from 1973 to 2010
****

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
PIV(-1)	-.35119	.18715	-1.8765[.080]
PIV(-2)	-.56740	.17338	-3.2726[.005]
INTR	-.014339	.040571	-.35343[.729]
INTR(-1)	-.045464	.039882	-1.1400[.272]
INTR(-2)	.016670	.030478	.54696[.592]
CRPV	.14539	.31387	.46321[.650]
RER	7.4657	4.4028	1.6957[.111]
RER(-1)	9.7100	5.3736	1.8070[.091]
RER(-2)	10.9253	3.9348	2.7766[.014]
M2	-.35456	.22749	-1.5586[.140]
M2(-1)	.18966	.20398	.92982[.367]
M2(-2)	.10554	.20838	.50646[.620]
INFL	-.062458	.027269	-2.2905[.037]
INFL(-1)	-.053791	.028343	-1.8979[.077]
LNGDP1	-11.5294	10.9496	-1.0529[.309]
LNGDP1(-1)	-6.2266	15.3169	-.40652[.690]
LNGDP1(-2)	37.8540	12.6270	2.9979[.009]
C	-70.3121	41.7779	-1.6830[.113]

****

R-Squared	.94409	R-Bar-Squared	.86209
S.E. of Regression	1.8503	F-Stat. F(22,15)	11.5133[.000]
Mean of Dependent Variable	8.1121	S.D. of Dependent Variable	4.9825
Residual Sum of Squares	51.3545	Equation Log-likelihood	-59.6418
Akaike Info. Criterion	-82.6418	Schwarz Bayesian Criterion	-101.4741
DW-statistic	2.1642		

****

Testing for existence of a level relationship among the variables in the ARDL model

****

F-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
5.5326	2.8194	4.2202	2.3666	3.6214

W-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
38.7282	19.7360	29.5413	16.5659	25.3495

****

If the statistic lies between the bounds, the test is inconclusive. If it is above the upper bound, the null hypothesis of no level effect is rejected. If it is below the lower bound, the null hypothesis of no level effect can't be rejected. The critical value bounds are computed by stochastic simulations using 20000 replications.

DIAGNOSTIC TESTS

Diagnostic Tests

****

* Test Statistics *	LM Version	*	F Version	*
* A:Serial Correlation*	CHSQ(1) = 1.1645[.281]*		F(1,14) = .44257[.517]*	
* B:Functional Form *	CHSQ(1) = 1.6571[.198]*		F(1,14) = .63837[.438]*	
* C:Normality *	CHSQ(2) = 2.3739[.305]*		Not applicable	*
* D:Heteroscedasticity*	CHSQ(1) = .059580[.807]*		F(1,36) = .056533[.813]*	

****

A:Lagrange multiplier test of residual serial correlation

B:Ramsey's RESET test using the square of the fitted values

C:Based on a test of skewness and kurtosis of residuals

D:Based on the regression of squared residuals on squared fitted values

APPENDIX II

CUSUM AND CUSUM-Q FOR STABILITY

Figure 1

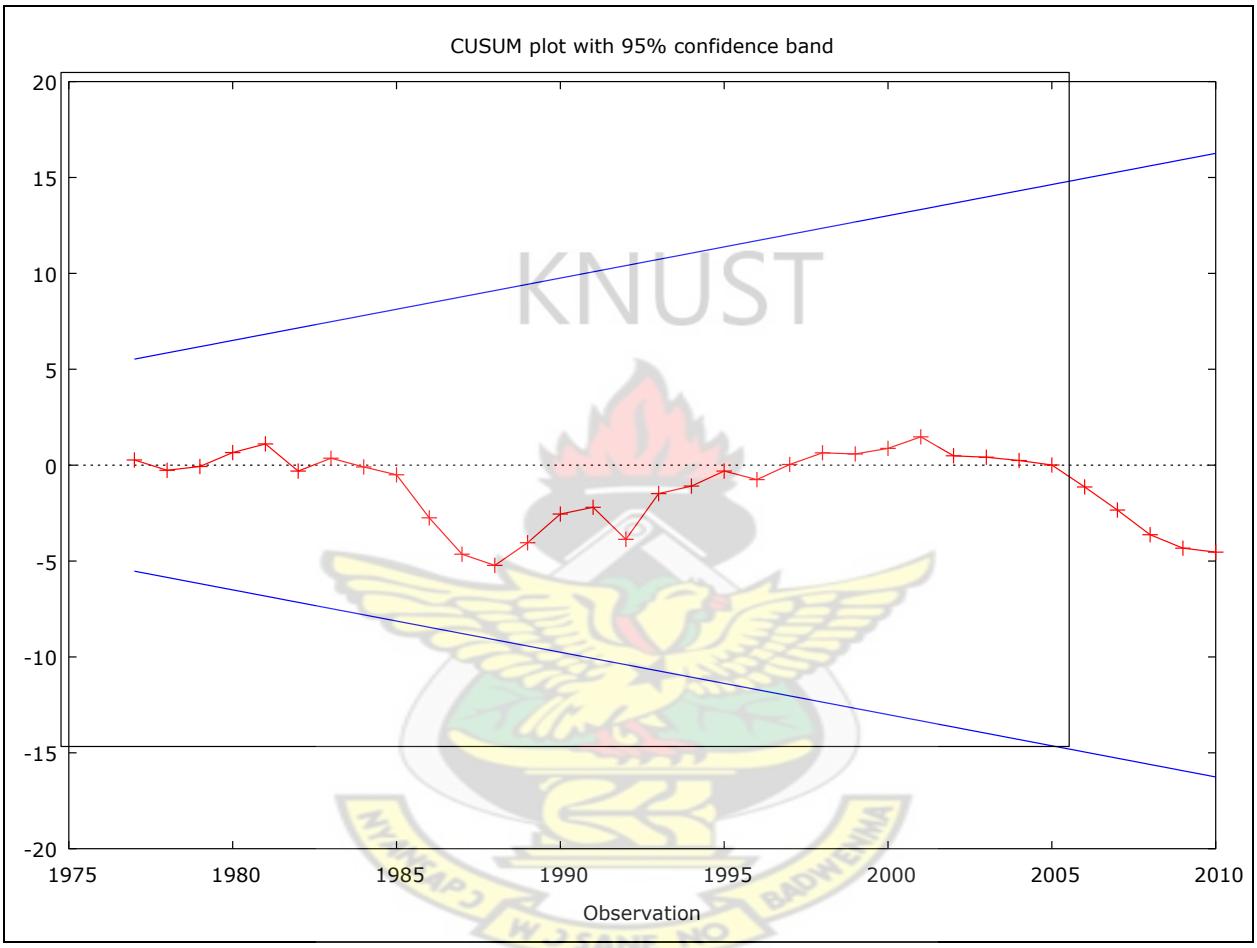
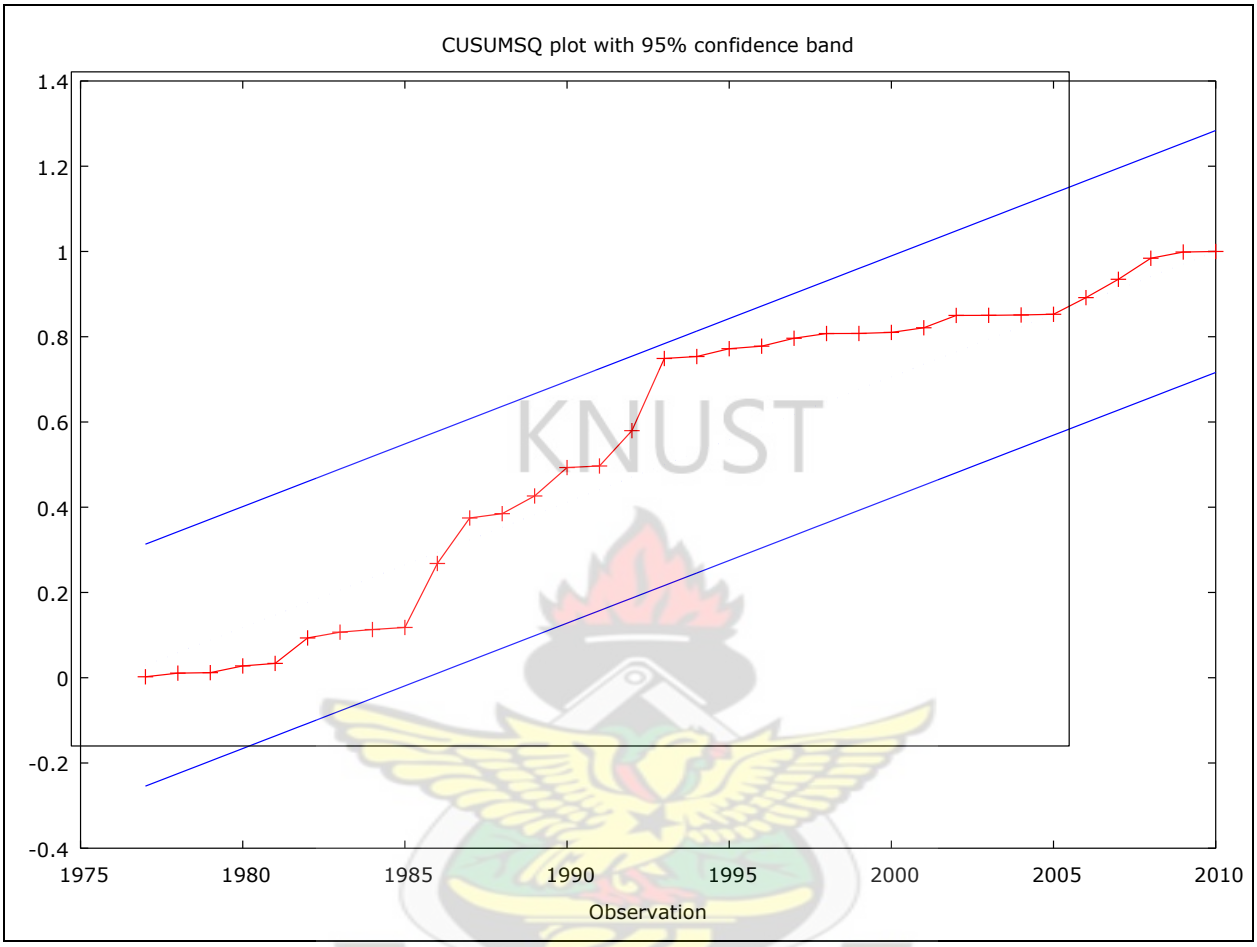


Figure 2



APPENDIX III
DATA USED FOR STUDY

YEAR	I^P	INTR	CRPV	RER	(M2/GDP)	INFL	GDP
1970	8.65	2.4	8.25	336.8	18.05	3.03	9.2
1971	8.47	-1.4	12.58	368.1	18.03	9.55	5.3
1972	3.22	-1.9	10.06	529.9	20.29	10.06	3
1973	5.99	-9.9	5.34	536.2	20.87	17.68	2.8
1974	9.86	-10.3	5.68	291.8	19.3	18.13	7.7
1975	7.98	-16.8	5.78	333.8	22.63	29.82	4.3
1976	2.41	-30.8	5.9	224.1	25.18	56.08	3.5
1977	2.29	-50.1	5.02	107	22.15	116.45	1.8
1978	1.49	-34.4	3.52	111	19.49	73.09	9.3
1979	3.3	-26.5	2.82	127	19.62	54.44	1.6
1980	4.21	-24.4	2.19	750.55	16.21	50.07	0.5
1981	2.22	-44.8	1.85	1669.32	13.76	116.5	2.9
1982	2.27	-9.6	1.8	2092.27	15.54	22.29	6.7
1983	2.85	-48.6	1.54	3578.93	9.68	122.87	4.5
1984	4.37	-10.4	2.21	545.98	9.75	39.66	8.6
1985	5.4	0.4	3.11	397.57	11.47	10.3	5.1
1986	2.01	-15.3	3.63	251.52	11.33	24.56	5.2
1987	2.42	-9.8	3.15	188.29	11.74	39.81	4.8
1988	3.22	-5.8	3.14	169.77	12.41	31.35	5.6
1989	5.4	8.2	5.85	158.57	13.93	25.22	5.1
1990	6.92	-21.3	4.93	157.5	13.31	37.25	3.3
1991	7.53	-3.1	3.66	160.78	13.38	18.03	5.3
1992	2.45	3.4	4.94	141.83	17	10.05	3.9
1993	12.7	6.3	4.84	123.92	17.35	24.95	5
1994	9.3	6.8	5.25	100.38	18.64	24.87	3.3
1995	7.1	-48.1	5.07	115.95	18.38	59.46	4
1996	6.99	-5.8	6.01	125.99	17.7	46.56	4.6
1997	11.4	-0.6	8.2	133.3	20.19	27.88	4.2
1998	11.06	-22.5	9.36	142.25	21.16	14.62	4.7
1999	10.71	-6.8	12.56	140.49	21.65	12.4	4.1
2000	12.7	-4	13.97	91.94	23.21	25.19	3.7
2001	16.8	9.2	11.88	92.95	25.77	32.9	4
2002	9.2	5.6	12.15	92.55	29.3	14.81	4.5
2003	14	4.3	12.49	92.78	28.12	26.67	5.2
2004	16	12.2	13.17	91.49	29.22	12.62	5.6
2005	17	15.5	15.54	100	29.49	15.11	5.9
2006	12.8	12.5	11.09	105.25	19.98	10.91	6.4
2007	11.57	13.5	14.49	104.54	22.26	10.73	6.5
2008	12.1	17	15.88	99.5	23.6	16.52	8.4
2009	14.57	18	15.66	91.55	20.04	19.25	4.5
2010	17.87	13.5	15.29	97.63	16.31	10.7	6.6