KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF ART AND SOCIAL SCIENCES

DEPARTMENT OF ECONOMICS

ESTIMATING THE RESPONSES OF REAL GDP AND INFLATION TO MONETARY POLICY INSTRUMENTS SHOCKS: EVIDENCE FROM GHANA.

BY

ABDUL RAZAK ALHASSAN

(PG7309112)

THESIS SUBMITTED TO THE DEPARTMENT OF ECONOMICS OF THE FACULTY OF ART AND SOCIAL SCIENCES, KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR AWARD OF MASTER OF PHILOSOPHY DEGREE IN ECONOMICS

NOVEMBER, 2014

DECLARATION

I hereby declare that this thesis is the result of my own original work towards the Master of Philosophy Degree in Economics and that to the best of my knowledge, it neither contains material published by another person nor materials which have been accepted for the award of any other degree of the University, except where due acknowledgments have been made in the text.

ID NUMBER PG7309112

ABDUL RAZAK ALHASSAN	.....	30-10-14
STUDENT'S NAME	SIGNATURE	DATE

CERTIFIED BY:

PROFESSOR J. OHENE-MANU	.....	30-10-14
PRINCIPAL SUPERVISOR'S NAME	SIGNATURE	DATE

CERTIFIED BY:

DR.(SR.) EUGENIA AMPORFU	.....	31/10/14
(HEAD OF DEPARTMENT)	SIGNATURE	DATE

ABSTRACT

This study examined the responses of real GDP and inflation to monetary policy instruments shocks in Ghana using a multivariate modeling technique of the Vector Autoregression (VAR) and focusing on the reduced-form relationship between real GDP, price level, broad money supply (M2), real lending rate, real effective exchange rate and domestic credit for the period 1980-2012. The stochastic shocks of monetary policy actions and decisions on the real GDP and inflation were carried out by examining the dynamic nature of Granger Causality Test, Cholesky Ordered Impulse Response Functions and Forecast Error Variance Decomposition for the VAR model. The study found that the potency of monetary policy in influencing real GDP and inflation is limited, as important channels of monetary transmission are not fully functional. In particular, the lending rate channel, credit channel, and the exchange rate channel were found weak, even though there is evidence of money supply as the only monetary policy instrument exerting significant effects on real GDP. Surprisingly, the connection between money supply and inflation is less clear in the case of Ghana. There is also evidence of transmission to inflation of changes in the lending rate. This study has, therefore, established the lack of unequivocal evidence in support of the conventional channel of monetary policy transmission mechanism. It has revealed that money supply was the most important variable in predicting real GDP in the case of Ghana during the study period.

It is recommended that a more expansionary monetary policy should accompany a set of policies geared towards improving investment efficiency and bolstering consumption. In addition, the Bank of Ghana should entice more reputable foreign banks, especially Islamic banks into the Ghanaian market with a view to importing expertise, increasing competition and efficiency of bank operations and lowering the interest rate spreads among commercial banks.

DEDICATION

To my loving and caring mother, Mma Hawa, for her heightened patience, support and endurance during my absence from home.

ACKNOWLEDGEMENTS

I am most grateful to the Almighty God for preserving my life, and giving me the courage to go through the difficulties that came my way on campus and in the course of preparing this thesis.

I would like to express my deepest appreciation and gratitude to Professor J. Ohene-Manu, who is not only my respectable supervisor but also my academic inspiration. From the very inception of this programme to the final session, he has always been an enthusiastic, encouraging and hardworking lecturer. His intelligible, interesting and valuable lessons have been an important motivation for my love for Economics.

I would also like to thank Dr. (Sr.) Eugenia Amporfo, Dr. Hadrat M. Yussif, Dr. George Adu, Mr. Kwaku Boateng and all the other lecturers in the Economics Department, KNUST for their useful lectures and enthusiastic suggestions in the thesis seminar which make not only master programme but my life. To them, I say God richly bless you.

I would like to thank the University, Kwame Nkrumah University of Science And Technology for giving me the opportunity to further my education in Economics and helping me, yet, unearth such a huge potential in me.

I am also grateful to my mother, Mma Hawa, for her inspiration, advice, moral and financial support in the course of undertaking this study. No word can express all my love to her. She has always been there for me and I owe her my life with love. It has always been her prayer that her children live in a world where they are the 'rule' rather than an 'exception'. May the Lord accept her prayers, shower His utmost blessings on her and may all her efforts be rewarded bountifully.

My final appreciation goes to all my friends at KNUST who have always received me with love, caring and sharing. I could not just imagine my days without you. To you all I say God bless you abundantly.

TABLE OF CONTENTS

CONTENTS **PAGE**

LIST OF TABLES

Table **Page**

LIST OF FIGURES

FIGURE **PAGE**

LIST OF ABBREVIATIONS

BoG	Bank of Ghana
CD	Currency Deposits
ERP	Economic Recovery Programme
GPRS I	Ghana Poverty Reduction Strategy
GPRS II	Growth and Poverty Reduction Strategy
HIPC	Highly Indebted Poor Countries
MoF	Ministry of Finance
MPC	Monetary Policy Committee
NGDP	Nominal Gross Domestic Product
OMO	Open Market Operation
PSBR	Public Sector Borrowing Requirement
SAP	Structural Adjustment Programme
USD	United States Dollar
VAR	Vector Autoregression
VEC	Vector Error Correction
WDI	World Bank Development Indicators

CHAPTER ONE

INTRODUCTION

1.1 Background of study

Monetary policy as a technique of economic management to bring about sustainable economic growth and development has been the pursuit of many nations and formal articulation of how money affects economic aggregates dates back to the time of Adam Smith and championed by the monetary economists.

The exposition of the role of monetary policy in influencing macroeconomic objectives like promotion of economic growth, sustainable development, price stability, and equilibrium in balance of payments has awaken monetary authorities to use monetary policy to grow their economies.

The relationship between monetary policy and economic growth has been more important in the field of monetary economics, Friedman (1968). Because of the importance of economic growth among developed and developing countries, persistent concern has always been given among monetary economists including McKinnon (1973), Shaw (1973), Fry (1997), Mathieson (1980), and Levine (1997) to the relationship between money supply and output.

Economists have dissension on the effect of money supply on economic growth (Rasheed, 2011). Some Economists believe that variation in the quantity of money is the most important determinant of economic growth. In effect, countries that devote more time to studying the behavior of money supply rarely experience much variation in their economic activities. In contrast, other countries are suspicious about the role of money on gross national income (Robinson, 1952). The implication of the stability of the relationship between money and economic growth will show the effectiveness of monetary policy following the conventional IS-LM analysis (Ogunmuyiwa and Eken, 2010).

Monetary policy can defined as the process by which the government, central bank or monetary authority of a country controls the supply of money, availability of money and cost of money or the rate of interest in order to attain a set of objectives oriented towards the growth and stability

of the economy (Irfan and Ume, 2011). Monetary policy rests on the relationship between the rates of interest in an economy, that is the price at which money can be borrowed, and the total supply of money. Monetary policy uses a variety of tools to control one or both of these variables to influence outcomes like economic growth, inflation, exchange rates with other currencies and unemployment.

Economic growth could also be defined as the increase in the amount of goods and service in a given country at a particular time. This indicates that when the real per capita income of country increases overtime, economic growth is taking place. A growing economy produces goods and services in each successive time period, showing that the economy's productive capacity is at increase. Broadly, economic growth implies raising the standard of living of the people and reducing inequalities of income distribution.

Sustainable economic growth and development is undoubtedly one of the most challenging issues in the developing countries today. Even from the days of the father of economics the main focus of macroeconomic thinkers and policy makers is how to attain macroeconomic stability, Adam (1992). The two major economic policies often used to stabilize any economy of the world are monetary and fiscal policies and their cardinal tools are money supply and government expenditure.

In a bid to achieve sustained economic growth, Ghana has been washed with a plethora of development plans by the various governments in place, with various degrees of implementation and success. These include the first seven-year development plan by Governor Gordon Guggisberg (1920-30) in 1919, followed by Second Ten-Year Plan (1930-40), Third Ten-Year Plan (1946-56), Fourth Ten-Year Plan (1951-61), Five-Year Plan (1951-56), Consolidation Plan (1958-59), Second Five-Year Plan (1959-64), Seven-Year Plan ("Work And Happiness") (1963/64-1969/70), Two-Year Development Plan "The Stabilization Plan" (1967/68-1968/69), "Rural Development Plan" (1971-72), Third Five-Year Plan (1975/76-1979/80), and Fourth Five-Year Plan (1981-86).

Our forth republican democratic experiment has shown various governments preparing national development agenda including: the Ghana Poverty Reduction Strategy (GPRS I) (2003 – 2005), the Growth and Poverty Reduction Strategy (GPRS II) (2006 – 2009), and currently the Ghana

Shared Growth and Development Agenda (GSGDA) (2010 – 2013). The GSGDA which is the current Government's blueprint for national development in the medium term is at its terminal year of implementation and is expected to be replaced by a successor medium term national development policy framework by 2014. The overarching goal for the Medium Term Economic Development policy framework is to achieve and sustain macroeconomic stability while placing the economy on a higher growth, achieving a per capita income of least US $3000 by 2020 and attaining the Millennium Development Goals. Therefore the need for Ghana to become an industrial country with high output growth rate and reasonable inflation rate cannot be overemphasized (GSGDA, 2010-2014).

The performance of the economy of Ghana, as measured by the rate of growth of GDP has been registering positive values since the latter part of the 1980's. For instance, the rate of growth of GDP, averaged at an annual rate of 3.5% per annum in the 1980's; 4.3% in the 1990's; 6.2% from 2000-2010 and 11.45% from 2011-2012 (Computed from the World Bank Development indicators, 1980-2012). In order to maintain this impressive trend of positive growth rates, and also achieve an accelerated growth rate which will plunge the country into the desired higher middle income status of a bench mark per capita income of $3975 that will create more employment, reduce poverty and inequalities, the macroeconomic framework must be well strengthened.

The country is therefore on the developing road and on the way to achieve the target, the understanding of fiscal and monetary policies and their effects on the macroeconomic stability is becoming significantly important to Ghanaian authorities. Furthermore, it is often argued that the more open and developed the country is, the easier the economy will be affected by distortions in international economies as government development agenda envisages export-led growth strategies which necessarily call for macroeconomic stability. This calls for the need to build effective policy instruments system to adjust the economy especially during recession.

Theory suggests that shocks in monetary policy could have influence on real GDP and inflation through different instruments; however, the detailed impact of those tools on recent Ghanaian economy has not been extensively studied quantitatively.

This creates difficulty for policy makers to manipulate the suitable policies to achieve the main objective of sustained real GDP growth and price stability. Therefore, an empirical study of the relationship between monetary policy instruments and macroeconomic variables such as real GDP and inflation is timely and necessary.

1.2 Problem Statement

Ghana has been bedeviled with a plethora of developmental challenges. For instance, despite the various economic reforms undertaken by the successive administrations in the past decades Ghanaians are on an average GNI per capita of US$ 1550 and this figure is far below the US$ 4085 upper bench mark of lower middle income economy. The situation even leaves much to be desired when compared to the US$ 12616 bench mark GNI per capita for high income countries (Atlas method, 2012).

After independence in 1957, the immediate challenge that faced the Ghanaian economy was how to accelerate economic growth in order to help reduce extreme poverty, improve health care, overcome illiteracy, strengthen democratic and political stability, improve the quality of the natural environment, diminish the incidence of crime and violence, and become an investment destination of choice for global capital. Long term broad based economic growth is essential for Ghana to increase incomes and enable her to reach her potential of becoming a significant trade and investment partner in the world (GPRS II Annual Progress Report, 2007, page, 9 -24).

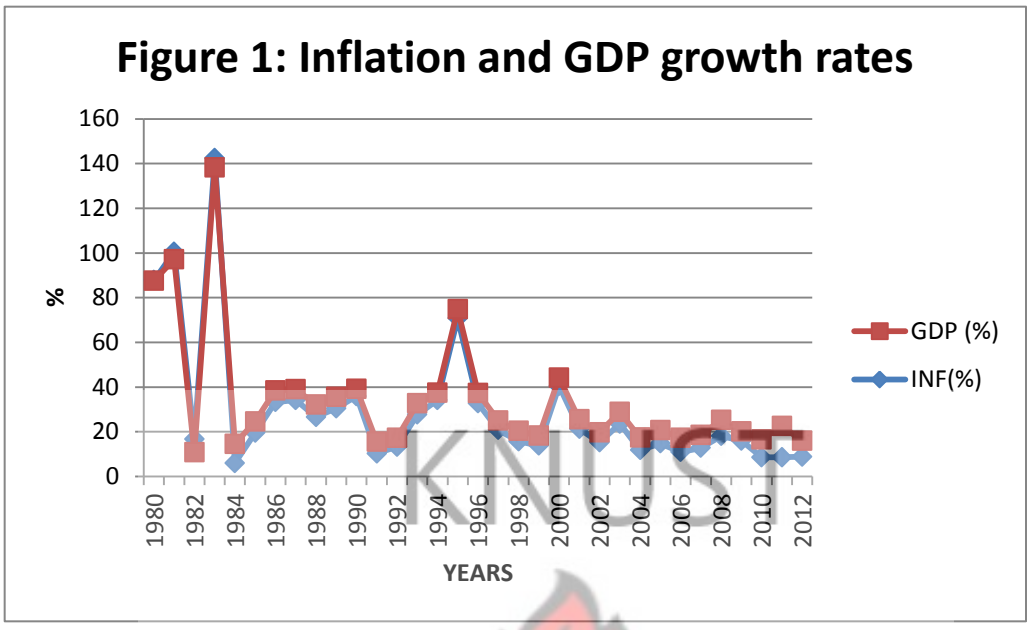
While rapid growth in China, Malaysia and India, for instance, have lifted millions beyond subsistence living, Ghana and many other African countries have, however, experienced the opposite by recording low growth rates and even in some years recorded negative growth Rates in the1970s, to the early 1990s (The Global Social Change Research Project, 2007). In 2010, Ghana launched the Shared Growth and Development Agenda Programme, with the aim of becoming an upper middle income country by the year 2020 with an average growth rate of at least 8% per annum (GSGDA Report, 2010).

The aim of the country of becoming a higher middle income earning nation by the year 2020, that is, only in six years' time to come can only be a reality if there is a high and sustainable rate of growth above 8% annually (The Coordinated Programme of Economic and Social Development Policies, 2010 – 2016, page, 4 and 5). From the early 1990s, the growth rates in Ghana have been registering positive values. The average growth rate from 1990 to 2012 was approximately 5.7% (Computed from the World Bank Development indicators, 1990-2012). However, these impressive growth records between 1990 and 2012 as compared to the earlier growth records of the Ghanaian economy in the 1960s, 1970s and 1980s, are deemed inadequate to move the economy to the targeted higher middle income (a GNI per capita income of US$12615 from the low level of US$1550 per capita in 2012) status by the year 2020. This implies that there is an urgent need to boost GDP growth in Ghana for the attainment of the international development goals.

This requires policies that can push GDP growth rates above 8% to 10% over the medium to long term, which can only be done if policy makers understand the determinants of growth, as well as how policies affect growth. Unfortunately, there have not been thorough studies on specific areas that most policies and strategies should be geared towards in order to achieve the desired rate of growth and even if there is, according to Easterly (2001), over the last decades, the issue of economic growth has attracted increasing attention and empirical research.

According to Adei (2013) Ghana is a middle income country with low income characteristics with GDP per capita of around $1,600, and increasing in real term that is not higher than the level it was in 1957 of about $400. Therefore, the need to drive Ghana's real GDP per capita growth to attain a high middle income country cannot be overemphasized.

An examination of the pattern of Ghana's growth rate reveals a wobbling swing as indicated in figure 1. The plot shows a case of macroeconomic instability associated with growth rates of GDP, ostensibly because of the swinging pattern of the rate of inflation which is a monetary policy instrument. Macroeconomic instability can be regarded as a situation of economic malaise, where the economy does not seem to have settled in steady equilibrium position, thereby making it difficult to make predictions and good planning (Azam, 2011).



Source: (World Bank Development Indicators, 2012)

The performance of the economy, as measured by the rate of growth of Gross Domestic Product (GDP), averaged at an annual rate of 3.5% in the 1980's and 4.3% per annum in the 1990s. Due to the external shocks, triggered by the decline in the world market prices of Ghana's major export commodities, cocoa and gold, GDP growth reduced from 4.4% in 1999 to 3.7% in 2000. From 2001 onwards, however, growth began to accelerate and reached a high of 7.3% in 2008, which is the second highest growth rate in the past three decades after the 8.6% recorded in 1984. In the wake of the global financial crisis and economic meltdown in 2007/2008, the real GDP growth rate declined to 4.7% in 2009. The deceleration in growth in 2009 was largely on account of stabilization measures adopted in the year to arrest fiscal and trade deficits that emerged in 2007 and 2008 with threatening consequences for macroeconomic stability.

Also, Ghana recorded a GDP growth of 8%, 14.385% and 7.1% in 2010, 2011, and 2012 respectively; averaging 9.83% for the period (Computed from the World Bank Development indicators, 1980-2012). Fiscal and monetary policies are the main instruments of achieving the macroeconomic objectives and could also trigger swings in the growth of GDP.

There is consensus among economists such as Ajayi (1974), Cardia (1991), Ajisafe and Folorunso (2002) that monetary and fiscal policies are either jointly or individually affecting the level of economic activities but the degree and relative potency of these policies has been the subject of debates and controversies between Keynesians and Monetarists.

Monetarists strongly believe that monetary policies exact greater impact on economic activities as anticipated changes in the stock of money affect output and growth. In fact, they are of the opinion that an increase in government spending would crowd out private sector and such can outweigh any short term benefits of an expansionary fiscal policy. In this regard, this study is appropriate in seeking to critically analyze how different variables of the monetary policy are manipulated to affect real GDP and inflation. It is only by studying the sources and causative factors of economic growth that policy makers can be moved to embark on the proper paths to achieve rapid, sustainable, broad-based economic growth and prosperity in Ghana, hence the need for this study.

1.3 Objectives of the Study

The General objective of the study is to estimate the responses of real GDP and inflation to monetary policy instruments shocks in Ghana.

In order to achieve this objective, the study is designed to achieve the following specific objectives:

i. To determine the relationships between the monetary policy instruments, real GDP and inflation in Ghana

ii. To examine the effectiveness of the various monetary policy instruments used by the Bank of Ghana.

iii. To estimate the impact of monetary policy instruments shocks on real GDP and inflation in Ghana.

1.4 Research Hypotheses

In examining the relationships between real GDP, inflation and monetary policy instruments, the following four hypotheses are stated for testing:

Hypothesis 1

Broad money supply has a significant impact on real GDP and inflation.

Hypothesis 2

Lending rate (a derivative of the BoG's prime rate) has a significant impact on real GDP and inflation.

Hypothesis 3

Domestic credit (a derivative of the BoG's reserve requirement) has a significant impact on real GDP and inflation.

Hypothesis 4

Real Effective Exchange rate has a significant impact on real GDP and inflation.

1.5 Data Sources and Scope of the Study

The data used in the empirical analysis were mainly secondary data collected from the period, 1980 to 2012 consisting of 32 annually observations for each variable. The data on the variables were obtained from the World Bank Development Indicators, the IMF's International Financial Statistics, The Ghana Statistical Service and the Bank of Ghana. The data set contain the following variables: Real Gross Domestic product, Inflation, broad money supply, lending rate domestic credit and real effective exchange rate.

1.6 Significance of the study

Monetary policy is a powerful tool for impacting the economy; therefore, it is crucial to have a good understanding of the channels through which monetary policy is transmitted.

Theory indicates that an increase in the money supply should lead to an increasing price level and may potentially increase real GDP. This can occur through a variety of channels including the interest rate channels, the credit channel, the exchange rate channel and the asset price channel (Mishkin, 2006).

Essentially, for the monetary transmission mechanism to be used in a more helpful way in formulating and implementing monetary policy, an empirical study of this kind is timely and useful in seeking to reveal monetary policy implications for Ghana, such as whether monetary policy should target real GDP or inflation.

1.7 Organization of the study

The study consists of six chapters: chapter one comprises the background of the study, statement of the problem, objectives of the study, research questions, hypotheses of the study, scope of the study, significance of the study, and organization of the study. Chapter two presents a review of theoretical and empirical literature on relationship between output and monetary policy instruments shocks. Chapter three is devoted to discussing monetary policy instruments and macroeconomic developments in Ghana. Chapter four presents the research methodology. It delineates the sources of data and the empirical design including model specification. The empirical results, analysis and discussions of the findings are presented in chapter five. Chapter six is the concluding chapter of the study. It enumerates the main findings of the study and discusses policy lessons which emanate from the findings.

CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction

In this chapter, the study dwells on the reviewed literature on the effects of monetary policy instruments shocks on GDP and inflation. It is presented in two main sections: the first section presents a theoretical or conceptual review of monetary transmission mechanism. The second section presents a review of empirical studies already done on the subject. Researchers to a large extent have focused on studying the interactions between monetary policy instruments shocks and output in different countries with wide spread econometric methods. However, little has been conducted in Ghana and this study seeks to analyze specifically the effects of monetary shocks on real output and inflation due to the increased focus for Ghana to attain a high level middle income status.

2.1 Theoretical Literature Review

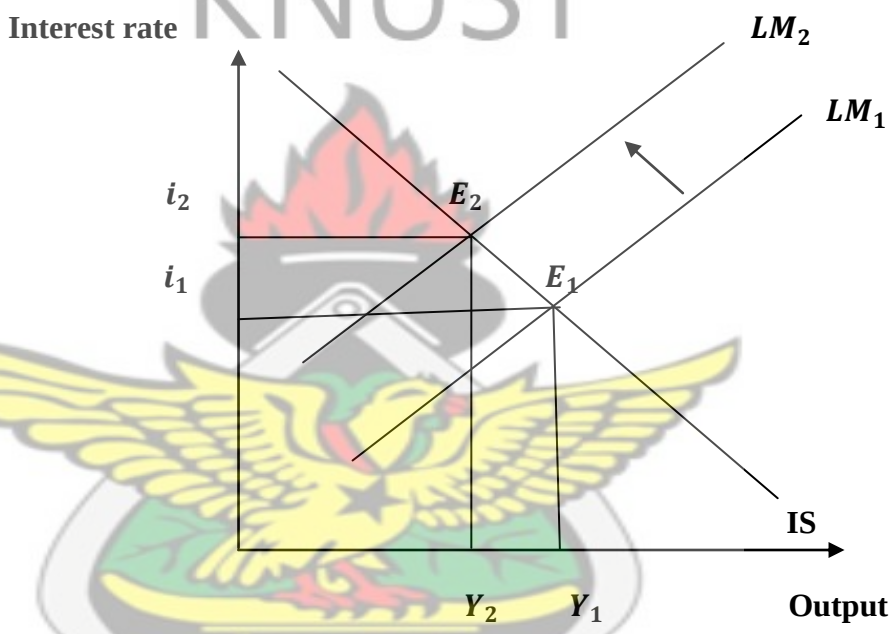
2.1.1 Traditional Keynesian IS/LM Relationship

The relationship between interest rate and output has been discovered and expatiated very clearly in the traditional IS-LM model. The IS-LM model could be viewed as showing what causes income to change in the short run when the price level is fixed or as a model showing what causes the aggregate demand curve to shift. IS stands for 'Investment' and 'Savings 'and it represents what is going on in the market for goods and services. LM stands for 'Liquidity' and 'Money' and the LM curve represents what is happening to the demand and supply of money. Because interest rate influences both investment and money demand, it is a variable that links the two halves of the IS-LM model, Mankiw (2006). Given that the Central Bank is following a contractionary monetary policy by reducing the money supply, the real money balance, M/P will then decrease (the price level, P, is exogenous and is unchanged in the short run). This triggers the LM curve to decrease, as seen in figure 2 from LM_1 to LM_2. The implication is the quantity demanded of money exceeding the quantity supplied.

That is, individuals try to obtain money by selling bonds or making bank withdrawals. To attract, now- scarcer funds, banks and bonds issuers respond by increasing the interest rates they offer (from i_1 to i_2 in figure 2) .

This in turn raises the capital cost for production, hence results in a reduction in investment and net exports. The new equilibrium in the IS-LM model will move along the IS curve from E_1 to E_2 showing a decline in output from Y_1 to Y_2 in figure two below.

Figure 2a: IS-LM Curve



The traditional Keynesian view of how a monetary tightening is transmitted to the real economy has been postulated by Mishkin (1995, Pp. 4) in the following schemata as:

"M*s* ↓⟹ i↑⟹ I↓⟹ Y↓".

Where (M*s* ↓) indicates a contractionary monetary policy leading to a rise in real interest rate (i↑) , which in turn raises the cost of capital , thereby causing a decline in investment spending (I↓) , thereby leading to a decline in aggregate demand and a fall in output (Y↓). Besides business investment spending, further studies have it that a fall in investment could also be understood as a postponement in consumers' residential housing and consumer durable expenditure. Studies conducted by Mankiw (1893) and Mankiw (1987) confirm that an increase in the interest rate reduces consumption of non- durables, services and the stock of durables.

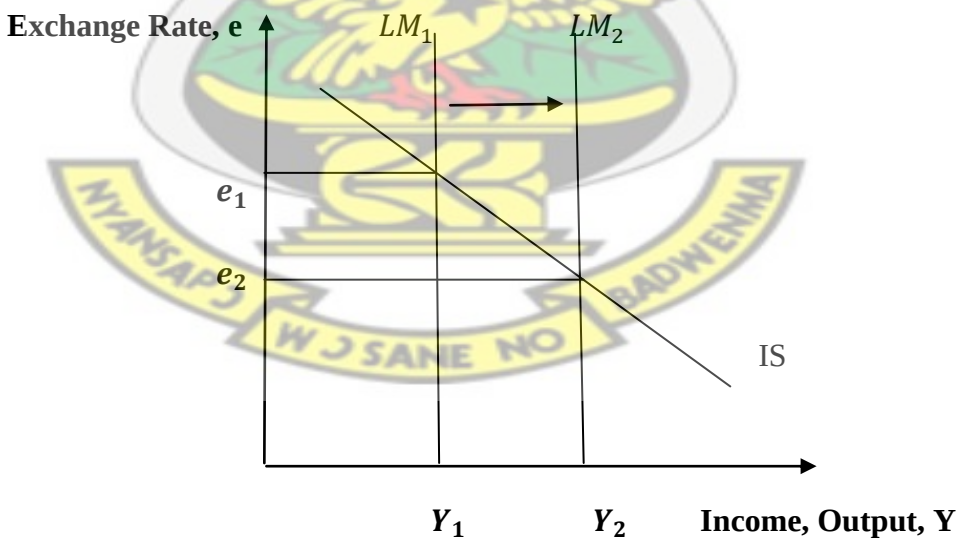
2.1.2 The Mundell—Fleming Model

The Mundell—Fleming model is an open-economy version of the IS-LM model. The Mundell—Fleming model extends the explanation of response of output to monetary policy shocks for an open economy with perfect capital mobility. Suppose that the Central Bank increases the money supply. Because the price level is fixed, the increase in money supply means an increase in real money balances. The increase in the real money balances shifts the LM^* to the right, as in figure 2b below from LM_1 to LM_2. The increase in the money supply raises income and lowers the exchange rate.

In a small open- economy, the interest rate is fixed by World interest rate (r^*). As a result, capital flows out of the economy as investors seek a higher return elsewhere. Further, an increase in the amount of investment to other countries increases the supply of the domestic currency in the market for foreign-currency exchange, the exchange rate depreciates.

The fall in the exchange rate from $e_1$to e_2 makes domestic goods inexpensive relative to foreign goods and therefore stimulates net-exports and increase output from Y_1 to Y_2, Mankiw (2006).

Figure 2b: The Mundell—Fleming Model



2.1.3 Tobin's q theory

Tobin's q theory of investment gives another systematic formal account of the link between stock prices and business investment and then to output. Tobin (1969), denoted "q" as the ratio of market value of installed capital to its replacement cost i.e. q = market value of installed capital/replacement cost of installed capital. The market value of installed capital is priced in the stock market and is the number of shares outstanding times their market price. The replacement cost of installed capital depends on the situation in the capital goods sector. If the demand for capital goods is strong, the price of capital will rise. When the interest rate 'r' increases, the opportunity cost of holding a share increases, which makes shares become relatively less attractive than bonds.

Consequently, financial investors will sell off their shares of the firm to buy bonds and the market value of shares will drop. The decrease in the share price leads to a decline in 'q' which also equal to the fact that the marginal benefit from investment (i.e. the gain 'q' in the value of shares resulting from the installation of an extra unit of capital) will also reduce. At the optimal level of investment, the marginal dividend forgone is just compensated by the extra capital gain on shares. Clearly, the lower the market valuation 'q' of an extra unit of capital, the lower chance the firm can push its level of investment before the marginal installation cost reaches the threshold where the shareholder's additional capital gain is offset by the extra dividend forgone. Therefore, firms may not purchase new investment goods when the value of 'q' is low so that investment will decrease causing output to fall. (Tobin, 1969)

According to Mishkin (1996), when money supply rises, individuals finds that it has more money than it wants and so tries to reduce the holdings of money by increasing their spending. The individuals can spend money in the stock market, increasing the demand for equities and consequently raising their prices. The Keynesian analysis comes to a similar conclusion because it sees the fall in interest rates stemming from expansionary monetary policy making bonds less attractive relative to equities, thereby causing the price to rise. A higher equity prices ($P_e \uparrow$) will lead to a higher q ($q \uparrow$) and thus lead to a higher investment spending ($I \uparrow$). A higher investment spending increases output. This analysis can be presented in the following transmission mechanism: M$s \uparrow \Rightarrow P_e \uparrow \Rightarrow q \uparrow \Rightarrow I \uparrow \Rightarrow Y \uparrow$, Mishkin (1996).

2.1.4 Monetary Transmission Channels

Monetary transmission is defined as "the route by which monetary policy is translated into changes in output, employment, prices and inflation" (Samuelson and Nordhaus 2010, pp. 211).

Specific channels of monetary transmission operate through the effects that monetary policy has on interest rates, exchange rates, equity and real estate prices, bank lending and firm balance sheet (Ireland 2008).

Monetary policy got its root from the works of Irving fisher who laid the foundation of monetary policy in the quantity theory of money through his equation of exchange, (Diamond, 2003). In his proposition, money has no effect on economic aggregates but price. However, the role of money in an economy got further elucidation from (Keynes, 1930) and other Cambridge economists who proposed that money has indirect effect on other economic variables by influencing the interest rate which affects investment and cash holding of economic agents. The position of Keynes is that unemployment arises from inadequate aggregate demand which can be increased by increase in money supply which generates increase spending, increase employment and economic growth. However, he recommends a proper blend of monetary and fiscal policies as at some occasions, monetary policy could fail to achieve its objective. The role of monetary policy which is of course influencing the volume, cost and direction of money supply was effectively conversed by Friedman, (1968).

Friedman's position is that inflation is always and everywhere a monetary phenomenon while recognizing in the short run that increase in money supply can reduce unemployment but can also create inflation and so the monetary authorities should increase money supply with caution.

Monetary policy is considered to be an important policy of every economy, which is one of the two main tools of government intervention to the economy as the "visible hand". It is widely accepted that monetary policy's main goals are economic growth, price stability and low rate of unemployment. Even though, sometimes it is considered as the machine "for doing quickly and commodiously what would be done, though less quickly and commodiously without it" but it is an extremely efficient machine with special features; it only exerts a distant and independent influence of its own when it gets out of order" (Mills,1929).

Monetary policy can help in preventing the economic disturbance from money itself and other sources as well as providing a stable economic background (Friedman, 1968. Pp. 12). According to Friedman, " the most appealing guides for monetary policy are exchange rates, the price level as defined by some index, and the quantity of a monetary total—currency plus adjusted demand deposits, or this total plus commercial bank time deposits or a still broader total" (Friedman, 1968).

Theoretically, monetary policy can influence the economy through such channels as exchange rate channel, credit channel, interest rate channel and money supply channel as underlined in the following sections.

The Money Supply Channel

In contrast with the Keynesian interest rate view which posits that a policy-induced increase in the short-term nominal interest rate leads first to an increase in longer-term nominal interest rates, as investors act to arbitrage away differences in risk-adjusted expected returns on debt instruments of various maturities. When nominal prices are slow to adjust, these movements in nominal interest rates translate into movements in real interest rates as well. Firms, finding that their real cost of borrowing over all horizons has increased, cut back on their investment expenditures. Likewise, households facing higher real borrowing costs scale back on their purchases of homes, automobiles, and other durable goods. Aggregate output and employment fall. Friedman (1956) and Friedman and Schwartz (1963) argue that the price level reflects money market conditions. They argue that money supply is under the control of the authorities (hence exogenous). On the other hand, money demand can be expressed as a simple multiplicative relation between nominal income and social and instructional factors that can be proxied by a constant. Given money market equilibrium, a reduction in the stock of money reduces aggregate demand and prices.

Friedman and Schwartz (1963) found that income expansions/contractions were always preceded by expansions/contractions in the money supply.

One of their more celebrated hypotheses was that the Great Depression of the 1930s was not the result of insufficient aggregate demand but rather that it resulted from a fall in the supply of money, the result of a misconceived contractionary Federal Reserve monetary policy compounded by the waves of bank failures during the period and a subsequent failure of the Federal Reserve to react appropriately. This reasoning challenges a Keynes' suggestion that money does not matter, and implies that monetary authorities could achieve price stability by controlling the growth in money supply. While the Keynesian view is that a shock to short-term real interest rates (e.g., a Bank rate change) could be more effective in achieving policy objectives, the standard monetarist view is that manipulations in the level of money supply (e.g. through open market operations) could be more ideal. Friedman and Meiselman (1963) compared the explanatory power of autonomous investment and money supply in their study and, indeed, found that money supply did better. Monetarist arguments are central to the conduct of monetary policy by the European central bank as well as the policy prescriptions of the International Monetary Fund.

These arguments also significantly influence the day-to-day conduct of monetary policy in Ghana. Subsequent monetarist propositions of the transmission mechanism typically centre on the criticism that, by focusing on one asset price (i.e., interest rates), the traditional interest rate channel ignores other asset prices through which monetary policy shocks can be transmitted in the economy, such as exchange rate and equity prices. This view has been a standard feature in the traditional Keynesian model. (Friedman and Meiselman, 1963). The mechanism can be traced by using the following schemata (Mishkin, 1995):

$$\mathbf{M}s \downarrow \Rightarrow \quad \mathbf{r} \uparrow \Rightarrow \quad \mathbf{I} \downarrow \Rightarrow \quad \mathbf{Y} \downarrow .$$

This diagram states that a contractionary monetary policy (M*s* ↓) leads to a rise in real interest rate (r↑), which raises the cost of capital, thereby causing a decline in investment goods (I↓). Further, this leads to a decline in aggregate demand and hence, a fall in output (Y↓).

The Interest Rate Channel

According to the traditional Keynesian interest rate channel, a policy induced increase in the short term nominal interest rate(e.g. a rise in the bank rate) leads first to an increase in longer term nominal interest rates, as investors act to arbitrage away differences in risk adjusted expected returns on debt instruments of various maturities.

When nominal prices are slow to adjust, these movements in nominal interest rates translate into movements in real interest rates as well. Firms, finding that their real cost of borrowing over all horizons has increased, cut back on their investment expenditures. Likewise, households facing higher real borrowing costs scale back on their purchases of homes, automobiles, and other durable goods. Aggregate output and employment fall.

Bernanke and Gertler (1995) recognizes two short comings of this view. First, there is lack of compelling empirical evidence if not few and weak to suggest that supposedly interest sensitive component of aggregate spending are indeed sensitive to the cost of capital.

Secondly, that monetary policy is presumed to exert large effects on short term interest rate example federal funds rate but contrary to this view, it is recognize that monetary policy exerts large effects on purchase of long-lived assets such as housing or production equipment which should be more responsive to real long term rates than real short-term rates.

Taylor (1995), develops a model that shows how monetary policy affects real short-term and real long-term interest rates, hence real investment, real consumption and real output. He maintains that the links of monetary transmission actually form a circle, with the circle being closed by linking the movements in real GDP and inflation and the short term interest rate. In his explanation the change in the short term interest rate has an impact on both the exchange rate and the long term interest rate; however, the short term interest rate is not the only factor affecting the exchange rate and the long term interest rate over time. As a result of rigidities in the economy (example stickiness in price), the changes in the nominal interest rate (both long-term and short-term rates) and nominal exchange rate will trigger movements in real exchange rate and real interest rates.

The changes in the real variables will then affect real consumption, real investment and real net exports which are components GDP, hence leads to change in real GDP. When the prices of goods and wages are not rigid, the value of the real variables (example, real GDP) in the long run will normalize. In turn, the change in real GDP and inflation will also have effect on the short rate. In the case of zero nominal interest rate, a decrease in real interest rate still can stimulate the economy by the expected price level and expected inflation. An expansion in the broad money makes the expected price level and thereby the expected inflation goes up. (Taylor, 1995)

As the result, the real interest rate decrease and investment, net export and hence output all increase. It is described as in the following notation:

$MS\uparrow \rightarrow P^e\uparrow \rightarrow \pi^e\uparrow \rightarrow r\downarrow \rightarrow I\uparrow$, $NX\uparrow \rightarrow Y\uparrow$.

Where MS is money supply, P^e and π^e are expectations of price level and inflation, r is interest rate, I is investment expenditure, NX is net export and Y is output. Taylor concludes that there is strong evidence of interest rate as a strong monetary channel that affects output.

The Domestic Credit Channel

This channel may be perceived as "a set of factors that amplify and propagate conventional interest rate effects" (Bernanke and Gertler (1995). Mishkin (1996), demonstrated that are three reasons expounding the significance of credit channels to the economy. Firstly, the effect of credit market imperfection to the firm's decision on input and output, such as the number of workers and machines, is widely accepted. Secondly, that there is evidence that small firms which are faced with credit constraint are more hurt by monetary policy than large firms. Finally, Mishkin maintains that asymmetric information view of imperfections in the credit market helps in clarifying some important phenomena in economics.

Bernanke and Gertler (1995) in their research likened the monetary policy transmission to a "black box" and due to the dissatisfaction with lack of empirical proof of interest rate channel effects, they suggested that credit channel has its own role in explaining the effects of monetary policy on an economy and using the complementary movement in the external finance premium along with interest rate may help bring a better explanation.

This credit account for the agency problems of asymmetric information and costly enforcement of contracts arise in the financial market and is divided into two possible linkages: The balance sheet channel and bank lending channel.

The bank lending channel focuses on the effects of monetary policy through the supply of loans to the bank. The bank lending channel is based on the view that banks play a special role in the financial system because they are especially well suited to solve asymmetric information problems in credit markets. An expansionary monetary policy, which increases bank reserves and bank deposits, increases the quantity of bank loans available. This will result in an increase in loans. Investment and consumer spending will then rise and result in a rise in output. Schematically, the monetary policy effect is as follows:

MS↑⇒bank deposits↑ ⇒bank loans↑ ⇒I↑⇒ Y↑

The balance sheet channel (the net worth) explains the effects of monetary policy to the economy base on the change in borrowers' balance sheets and income statements. The balance sheet channel is affected in different ways. A contractionary monetary policy induces a decline in money supply and may account for a decline in equity prices (P^e). This lowers net worth, which means that lenders in effect have less collateral for their loans, raises the problems of moral hazard and adverse selection. Adverse selection occurs because a decline in the net worth will lower value of collateral for lenders' loans and they suffer from higher loses. Lower net worth of business firms also increase the moral hazard problem it means that owners have lower equity value in their firms and they may have more incentive to invest in riskier portfolios and loans are more likely to be defaulted. In that case, a decrease in business firms' net worth might occasion a decline in lending and for that matter in investment spending. Since investment is a constituent of output or aggregate demand, it will also decrease as well. (Bernanke and Gertler, 1995)

Mishkin (1995), explains that monetary policy can affect firms' balance sheet in several ways. Contractionary monetary policy (Ms ↓), which causes a decline in equity prices (P^e ↓) lowers the net worth of firms; this results in a decline in lending and so leads to lower investment spending (I ↓) and aggregate demand (Y↓) because of the increase in adverse selection and moral hazard problems.

This leads to the following schemata for the balance sheet channel of monetary transmission:

$M_s \downarrow \Longrightarrow$ pe $\downarrow \Rightarrow$ adverse selection$\uparrow$ and moral hazard $\uparrow \Rightarrow$lending$\downarrow \Longrightarrow$ I $\downarrow \Longrightarrow$ Y$\downarrow$.

In an addition, a contractionary policy may also push interest rates which results in deterioration of firms' balance sheet because it induces higher interest rate and hence an increase in the chance of adverse selection and moral hazard problem. Stiglitz and Weiss (1981) called this phenomenon "credit rationing" where firms who are willing to pay the highest interest rate are those who have the riskiest investment. This change builds up a financial pressure that accounts for the drop in investment and consequently leads to the fall in output. This leads to the following schematic notation for the balance sheet channel. (Mishkin 1995).

MS$\downarrow \Longrightarrow$ i$\uparrow \Longrightarrow$ cash flow$\downarrow \Longrightarrow$ adverse selection and moral hazard$\uparrow \Longrightarrow$lending$\downarrow \Longrightarrow$ I$\downarrow \Longrightarrow$Y$\downarrow$

A third balance sheet channel operates through monetary policy effects on the general price level. A money supply expansion may cause an unanticipated rise in the price level because of nominal price rigidity in contracts. (i.e. debt payment are contractually fixed in nominal terms). This results in an upsurge in the real net worth which lowers the problem of adverse selection and moral hazard, thereby leading to a rise in investment spending and aggregate output. This process is summarized schematically by Mishkin (1995) as follows:

MS$\uparrow \Longrightarrow$Unanticipated P$\uparrow \Longrightarrow$adverse selection and moral hazard$\downarrow \Longrightarrow$ lending$\uparrow \Longrightarrow$ I $\uparrow \Longrightarrow$ Y$\uparrow$.

Bernanke and Gertler (1995) describe a broader credit channel; the credit channel reflects efforts to explore whether credit market frictions could explain the effectiveness of the transmission mechanism. The general argument is that the effect of monetary policy on interest rates is amplified by endogenous changes in the so-called external finance premium (i.e., the wedge between the costs of externally-raised and internally-raised investment funds). The size of this premium is a reflection of market imperfections, and a change in market interest rates due to monetary policy is positively related to a change in the premium, hence credit conditions, money supply, prices and output.

Bernanke and Gertler describe this in two possible ways: the balance sheet channel and the bank lending channel. The balance sheet channel argues that tight monetary policy directly weakens borrowers' balance sheets, lowers their collateral for loans and credit-worthiness, and increases

their external finance premium. Lower net worth for borrowers increases both adverse selection and moral hazard problems, leading to a decline in lending for investment spending.

The bank lending channel posits that a disruption in the supply of bank loans resulting from tight monetary policy makes loan-dependent small and medium firms incur costs associated with finding new lenders (Ehrmannn & Worms, 2001). This directly increases their external finance premium, lowers the levels of their borrowing, and reduces real economic activity.

Furthermore, Bernanke and Gertler (1995) and Mishkin (1995) explain how the credit channel operates on consumer expenditure on durable goods and housing. Suppose authorities maintain a tight monetary policy. This may lead to lower equity prices and possibility of plunging consumers into financial distress (i.e. their financial assets such as stocks and bonds prices are lower) and it is likely that they may prefer holding fewer illiquid assets and more liquid assets. The result is a decline in the consumption of durable goods and housing and in turn a fall in aggregate output.

Conversely, where the financial position of consumers is high, they will be willing to increase their expenditure on durables or housing. When the prices of stocks increases , there will be an increase in the value of financial assets as well; consumers expenditure on durables will also increase because they have a more secured financial stance and lower possibility of suffering a financial distress and this will in turn cause increase in output. The process is summarized by Mishkin (1995) as follows:

MS↑⟹ Pe↑⟹ financial assets↑⟹ likelihood of financial distress↓⟹consumer durables and housing expenditure↑⟹ Y↑

The Exchange Rate Channel

The exchange rate channel captures the international effect of domestic monetary policy, especially after financial liberalization (Taylor, 1995). Therefore to an open economy, net export is impacted by the exchange rate and so one channel through which monetary policy can influence the economy is through the exchange rate channel.

Assuming flexible exchange rates, a rise in domestic real interest rates reflective of tightened monetary policy makes deposits denominated in domestic currency more attractive than those denominated in foreign currency. The increase in net capital inflows resulting from the high real interest rate differential leads to domestic currency appreciation.

The appreciation of the domestic currency makes domestic commodities relatively more expensive than foreign commodities; hence there will fall in exports, export-oriented investment and aggregate output. Furthermore, the appreciation of the domestic currency makes imports competitive in the domestic economy. Consequently, net export will decline causing a fall in aggregate output.

Conversely, an expansionary monetary policy (MS↑) will lead to a fall in domestic interest rates (ir↓). Deposits denominated in domestic currency become less attractive to deposits denominated in foreign currencies. This leads to a fall in the value of the domestic currency relative to other foreign currency deposits, and this amounts to depreciation of the domestic currency (E↓). This makes domestic commodities become relatively cheaper to foreign commodities, thereby causing a rise in net export (NX↑) and a resultant increase in aggregate output (Y↑). (Mishkin,1996). The relationship is schematically summarized as:

MS↑⇒ir↓⇒E↓⇒NX↑⇒ Y↑

A research from International Monetary Fund by Ghosh et al (1996) on 145 countries during 30 years considering the effect of different exchange rate regime to macroeconomic performance gives the conclusion that countries with fixed exchange rate regime can achieve lower inflation rate by increasing the currency's confidence and bringing higher policy discipline. A pegged exchange rate regime, therefore, is considered to be an anti inflationary tool but equally, output growth and employment are at risk of higher volatility.

In Radzyner and Riesinger (1997) point of view, a pegged or fluctuation with narrow bands exchange rate reduce the possibility of using exchange rate as an effective monetary policy instruments. They also suggested that Central bank should be allowed to create monetary policy autonomously independent with the Government.

When it comes to macroeconomics view, it seems to be a trade-off between low inflation rate and high output growth as evidences show that countries with fixed exchange rate are likely to achieve lower economic growth than countries that allow exchange rate to fluctuate with less control. This is due to the effect of exchange rate on investment and productivity.

On one hand, a country that follows a fixed exchange rate regime was able to have higher investment by reducing the uncertainties in policy making process and bringing lower interest rate. On the other hand, it might achieve a lower rate of productivity growth due to the misallocation of resources, in case the exchange rate fixed is the wrong one. In other way, countries that allow the exchange rate to fluctuate will catch up better with the true price in the exchange rate market, which help to reduce price distortion and make a better resources allocation. In brief, considering both effects, a conclusion is drawn that growing pace is often higher in countries with floating exchange rate regime, Ghosh et al (1996).

2.2 Empirical Literature from Developed, Developing and other Emerging Economies

In connection with the above discussions, numerous researches have been conducted to examine the relationship that exists between monetary policy instruments and macroeconomic variables in both developed and developing countries. In this review, past and existing studies have been grouped under the money supply, credit, interest rate and exchange rate channels.

2.2.1 Studies on the Money Supply Channel

Morsink and Bayoumi (2001) used VAR models with quarterly, seasonally-adjusted data from 1980 Q1 to 1998 Q3, using two lags to analyze the effect of monetary shocks on the Japanese economy. In their basic model, they use economic activity, prices, interest rates, and broad money. They find that both the interest rate and broad money significantly affect output. Then, after examining the basic model, they extend the VAR to include different channels of the monetary transmission mechanism and conclude that both monetary policy and banks' balance sheets are important sources of shocks to output, that banks play a crucial role in transmitting monetary shocks to economic activity, and that business investment is especially sensitive to monetary shocks.

Disyatat and Vongsinsirikul (2003) also used the VAR approach with quarterly, seasonally-adjusted data from 1993Q1 to 2001Q4 with two lags to analyze the monetary transmission mechanism in Thailand. Their basic model includes real output, the price level, and the fourteen-day repurchase rate, which they assume to be the measure of monetary policy. They find that tightening monetary policy leads to a decrease in output, which bottoms out after around 4–5 quarters and dissipates after approximately eleven quarters. The aggregate price level initially responds very little, but ultimately starts to decline after about a year. Investment appears to be the most sensitive component of gross domestic product (GDP) to monetary policy shocks. Their findings were consistent with those of other countries and with what monetary theory suggests.

Al-Rajoub (2004) examined the output effect of monetary policy in Jordan. The result showed that each time series explained the preponderance of its own past values. M2 explains 85 % of its forecast error variance; industrial production index explains 15.2% of the forecast error variance in 2 periods, whereas the money supply explains 7% of the forecast error variance of industrial index.

Lozano (2008) developed a Vector Error Correction (VEC) model with quarterly data spanning from 1981:1 to 2007:4 to examine the relationship between budget deficit, money growth and inflation in Columbia. The results affirmed a close long term relationship between inflation and money supply with 1% increase in the fiscal deficit (as a share of GDP) leading to an increase of almost 0.46% increase in M1 money growth rate.

Chimobi and Uche (2010) examined the relationship between money, inflation and output in Nigeria for the period 1970 – 2005. The study adopted co-integration and granger causality test analysis. The cointegration analysis of the study showed that the variables used in the model exhibited no long run relationship among each other. Nonetheless, money supply was observed to granger cause both output and inflation. The indication from this study is that monetary stability can cause price stability in the Nigerian economy since variation in price level is caused by money supply and concluded that inflation in Nigeria is to an extent a monetary phenomenon.

Majid (2007) study the causality relationship between monetary aggregates, output and prices in the case of Malaysia.

The results indicate a bi-directional causality running between monetary aggregates, M2 and M3 and output, whereas there is a unidirectional causality running from monetary aggregate, M1 and output.

Abdul Qayyum (2006) conducted an investigation in the relationship between money, inflation and growth in Pakistan for the period 1960-2005. The results from the correlation analysis indicate that there is strong relationship between money and inflation. The correlation coefficient between money growth and current real GDP was found to be 0.226 and 0.069 for previous year's money growth and current year's real GDP growth. The results lead to the conclusion that money growth will at first have impact on real GDP growth and subsequently influence inflation in Pakistan.

Onyeiwu (2012) tested the impact of monetary policy on the Nigerian economy using ordinary least squares method (OLS) to examine the data from 1981 to 2008. The study found that monetary policy presented by money supply exerts a positive impact on GDP growth and balance of payment (BOP) but negative impact on the rate of inflation. In addition, the study supports the money-price-output causality hypothesis for Nigeria.

Fatima and Iqbal (2003) examined the relative impact of monetary and fiscal policies on the economic growth in five Asian countries: Pakistan, India, Thailand, Indonesia, and Malaysia. The results showed a binary causal trend between fiscal policy and economic growth, as well as between monetary policy and economic growth for Thailand. In the case of Indonesia, the causal direction was single from the monetary policy to economic growth and fiscal policy to economic growth. The estimated results for Malaysia showed a single causal direction of policy variables to economic growth. In the case of Pakistan, it found that the monetary policy has an impact on economic growth. As for India, the study showed a single causal direction of monetary policy to economic growth.

2.2.2 Studies on the Credit Channel

A lot of evidence in support of the bank lending channel has also been adduced. Gerlack and Smets (1995) examined the monetary policy transmission mechanism in the G-7 countries using a quarterly data set spanning from 1979:1 to 1993:4.

The study employed the structural VAR (S-VAR) methodology. They argued that in order to enhance the comparability of the results across countries, the short-term interest rates were used as a proxy of monetary policy stance. The results showed slight variations across countries. Their point estimates suggested that the output effects of a monetary policy tightening were smallest in France and Italy; and largest in Canada , Germany and the United States; however, the effects in Japan and the United Kingdom fell somewhere between the two groups above.

Gertler and Gilchrist (1994 and 1991) supports the view of the credit channel and argued that small business experience decline in loan facility during tight monetary policy and they are affected more adversely by changes in bank related aggregates like broad money supply. In their view, small firms are particularly sensitive to macroeconomic disturbances including shifts in monetary policy. They observed that following tight monetary policy, small firms' sales decline at a faster pace than large firms and that bank lending to small firms contrasts whilst it rises for large firms. Their results suggested macroeconomics relevance of credit market imperfections.

Kim (1999) in an empirical study examined whether the credit channel is key monetary transmission mechanism in Korea. The study employed two empirical tests for identifying distinctive lending channel: the narrative approach and VAR approach from 1993 to 1998. The paper found convincing evidence of the practical importance of the credit channel in the aftermath of the Korean financial crisis.

Bacchetta and Ballabriga(2000) examined the role of the credit channel for 13 European countries using a Vector Autoregression (VAR) with six variables: the federal funds rate, the unemployment rate, the consumer price index, bank deposits, bank loans and bank holdings of securities. The study found that for most countries bank loans decline more than money in the medium run. In the short run, however, loans are sticky and react less than money. Also, loans and output response to an increase in interest rate tend to be more synchronized than those of money and output. This evidence is thus consistent with broad credit channel of monetary policy.

Bogunjoko (1997) examined the efficacy of monetary policy as a stabilization tool, using modified St. Louis model to take account of the peculiarity of the Nigeria economy.

Using an error correction model and data covering the period 1970 to 1993; the study found that money matters in Nigeria economy and the appropriate monetary target is the domestic credit of the banking sector.

Ludke (2000) investigated the credit channel of monetary policy transmission in Germany and the United Kingdom by employing the Vector Autoregression (VAR) from 1989:2 to 1998:12. The results revealed that the overall effect on loans to company sector and real activity in Germany seems not to be significantly different from that in the United Kingdom. The impact on bank lending was found to be relatively small in Germany. By contrast, a rise in official interest rates in the United Kingdom is almost immediately passed on to clients.

2.2.3 Studies on the Interest Rate Channel

With regards to the interest rate channel, a chunk of researchers have found mild evidence of the quantitative effect of it. Cheng (2006) examines the impact of a monetary policy shock on output, prices, and the nominal effective exchange rate for Kenya using data during 1997–2005. The study employed the Vector Autoregression (VAR) analysis in the study. The main results suggest that an exogenous increase in the short-term interest rate tends to be followed by a decline in prices and appreciation in the nominal exchange rate, but has insignificant impact on output. Moreover, the paper finds that variations in the short-term interest rate account for significant fluctuations in the nominal exchange rate and prices, while accounting little for output fluctuations.

Ganev et al (2002) investigated the effects of monetary policy shocks in ten Central and Eastern European (CEE) countries. A series of Granger- Causality test and impulse response analysis were carried out to assess the strength of interest rate and exchange channels for the period 1995-2000. The study found no evidence in support of interest rates effects on output; however, it found some indication that change in the exchange rates have effects on output.

Starr (2005) examined the effectiveness of monetary policy on output and prices in five commonwealth independent states (CIS). Using an SVAR model with orthogonalised identification found little evidence of real effects of monetary policy with notable exception that interest rates have a significant impact on output in Russia.

Rafiq and Mallick (2007) examines the effects of monetary policy shocks on output in the three largest euro area economies – Germany, France and Italy (EMU3) – by applying a new VAR identification procedure.

The results show that monetary policy innovations are at their most potent in Germany. However, apart from Germany, it remains ambiguous as to whether a rise in interest rates concludes with a fall in output, showing a lack of homogeneity in the responses. Homogeneity in response to a monetary shock is crucial in a one-size-fits-all framework. Nonetheless, the lack of similarity between the responses, which is hypothesized to cause de-synchronized business cycles in optimal currency area literature, is often based on the premise that monetary policy itself is a major source of business cycle fluctuations. This paper concludes that monetary policy innovations play, at most, modest role in generating fluctuations in output for the EMU3. Consequently, it is less important whether the effects of monetary policy are homogenous.

Romer and Romer (1994) analyses the contribution of monetary and fiscal policy to post war economic recoveries in their paper "What ends Recession?". They suggested in their finding a significant negative response of real aggregate output to changes in federal funds rate in US after the war.

The observations above have convinced many researchers for example Bernanke and Gertler (1995. Pp 28) to suggest that other mechanism rather than interest rate may also be the transmission of monetary policy and they consider the credit channel among others to be an important monetary transmission mechanism.

2.2.4 Studies on the Exchange Rate Channel

The researches on the effects of exchange rate on output have also produced different results. In Singapore, Hwee (2004) uses the real effective exchange rate as a measure for monetary policy and finds that output reacts immediately and significantly to a contractionary monetary policy shock. He also finds that the exchange rate channel was more effective in transmitting monetary policy to the economy than was the interest rate channel.

Adebiyi (2006) examined financial sector reforms and the transmission mechanism of monetary policy in Nigeria. The study employed the Vector Auto regression (VAR) and Error Correction Mechanism (ECM) models with quarterly time series data from 1986:1 to 2002:4. Unit root and cointegration tests were also carried out. The study revealed that the real deposit rate and inflation rate are significant for the growth of the manufacturing sub-sector in Nigeria. Furthermore, the study uncovered that the predominant sources of fluctuation in the index of manufacturing production are due largely to own shock and to a lesser extent, to real deposit rate. Again, the study showed that in the long run the index of manufacturing production is insensitive to inflation rate, commercial banks' credit to the manufacturing sector, interest rate spread and exchange rate.

Folawewo and Osinubi (2006) examined the efficacy of monetary policy in controlling inflation rate and exchange rate instability, the analysis performed was based on a rational expectation framework that incorporates the fiscal role of exchange rate using quarterly data spanning from 1980:1 to 2000:4 and applying time series test on the date used , they came to conclusion that the effects of monetary policy at influencing the finance of government fiscal deficit through the determination of the inflation –tax rate affects the rate of inflation and exchange rate thereby causing volatility of their rates.

Edwards (1986) examined the group of twelve developing countries for the period 1965-1980 by building a model of money growth surprises, fiscal deficit, relative price of exports to imports and real exchange rate. The results generated in indicate that in the short-run devaluation have a negative impact on output for one year and thereafter, with other variables remaining in situ, real devaluation have an expansionary effect on output. The study also suggested that in the long – run, devaluation will have neutral effect on output.

In an analogous research, Upadyaya (1999) estimated the effect of currency devaluation on the aggregate output level in six Asian countries including India, Pakistan, Sri lanka, Thailand, the Philippines and Malaysia. The results suggest that devaluation in general have neutral effect in the long-run. The results had some exceptional cases in Thailand and Pakistan where devaluation is found to have contractionary effect on output in the long run.

Al-Mashat and Billmeier (2007) examined the monetary transmission mechanism in Egypt using a VAR model and documents evidence that increase in exchange rate channel plays the strongest role in propagating monetary policy shocks to prices and output and that such channels as interest rate , bank lending and asset price are weak.

Vo et al (2001) investigated the relationship between money supply and inflation and output growth in Vietnam and found little evidence of the effect of monetary policy and exchange rate policy on output and price level. Changes in broad money do not help to predict real output as well.

2.3 Empirical Literature from Ghana

Bawumia et al (2003) conducted an investigation of the monetary transmission mechanism in Ghana. The study adopted a Structural Vector Error Correction (S-VEC) analysis for the periods of 1969:4 to 2002:4 and M2+ money supply as a shock variable. They found evidence of the monetary policy instruments having effects on inflation and output in the long run. The study also showed that the exchange rate channel remains the main medium through which monetary policy acts in Ghana.

Ocran (2007), examined the effects of monetary policy on inflation in Ghana using Johansen cointegration technique test and an Error Correction Mechanism for the periods 1960 and 2003. The study identified inflation inertia, changes in money supply, changes in Government Treasury bills as well as changes in exchange rate as determinants of inflation in the short run. The study found inflation inertia to be the main determinant of inflation. The study also identified the exchange rate, foreign prices and terms of trade as determinants of prices in the long run.

CHAPTER THREE

MONETARY POLICY INSTRUMENTS AND MACRO DEVELOPMENTS IN GHANA

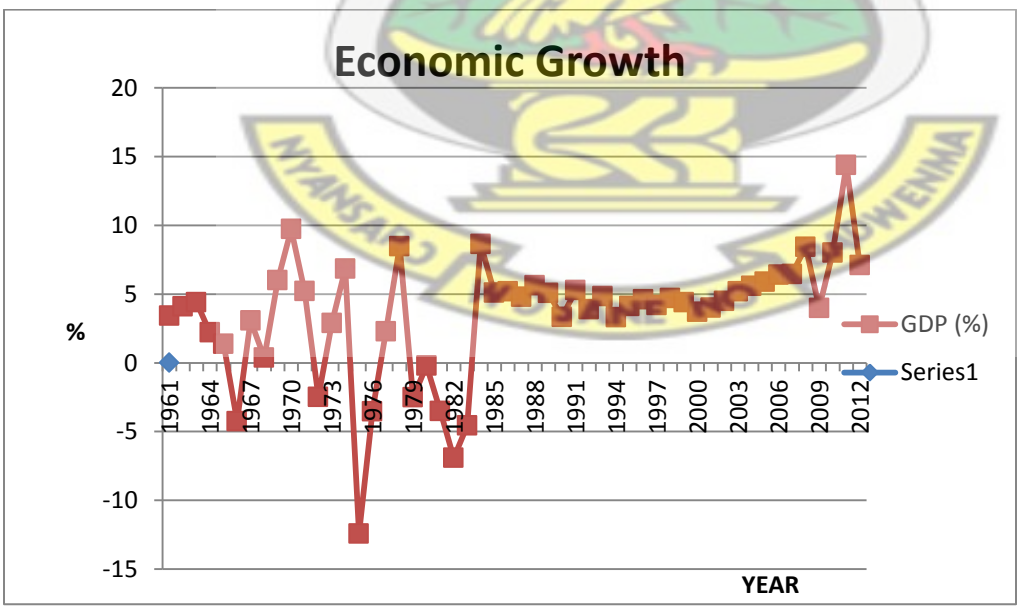
The purpose of this chapter is to provide comprehensive but concise account of the growth pattern of the economy of Ghana; and to review the various inflation episodes since inflation has been one of the intractable problems that have inhibited growth and development in Ghana. Included in this chapter are also the monetary policy instruments used by the Central Bank of Ghana to achieve monetary policy objective of price stability.

3.1 Macroeconomic Developments in Ghana

3.1.1 Economic Growth

At the time of independence in 1957 Ghana had good prospects for economic growth and development. However, the economy suffered a decline of more than 30% during the seventies and early eighties. With the implementation of an Economic Recovery Programme (ERP), followed by a Structural Adjustment Programme (SAP) in the eighties, the economy began to experience relative stability as shown in figure 3.1.

Figure 3.1 Economic Growth Path



Source: World Bank Development Indicators, 2012

From a negative growth rate of about 3.3% during 1979-1983 the GDP growth rates experienced upward trends averaging about 4.5% between 1984 and 2000. Notwithstanding these positive gains, the country faced serious social and economic challenges including the following: Economic growth had remained stagnant at below 5% for almost two decades of stabilization and structural adjustment. The year 2000, for instance, had ended with a GDP growth of 3.7% just barely over the population growth rate of 3.1%.

The many problems that bedeviled the economy could be attributed to the following social-economic factors.

- The institutions of state remained weak due to several decades of neglect and failure of SAP reforms to adequately address their deficiencies.
- Investments, particularly, private investment had hit its lowest levels in 2000, due to low levels of savings, and high interest rates.
- Poverty levels reduced by only 12 percentage points between 1991/92 and 1998/99, leaving about 49.5% of the total population and 63.9% of the rural population still below the poverty line in 2000.
- Fiscal policies depicted strong imbalances in government finances that appeared to reverse the modest gains from the recent past reforms. As a result overall government budget deficit remained large at 8.2% relative to the GDP in 2000.
- Monetary policy in 2000 was dictated by intensive government borrowing from the banking system to finance rising government fiscal deficit.
- The year 2000 saw interest rates generally spiraling upwards along with the inflationary trend. The commercial bank lending interest rates was about 47% whilst inflation stood at 40.5%.
- The year 2000 also experienced unfavourable terms of trade and foreign exchange depreciation in nominal terms of 57% against the US dollar. There was a decline in aid disbursements in the face of what donors characterized as a low effective absorptive capacity.
- As a result of high indebtedness of the state, interest payments on external and domestic debt rose in nominal terms by 110.8% and 70% respectively in 2000, with the absolute

payments of national debt service far exceeding the total capital (investment) expenditure of the state.

- Investments in roads, health and education decline fiscal space. The health expenditure index, for instance, fell from 100 in 1993 or 120 in 1999 to 88 in 2000. (Ghana Shared Growth and Development Agenda, (2010-2013).

The Heavily Indebted Poor Countries (HIPC) Initiative and Poverty Reduction Strategies

The Government swiftly acted in order to restore macroeconomic stability by applying for the HIPC initiative and preparing a national framework documents GPRS I and GPRS II.

The government applied for the enhanced initiative for Heavily Indebted Poor Countries (HIPC), with the view to reducing the debt burden and enhancing her access to more resources for accelerated poverty reduction. Ghana reached the HIPC Decision Point in 2002. In order to benefit from the debt relief under the HIPC, the documents of Growth and Poverty Reduction Strategy (GPRS) was initiated. Through prudent fiscal and monetary policy, the country reached the completion point of the Enhanced HIPC Initiative in July 2004, within a record time of thirty months.

As a result, the Paris Club of creditors offered an outright debt cancellation of about US$2 billion, with a further US$2 billion to be forgiven in installments over the next 20 years. Ghana was required to use 80 percent of the savings generated from the debt relief for additional poverty related expenditures, and 20 percent to reduce domestic debt.

In 2006 the fiscal space for investment in poverty reduction programmes was further widened with additional savings from a cancellation of Ghana's debt under a Multilateral Debt Relief Initiative (MDRI) of the G-8 countries equivalent to about US$4.2 billion. Between 2001 and 2005 the HIPC debt relief created substantial savings to allow for substantial increases in poverty-related spending from 4.7% of GDP in 2001 to 8.5% in 2005. The savings also bolstered the fiscal consolidation efforts of the government and, thereby, contributed strongly to a significant reduction in domestic debt service.

Between 2002 and 2006, for instance, the burden of the domestic debt service, as measured by the ratio of the domestic debt relative to the GDP, declined from a peak of 29.12% to about 15.2%. This, however, happened in the face of a substantial increase in the absolute debt stock by almost 25.2% over the 2005 stock or from ¢13,631.2 billion in 2003 to ¢17,061.2 billion in 2006.

GPRS I, which covered the period 2003-2005, was formulated to enable Ghana to benefit from a significant measure of debt relief under the global HIPC initiative and to position the country in an improved macroeconomic environment to address critical issues of poverty on an emergency basis. Issues relating to poverty reduction were identified and packaged and addressed under the following five thematic areas: Macroeconomic Stability, Production and gainful employment, Human development, and basic services, Special programmes for the vulnerable and excluded.

Following the positive results achieved from the implementation of GPRS I, government launched the second phase of the Growth and Poverty Reduction Strategy (GPRS II) to be implemented over the period 2006-2009. The strategic direction of the GPRS II was to accelerate economic growth and poverty reduction by supporting the private sector to create wealth. Accordingly, emphasis was placed on the implementation of policies and measures which have the potential to fundamentally restructure the economy by diversifying the export base, and increasing agricultural productivity, processing and storage, thereby contributing national food security and rural incomes.

These reforms, HIPC, GPRS I, and GPRS II, yielded tremendous results with the economy responding positively with an average output expanding from an annual rate of 3.7% in 2000 to 6.2% in 2006 and reached a record high of 7.3% in 2008 which is the second highest growth in the past three decades after the 8.6% record in 1984. In the wake of the global financial crises and economic decline in 2007/2008, the real GDP growth rate declined to 4.7% in 2009. The deceleration in growth in 2009 was largely on account of stabilization measures adopted in the year to arrest fiscal and trade deficits that emerged in 2007 and 2008 with threatening consequences for macroeconomic stability. With large fiscal deficits of 14.5% recorded in 2008, it became imperative for government to take appropriate policy measures to reduce the deficit level for 2009.

From 2009 onwards, the country recorded a GDP growth rate of 7.7%, 15% and 7.9% for 2010, 2011and 2012 periods respectively. The average growth for that period was 10.2 %. (Computed from the World Bank Development Indicators data, 2012).

According to the new Socio-Economic Development Plan for 2010-2016 which is built by the Government of Ghana, the main goal for this period is to enable Ghana to become a middle income developed industrialized country that will ensure an annual minimum average real GDP growth rate of 8.0% to warrant the attainment of a per capita income of at least USD 3000 by the year 2020 (CPESD, 2010-2016.Pp 2).

3.1.2 Inflation Trends and Episodes

Inflation is defined as the persistent and appreciable increase in the general price level. The most common measure of inflation is the Consumer Price Index (CPI). The CPI measures changes in the average price of consumer goods and services. Once the CPI is known, the rate of inflation is the rate of change in the CPI over a period (e.g. year-on-year inflation rate). Inflation can be viewed from two directions: as a demand side problem and as a supply side problem.

The demand side problem of inflation occurs when too much money chases few goods. If more money is injected into the economy with goods and services remaining the same, then demand-pull inflation arises. Underlying this analysis is the assumption that there is full employment of production of output, such that output cannot be increased in response to demand leading to continual increase in prices.

The supply side problem also known as cost-push inflation occurs when there is a tendency for increases in the cost of production (due to increase in wages, increase in interest rates or depreciation of the cedi) to lead to a continuous increase in the general price level.

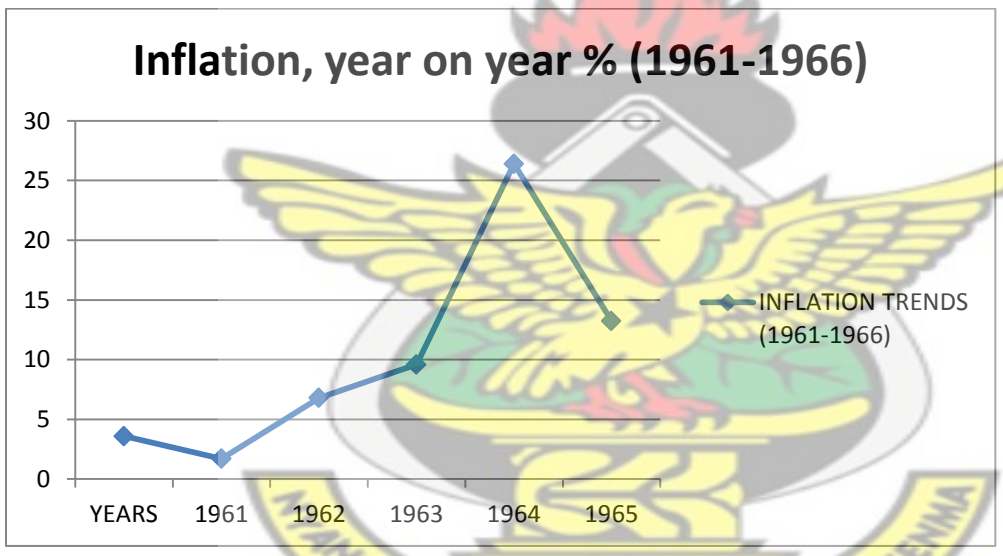
Inflation has been one of the intractable problems that has confronted and inhibited the growth and development of the Ghanaian economy ever since the attainment of independence in 1957. It is useful to review the various inflation episodes, six in all, as indicated also in the works of Cudjoe (2004), Hug (1989), Kwakye (2010), Oduro (2002), ISSER (2001-2005), as well as the Bank of Ghana Annual Reports and World Bank Development Indicators, (2012)

Episode 1: 1957-1966

Ghana experienced her first serious bout of inflation in the mid-1960s. The rate of inflation in 1961 was 3.6%. This further fell to 1.7% in 1962 but thereafter rose to 6.8% in 1963. After independence, there was the need to embark on an industrialization drive with the setting up of many import substitution industries to step up the level of economic development in Ghana.

These import substitution industries relied heavily on imported raw materials and other inputs. However, due to poor management and lack of foreign currencies for the acquisition of such inputs, these industries performed abysmally. Output was therefore minimal and with increased demand, it exerted upward pressure on prices.

Figure 3.2a: Inflation Trends (1961-1966)



Source: (World Bank Development Indicators, 2012)

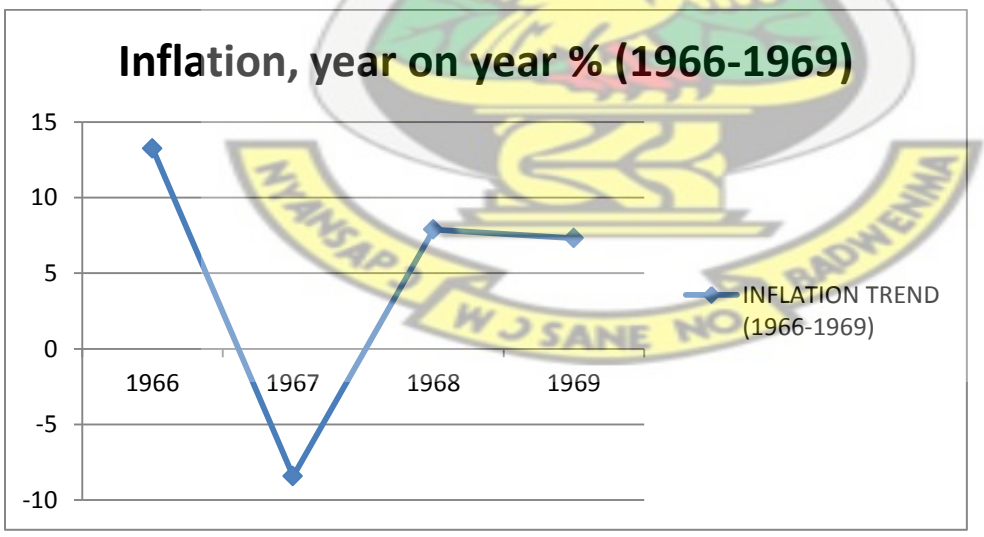
As shown in figure 3.2a, Inflationary pressures started mounting up between 1964 and 1966. The rate of inflation rose from 9.6% in 1964 to 26.4% in 1965, the highest during the time. It however fell in 1966 to 13.3% (See figure 3.2a). One major factor behind the development of the inflationary pressures during the period under review was the government's policy of budgetary deficits, and the financing of deficits mainly by borrowing from the central bank and the commercial banks with the result that more money was pumped into the economy than was warranted by real growth in GDP.

In addition, between 1964 and 1965, there was a sharp increase in total payments made to cocoa farmers following the boom in cocoa yield in the 1964/65 cocoa season. This further increased the money supply in the economy by 37.2% and with a decline in the supply of goods due to shortages and import restrictions, there exerted an upward pressure in general price levels resulting in a 16.8% rise in inflation between 1964 and 1965.

Episode 2: 1966-1969

During this period attempts were made to reverse Import-Substitution Industrialization policies. The Government rather adopted an International Monetary Fund (IMF) sponsored Stabilization Programme including devaluation and trade liberalization to bring inflation down to an acceptable level. This involved cutting back public spending and the use of bank financing to resolve budget deficits. There were also tight monetary policies through interest rate increases and cedi restrictions which helped to pin down the amount of money stock in circulation in the economy. In addition, there was a 30% devaluation of the domestic currency in 1967 which in effect served as a tax on imports and a subsidy on exports. Consequently, inflation had declined from 13.3% in 1966 to 9.0% in 1967 and further declined to 7.1% in 1969. (See figure 3.2b)

Figure 3.2b: Inflation Trends (1966-1969)

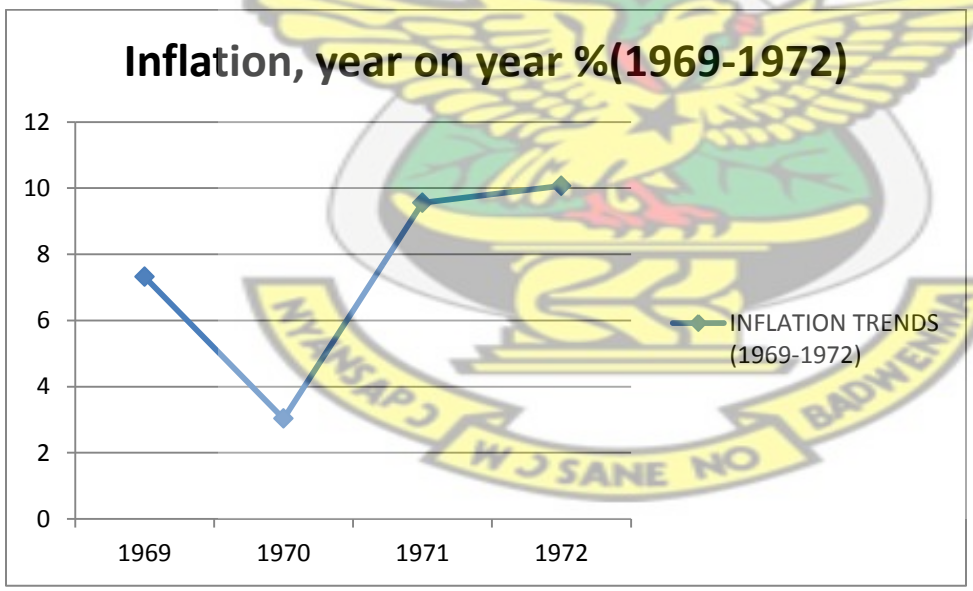


Source: (World Bank Development Indicators, 2012)

Episode3:1969-1972

After the period of stabilization, the government revived economic activity as public investment and spending increased as well as private participation. This brought down inflation further to as low as 3.9% in 1970. This was due to marked domestic output growth and improved import supplies due to the cocoa boom in 1970. The government also pursued trade liberalization which was initiated by in 1967. However, the import liberalization policy and the precipitous fall in the world market price of cocoa in 1971 combined to cause a rapid decline in the country's foreign exchange reserves, leading to balance of payments difficulties. Following these pressures, the low rate of inflation in 1970 could not be sustained and thus rose to 9.3% in 1971. The government responded by introducing stiffer restrictions on imports and foreign exchange transfers and the cedi was again devalued in December 1971. This reduced the value of the cedi in terms of the US dollar by 78%. (See figure 3.2c)

Figure 3.2c: Inflation Trends (1969-1972)



Source: (World Bank Development Indicators, 2012)

Episode 4: 1972-1981

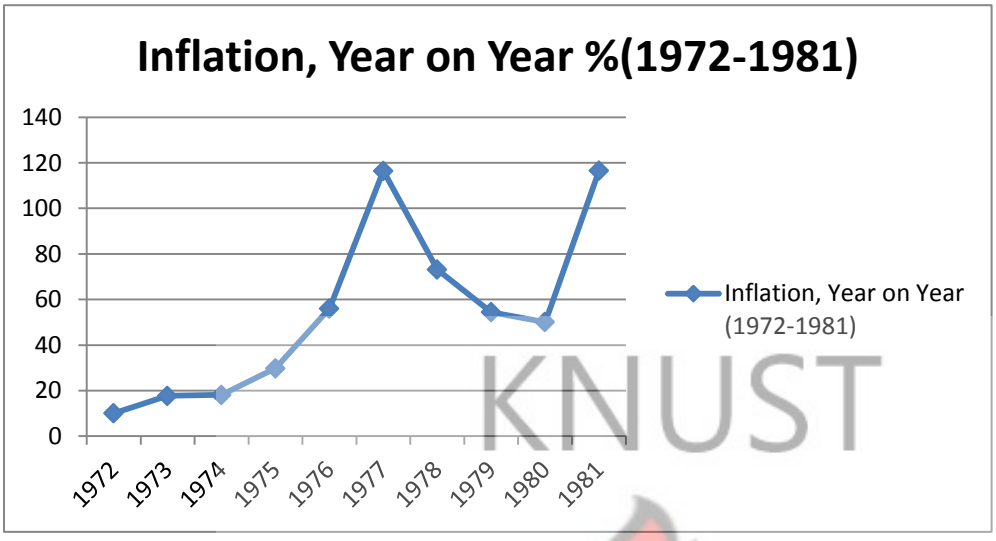
The decade 1972-1981 was characterized by one military takeover to another. The then regime proceeded to recreate a command economy dubbed "Self Help" with expanded state participation. The popular economic slogans at the time were "Operation Feed Yourself" and "Operation Feed Your Nation". The cedi was revalued and there was rigorous price controls. Despite all these, it failed to control inflation.

From 1972 onward, inflation gathered momentum and it has been described in political parlance as a period of "acceleration towards the abyss". The rate of inflation increased persistently between 1972 and 1977 from 10% to 116% for the period. Ghana's inflation could truly be termed as galloping since it was assuming triple digits.

In discussing the causes of inflation during the late 1970s and early 1980s, the Central Bureau of Statistics put the blame squarely on the "huge borrowings by the government from the Central Bank, which continued to increase year after year". Budget deficits were financed by bank loans to government and parastatals. This period witnessed persistent budget deficits. In 1972 and 1976, the Deficit-GDP ratio was 6% and 11% respectively. In fact this was the period in which the Bank of Ghana was regarded as a government "printing press" . This is because government often resorted to the Bank of Ghana to print money to finance expenditures and budget deficits. Total money supply by the end of 1981 was about 29 times the level at the end of 1971. The Bureau cites the worsening supply position of domestic agricultural produce over the decade as another major contributory factor generating the runaway inflation.

Between 1972 and 1981, inflation averaged about 50% while the average for 1977 and 1981 stood at 116.7%. To curtail inflation these regimes made use of extensive price controls, fixed exchange rate regimes and interest rate controls. This led to economic stagnation and severe shortage of goods and services and this further worsened the inflationary situation in the country. (See figure 3.2d)

Figure3.2d:InflationTrends(1972-1981)



Source: (World Bank Development Indicators, 2012)

Episodes 5: 1982 to 2000

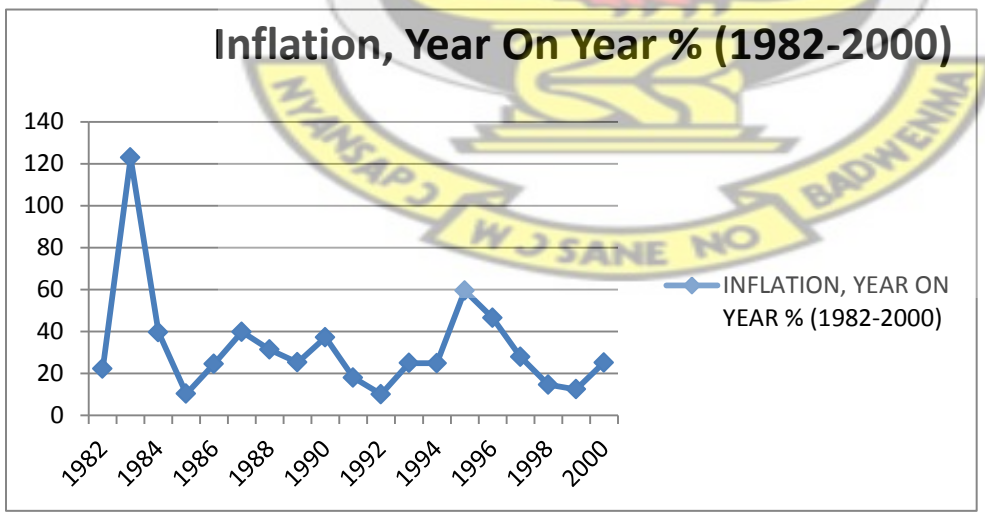
During this time the Ghanaian economy was in a very bad shape. This was manifested in a declining per capita income, negative growth rate in GDP, huge external deficits, run down in social and economic infrastructure and strong inflationary pressures. Inflation hit its all time high figure of 122.8% in 1983, the highest since independence. This resulted from the intensive drought and bush fires which destroyed large quantities of food crops in 1983 thereby creating acute food shortage in the country. The situation was further worsened by the influx of Ghanaians from Nigeria in the same period. All these exerted upward pressures on demand for goods and services and on general price levels.

The year 1983 also witnessed an exchange rate overvaluation as well as the development of a buoyant parallel market coupled with other inappropriate policies all of which are contributory factors to the inflationary pressures at the time. Following the poor economic performance at the time, government initiated the Economic Recovery Programme (ERP) in 1983 with the control of inflation being one of the prime objectives. The main components of the ERP included IMF stabilisation policies and policies of World Bank Structural Adjustment Lending and/or Sectoral Adjustment Lending.

Within a year of the ERP, inflation dropped drastically from the all-time high of 122.8% in 1983 to 40.2% in 1984 and further fell to 10% in 1985. The low rate attained in 1985 was due to the good harvest in 1984. Food prices constitute about 50%- 60% of the CPI. An increase in food production exerted downward pressure on food prices and as a result the rate of inflation dropped for the period. Between 1986 and the end of 2000, inflation remained above the targets set by the government in the ERP. For instance, in 1989, inflation when had fallen from 31.4% to 25.2% was above the target of 15%. In 1990, inflation rose again to 37% and fell in the subsequent year to 18%. It further fell in 1992 to 10.02% which again was above the target of 8%. The further decline in the rate of inflation in 1992 was due to the conscious effort at monetary control by the government and the good harvest in 1991.

The years 1993 and 1994 have different stories to tell. The rate of inflation rose from 10.02% to 27.7% in 1993 and declined to 24.9% in 1994 but rose to 74.4% in 1995, the highest since the inception of the ERP. The high rate of inflation in 1995 could be explained by the introduction of the Value Added Tax (VAT) by the NDC government which received severe criticisms by a wide spectrum of Ghanaians. Inflation however declined continuously between 1996 and 1999 falling from 46.6% in 1996 to 12.6% at end of 1999. (See figure 3.2e)

Figure 3.2e: Inflation Trends (1982-2000)



Source: (World Bank Development Indicators, 2012)

Episode6:2001-2012

Inflation had increased to 41.9% from 40.5% as at the end of December 2000. This was due to the excessive money supply growth in the last quarter of 2000, rundown of local food stocks and the upward adjustment in petroleum prices in February 2001. However, through prudent fiscal management and tight monetary policies coupled with a relatively stable cedi, the government has been able to reduce the year-on-year inflation from 40.5% as at the end of December 2000 to 21.3% as at the end of December 2001, representing a 19.2% decline. This was below the target of 25% set for the end of 2001, the first time an actual inflation rate fell below the target.

Remarkably, the rate of inflation has further been reduced to 10.5% as at end of December 2006, which is a narrow miss of the single digit target that is set for the period. The government adopted Inflation Targeting in 2001 as a stabilization policy pursued with the aim of controlling inflation. Inflation targeting is an economic policy in which a Central Bank estimates and makes public a projected or "target" inflation rate and then attempts to steer actual inflation towards the target through the use of interest rate changes and other monetary tools. The targets are often set as range or point. However, when these are set, unexpected changes such as fuel price changes which tend to affect a whole range of activities can bring deviations from the target.

Inflation targeting thrives on the independence of the Central Bank in conducting monetary policy which includes the freedom to use its available instruments in achieving its inflation target with little or no government borrowing from the Central Bank. It also relies on the technical and institutional capacity of the Central Bank to model and forecast domestic inflation rate, predict the time lag between monetary tools and their effect on inflation rate and have a well informed view of the relative effectiveness of the various instruments of the monetary policy.

With a view to reducing inflation to a low and stable level, the government enacted the Bank of Ghana Act 2002 (Act 612). The Act redefined the objective of the Central Bank to be essentially price stability and granted the Central Bank some degree of independence. The Act also established the Monetary Policy Committee (MPC) of the Bank of Ghana and mandates the MPC to formulate and implement policy in the areas of money, banking and credit with the main aim of maintaining stable prices conducive to a balanced and stable economic growth.

Based on the Act, the Bank of Ghana is to implement monetary policy that would switch the economy from a regime of high inflation, high interest rate and exchange rate depreciation to a regime of low inflation and low interest rate with exchange rate stability. The current inflation target used by the Bank of Ghana is set jointly by the Central Bank and the Ministry of Finance and Economic Planning. The Central Bank in its quest to achieve the targeted inflation uses the prime rate as its key policy instrument for monetary policy. With the adoption of inflation targeting, the government had been able to bring down inflation to lower levels as inflation in Ghana now hardly rises above 20%.

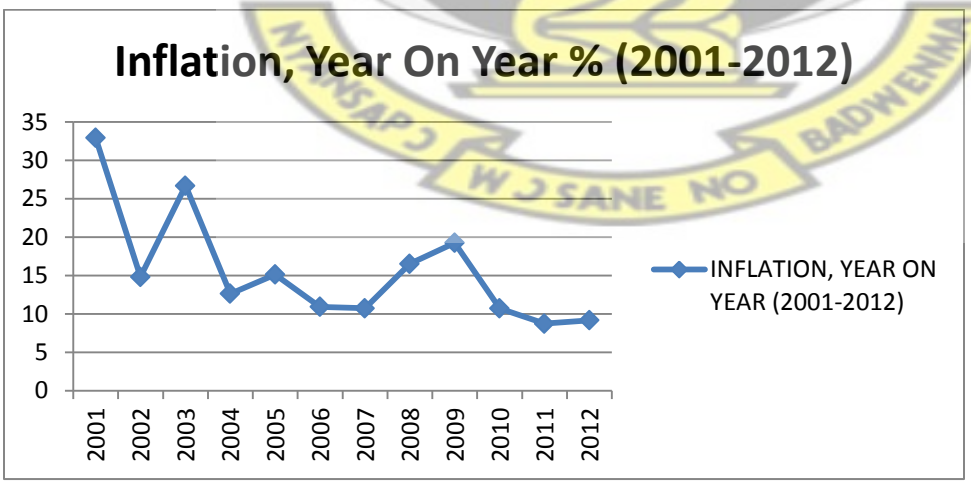
In line with the broad objective of Ghana's medium term Economic Programme, the government set an inflation target of 13% by end of 2002. To meet the set target, the government together with the monetary authorities continued with the prudent fiscal management and the tight monetary policy stance initiated in 2001. These measures coupled with the slow pace of depreciation of the cedi led to a deceleration on the year-on-year inflation rate from 21.3% in 2001 to 15.2% as at the end of December 2002. This time, the actual rate of inflation rose above the target set for the period. However, at the end of the year, inflation stood at 23.6%, far above the target for the period. This was due to the adjustments and corrective measures instituted in the petroleum sector of the economy. There was 100% adjustment in petroleum prices in January 2003 resulting in distortions in general prices. This escalated the rate of inflation to its peak of 30% in April, but sustained implementation of the fiscal framework along with prudent monetary management implemented by the Bank of Ghana reduced inflation to 23.3% at end-December 2003.

The year 2004 was an election year and a very challenging one for the monetary authorities in view of the history of excessive fiscal deficits accumulated through expansionary monetary policy that give rise to price increases and exchange rate volatility in the run-up to elections. There was a decline in inflation to 11.8%, a further miss of the single digit target. There was also exchange rate stability coupled with a decline in the prime rate which was introduced by the government in 2002 to replace the bank rate. In order to achieve the stability necessary for accelerated growth and poverty reduction, government proposed to reduce the end of period inflation to 13.5% by December 2005 and gradually moves towards a single digit rate by end 2006.

However, due to petroleum price adjustments within the year under review, the growth in money supply and the appreciation of the cedi by 9.98%, the rate of inflation as at end of December 2005 was 14.8%, overshooting the target of 13.5%.

In 2006, inflation hit the single digit mark in the months of March and April, but the year ended with a 10.50% rate of inflation. The yearly average for 2006 is 10.96% which was a narrow miss of the single digit target that the government wanted to attain. The acceleration of inflation was due to high expansionary fiscal policy, particularly in 2008, to counter the global food and fuel price increases and the currency depreciation between June 2008 and June 2009. Inflation continues to be a major challenge although the peak levels observed between October 2007 and June 2009 have reduced significantly. Inflation increased from 10.1% at the end of October 2008 to peak at 20.7% in June 2009. Since then inflation has declined steadily to a single digit of 9.46% in July 2010. The decline in inflation is as a result of tighter fiscal and monetary policies as well as an improvement in the food component of the CPI. Indeed food inflation decelerated from 11.84% in December 2009 to 5.84% in July 2010, while non-food inflation declined from 18.82% to 11.94% in same the period. The inflationary rate has since stood at 8.71% and 8.8% for 2011, 2012 respectively. (See figure3.2f)

Figure 3.2f: Inflation Trends (2001-2012)



Source: (World Bank Development Indicators, 2012)

3.2 Focus on Monetary Policy in Ghana

The Bank of Ghana is the anchor of the macroeconomics policy and it conducts its policy by using some monetary policy instruments to determine basically three targets: the operating target (Reserve Money), the intermediate target (Money Supply) and the ultimate or final target (the General Price Level).

In the course of its day-to-day operations, the bank of Ghana strives to meet a target growth rate for the monetary base. Base, or Reserve money consists of currency in circulation plus deposits of commercial banks at the Bank of Ghana. Reserve money (RM) is a liability of the Bank of Ghana and can be directly controlled by the Bank through the manipulation of the assets and other liabilities on its balance sheet.

The Bank of Ghana (BoG) has several instruments it uses to achieve its monetary policy objectives. These include open market operations, repurchase agreements, foreign exchange operations, reserve requirements, discount policy, and interest rates. Much of the information in this section is drawn from Youngblood (2000) and BoG Annual Reports.

3.2.1 Open Market Operations and Repurchase Agreements (repo's)

An open market operation (also known as OMO) is an activity by the Central Bank (BoG) to buy or sell government bonds on the open market. The central bank uses them as the primary means of implementing monetary policy. The usual aim of open market operations is to manipulate the short term interest rate and the supply of base money in an economy, and thus indirectly control the total money supply, in effect expanding money or contracting the money supply. This involves meeting the demand of base money at the target interest rate by buying and selling government securities, or other financial instruments. Monetary targets, such as inflation, interest rates, or exchange rates, are used to guide this implementation. (Youngblood, 2000)

Under a repurchase agreement the BoG buys T-bills from banks and the banks are contractually obligated to buy the bills back (repurchase them) within a very short period of time, typically one day, sometimes 2 or 3 days. The interest rate on repo's is usually 0.5-0.75 percentage points higher than the 91-day T-bill rate established at the most recent auction.

When the BoG enters into a repo, it injects reserves into the banking system and increases the supply of high-powered money: the BoG credits the selling bank's account at the BoG directly increasing one component of high-powered money. When the bank closes out the repo by repurchasing the T-bills, the bank's account at the BoG is debited and the supply of high-powered money is reduced.

In a "reverse repo", the BoG sells T-bills from its own account to a bank. The bank's account at the BoG is debited, so reserves and high-powered money decrease. When the BoG repurchases its T-bills within one to three days, high-powered money increases. Thus, repo's and reverse repo's alter the supply of base money temporarily. This is in sharp contrast with an OMO which changes the supply of base money permanently. Use of repo's is often defensive in nature, designed to smooth out temporary and undesirable changes in the money supply, for example those caused by the Islamic Festivities and Christmas shopping seasons. (Youngblood, 2000)

3.2.2 Foreign Exchange Operations

The sale of foreign exchange has often been used by the BoG to mop up liquidity if other instruments failed. Given the uncertainty about the success of OMO's in government securities, the temporary nature of repo's and reverse repo's, and the difficulties in using reserve requirements as an instrument of monetary control (discussed below), foreign exchange operations have been one of the BoG's main instruments of monetary control. A sale of foreign exchange has the same effect on reserve money as an open market sale of government securities. Individuals and companies pay for the foreign exchange by drawing down their cedi deposits at banks or by reducing their cedi cash holdings; this reduces bank reserves in the former case or reduces currency in circulation in the latter case. Since currency in circulation and bank reserves are both components of high-powered money, the supply of high-powered money is reduced. If banks buy foreign exchange from the BoG, their accounts at the BoG are debited and this reduces the supply of high-powered money. This type of BoG intervention in the foreign exchange market, unless it is sterilized, not only reduces high-powered money, but also moderates the rate of depreciation of the cedi against foreign currencies.

Maintaining a stable value of the exchange rate is one of the BoG's legislated objectives. The exchange rate is a highly visible sign of the stability (or lack thereof) of the economy. The BoG has tended to use the exchange rate as a nominal anchor for the economy: a stable nominal exchange rate is a tangible sign that the authorities have inflation under control. However, attempts to use the exchange rate as a nominal anchor for inflationary expectations when government deficits are large and persistent have an especially pernicious effect on international competitiveness. Depreciation is kept below the rate of inflation and consequently the real exchange rate appreciates. With real appreciation, the incentives to export are reduced and the structure of incentives is skewed in favour of imports and import competing activities. This directly undermines the government's announced policy of development through export-led growth. Furthermore, when terms of trade turn against Ghana and the foreign exchange available to the BoG dwindles, the BoG is deprived of this monetary policy instrument and sets the stage for speculative attacks on the currency. (Youngblood, 2000)

3.2.3 Reserve Requirements on Domestic and Foreign Currencies

Reserve requirements are set by the BoG as a fixed percentage of banks' deposit liabilities, including foreign currency accounts. There are two sets of reserve requirements: Primary or cash reserves and secondary reserves.

Primary reserves consist only of deposits of banking institutions at the BoG. Secondary reserves must be held in the form of approved government paper, and primarily Treasury bills. In modern banking systems, changing the reserve requirement is an outmoded instrument of monetary control. Industrialized countries use reserve requirements more as a prudential measure than as a monetary control measure. They require banks to set aside a fraction of their deposits in order to meet ordinary and reasonable withdrawal demands by customers. The fact that the cash is there when the customers demand it maintains the public's confidence in the soundness of the banking system.

Frequent changes in reserve requirements for monetary control purposes impose accounting costs on banks and thus raise the cost of financial intermediation. For this reason, required reserve ratios in industrialized countries tend to remain constant for long periods of time.

These countries have found that there are much more effective instruments of monetary policy, primarily open market operations. Open market operations directly change the quantity of high-powered money in the system, and these changes, when passed through the money multiplier, directly change the supply of broader money aggregates.

Reserve requirements on foreign currency deposits are assessed on the cedi value of those accounts. Thus, as the cedi depreciates, reserve requirements increase even if the foreign currency value of the account remains constant. The resulting pain will vary from bank to bank, depending on the share of foreign currency accounts in total deposit liabilities. Banks do not like this, claiming that it increases their foreign exchange risk.

The BoG views this method of assessing reserve requirements as an automatic stabilizer for monetary control purposes. The BoG also thinks it lessens the perception that it is directly controlling foreign exchange; a perception that it feels would grow if it required banks to deposit foreign exchange as reserves against foreign currency accounts. The increase in reserves on these accounts due to depreciation must be met by setting aside additional monies from other sources (e.g., demand, time, and savings deposits). The true cost to the banks occurs when they are forced to divert money from these sources to meet the primary reserve requirements on foreign currency deposits. Deposits at the BoG, into which these monies go, pay no interest and they divert money that could go into investments in government securities. (Youngblood, 2000)

3.2.4 Required Reserves and Excess Reserves

The total required reserve ratio has historically been very high in Ghana; it was as high as 57 percent for several years, but has since declined to 9% since 2012. Primary reserve requirements have tended to fall over time and are more or less in line with international standards. Banks have typically held primary reserves in excess of the requirements, with the excess running between 1.5% - 4%. Holdings of excess primary reserves are not unusual—banks want to be able to meet the withdrawal requests of their customers and the amounts of these withdrawals cannot be predicted with pinpoint accuracy, particularly when macroeconomic conditions are unstable. Also, if penalties for failing to meet reserve requirements are high, banks have a further incentive to hold some excess reserves.

Some observers have noted that the high total reserve requirements in Ghana severely constrain the supply of credit to the private sector. With the government (or its agent, the BoG) claiming roughly half of the money that is deposited into the banking system, only 50 percent is potentially available for lending. But the behavior of the banks belies this claim. The secondary reserve requirement has remained at almost 35%. Banks have willingly held far more government securities than are needed to meet reserve requirements. Excess holdings of government securities have ranged between 10 and 20 percent. Excess reserve holdings of this magnitude suggest that even if the secondary reserve requirement were to be eliminated, banks would voluntarily place large percentages of their deposit liabilities in government securities.

From the banks' point of view, these securities offer very high margins over the banks' cost of funds (the interest they pay their depositors) at very low risk. The banking skills required to participate in the T-bill auctions and to manage their investment portfolios are readily available in Ghana. The alternative is for the banks to sift through a large pool of high-risk potential borrowers and select the few that will repay their loans with high probability. This requires a very different set of banking skills, a set that is in very scarce supply in Ghana.

Furthermore, even if these few borrowers are selected and the loans are made, unstable macroeconomic conditions (including very high real interest rates) jeopardize the repayment abilities of even the good borrowers. (Youngblood, 2000)

Sources of Reserves for Banks:

When the discount houses were first established in the early 1990s, banks were supposed to deposit any excess funds on call at the discount house. Banks with deficit positions would borrow from the discount house, typically by issuing an unsecured, negotiable CD of short maturity (less than 1 week). If the whole system was in deficit, all the banks would call their money from the discount houses and they in turn would need funds to repay the banks. The discount houses were supposed to borrow from the BoG in this case. Any BoG lending to the discount houses would be secured by T-bills. (Youngblood, 2000)

In practice, when the discount houses had to borrow from BoG, they paid punitive rates. The discount houses passed these punitive rates along to its borrowers. The banks found that it was cheaper for them to bypass the discount houses and deal directly with one another, in effect creating the interbank money market. This market has evolved into the primary market in which banks borrow to meet reserve needs or lend out their excess reserves. This is an informal market operating on the honor system, in which bankers deal directly with one another over the phone, as opposed to a more formal market arrangement relying on an electronic network and market makers. Interbank transactions are unsecured. Despite this, the interest rate on overnight loans is usually below the T-bill rate and is usually the cheapest source of funds, at least for the most credit-worthy banks. (Youngblood, 2000)

The next preferred alternative is to enter into a repurchase agreement with one of the three discount houses. The bank sells Treasuries in its portfolio to the discount house and agrees to repurchase them within one to three days. The interest rate charged by the discount house is a fixed margin over and above the prevailing interest-equivalent rate on Treasuries. This margin is higher than the one the BoG adds in its repo transactions (usually 0.5 percent). There is some counterpart risk in repos, depending on the quality of the bank, so the discount houses adjust the interest rate charged to a particular bank to reflect this risk. The risk is that the bank may not have the money to close out the repo, i.e., to buy back the Treasuries it sold to the discount house. If a bank is unable or unwilling to enter into a repurchase agreement with a discount house, it can issue a CD to a discount house. This would be unsecured lending by the discount house, so it charges a higher interest rate than it does on repos.

The last resort for a bank looking to borrow is to enter into a repurchase agreement with the BoG. However, the BoG engages in these transactions only if there is a reserve deficiency for the entire banking system. (Youngblood, 2000)

3.2.5 Discount Rate and Interest Rates

The discount rate is no longer used as a tool of monetary policy. It is theoretically the rate at which a bank can borrow from the BoG. In Ghana, the BoG does not change discount rate very often and it lags by a considerable margin changes in T-bill rates.

The interest rate is the yearly price charged by a lender to a borrower in order for the borrower to obtain a loan. This is usually expressed as a percentage of the total amount loaned. In Ghana, interest rates decisions are taken by the Monetary Policy Committee of the Bank of Ghana. The official interest rate is the Monetary Policy Rate (MPR). According to the BoG officials a primary consideration in setting the interest rate is the cost to the government of servicing the debt. This consideration, and the BoG's status as residual claimant of auction proceeds, effectively makes interest rates an instrument of last resort. The interest rate is changed only when reserve money targets cannot be consistently met through the use of alternative monetary policy instruments or when extraordinary circumstances compel a change, e.g., a sharp depreciation of the cedi. (Youngblood, 2000)

Interest rates will not be an effective monetary policy instrument until the government's budget deficits are significantly reduced for a prolonged period of time, the outstanding stock of public sector domestic debt is reduced, the BoG acquires sufficient Treasury securities with which it can conduct open market operations, and a liquid secondary market in T-bills develops. The development of a secondary market in itself hinges on the ability of market participants to freely set bid and offer prices for Treasuries. This is unlikely to happen as long as the government has a vested interest in keeping the costs of servicing its domestic debt low through the manipulation of the interest rate on the debt, rather than reducing servicing costs through a decrease in the stock of the debt.

A Critique of the Monetary Policy Instruments:

The instruments available to the Bank of Ghana to meet its numerous objectives can be characterized as outmoded and ineffective (the discount rate and reserve requirements), dependent on external circumstances when they are effective (foreign exchange operations),

or when either of these two conditions do not apply, rife with uncertainty about their effectiveness. (Open Market Operations).

There have been short periods of time when the BoG has been able to control the growth of high-powered money, and hence the money supply, and has brought the inflation rate down. But the overall record of monetary management is poor and the consequences have been an unstable macroeconomic environment and deterioration in international competitiveness. However, the root cause of Ghana's monetary, price, and exchange rate instability is the persistent and large government budget deficits that the Government needs to finance. Until the government reduces its deficit—substantially and for an extended period of time—the BoG will fail to deliver macroeconomic stability, given the limited instruments under its control, and its lack of independence.

The BoG's ability to implement an effective and independent monetary policy is seriously impaired by its enabling legislation, which saddles the BoG with too many objectives that sometimes conflict with each other and currently makes monetary policy a tool for financing the Government's budget deficits. Open market operations are potentially the most effective arrow in the BoG's quiver. But the BoG is seriously hampered in using OMO's by its subservient relationship to the MoF, which gets first claim on the auction proceeds to meet the government's public sector borrowing requirement with the BoG the residual claimant. The government's need to control interest rates to keep its debt servicing costs from growing explosively means that interest rates are not allowed to rise to clear the market (thereby enabling the BoG to conduct its open market operations).

Another implication is that the BoG cannot rely on interest rates as a monetary policy instrument. The ineffectiveness of OMO's forces the BoG to rely on second-best instruments of monetary policy, e.g., selling foreign exchange to mop up excess reserves; use of prudential regulations (reserve requirements) to achieve monetary growth targets; and the use of short-term policy instruments to accomplish longer term objectives (reverse repurchase agreements).

CHAPTER FOUR

METHODOLOGY

4.0 Introduction

This study seeks to investigate the effect of monetary policy instruments shocks on real GDP and inflation in Ghana. Consequently, this chapter is concerned with the description of the dataset that was used and the time series methodology that unveils the dynamism of the regression variables.

4.1 Data Collection and Sources

The data used in the empirical analysis was mainly secondary data collected from the period, 1980 to 2012 consisting of 32 annually observations for each variable. The data on the variables were obtained from the World Bank Development Indicators, the IMF's International Financial Statistics, The Ghana Statistical Service and the Bank of Ghana. The data set contain six variables. These are: Real Gross Domestic product (in constant 2005 US$); Inflation (i.e. year on year inflation) measured as the rate of change in the annual CPI (2005=100); broad money supply (measured in millions Ghana Cedis); The lending rate of interest in real terms; domestic credit to private sector measured as a percentage of GDP; and an index for real effective exchange rate (2005=100).

4.1.1 Description of Variables

A brief description of each of the six variables used in the study is provided as follows:

Real Gross Domestic Product:

In economics, GDP is defined as the value of all goods and services produced within the geographic territory of an economy in a given interval, such as a year. A well-known formula for GDP has been stated as the total market value of all final goods and services produced in a country in a given year, equal to total consumption, investment and government spending,

plus the value of exports, minus the value of imports. GDP is the most commonly known measures of national income, output, and growth. GDP is of two types: Nominal GDP and real GDP. Nominal is sometimes called money GDP, and real GDP is sometimes called inflation-corrected GDP or constant price GDP.

Real Gross Domestic Product is used as a proxy for output of the economy which is calculated by the constant price in 2005. The reason why real GDP is used instead of nominal output is that the latter one is not adjusted by price level which experiences dramatic fluctuation during time and hence, it does not reflect a true movement of output. After been adjusted by the price level (CPI), the real GDP gives a better performance for output change. For purpose of this study, data for real GDP for the period 1980-2012 has been considered and the symbol 'RGDP' was used. (Mankiw, 2006)

Inflation Rate:

Inflation refers to the persistent rise in general price level. Inflation affects the distribution of both income and wealth. Stable inflation is recognized as an integral component of sound macroeconomic policies. Nominal incomes of some individuals tend to increase with inflation, while those of others remain constant thus causing a change in the distribution of income in favor of the former group .There are several measures of inflation such as GDP deflator and CPI but the Ghana Statistical Service uses CPI as a main inflation measure. The Consumer Price Index (CPI) is also the most common measure of inflation. The symbol 'INF' was to represent inflation in the models used in this study. (Mankiw, 2006)

Money Supply:

Money supply is the total amount of money available in an economy at a particular point of time. The importance of an appropriate monetary aggregate can hardly be over emphasized, particularly for those countries that attach their monetary policy to monetary aggregates. M2 measures traveler's cheques of non-bank issuers, demand deposits, Other Checkable Deposits (OCD's) also known as demand deposits and those currencies that consist of M1.

Where M1 measures the most liquid forms of money; it is limited to the actual currency in the hands of the general public like currency coins and notes.

This includes chequeable accounts like cheques, and other deposits against which cheques can be written for and cleared. Economists use the M2 in quantifying the quantum of money in circulation within an economy and their desire to explain the conditions of the monetary economy. Money supply was represented by 'M2' in the models used for this study. (Mankiw, 2006)

The Real Lending Rate of Interest:

The Lending Rate is used in this study to be a proxy of interest rate channel as a tool of monetary policy. There is also a base rate that is set by the BoG; however, this base interest rate has rarely changed over the time and does not reflect the supply of and demand for money in the money market but serves as a reference rate for commercial banks to set their deposit and lending interest rate, hence, it is of little importance when doing model on Ghana's monetary policy. Real lending rate was represented as 'LRATE' in the various models used for this empirical study. (Mankiw, 2006)

The Domestic Credit Ratio:

This is one of the channels through which monetary policy could influence a change in GDP. Domestic credit is defined as the sum of net credit to the non-financial public sector, credit to the private sector, and other accounts . The domestic credit variable is computed as the ratio of domestic credit to GDP, expressed as a percentage. A rise in domestic credit represents an expansionary monetary policy. The domestic credit was used as 'DC' in the models used for the study. (Le et al, 2008)

The Real Effective Exchange rate:

The exchange rate is defined as the price at which one currency is exchanged for another currency and the transactions are carried out either in the spot or forward exchange markets. There are two forms of the exchange rate: the nominal exchange rate and the real exchange rate. The spot rate is also referred to as the nominal exchange rate. The nominal exchange rate measures the value of one currency in terms of another The spot rate is particularly useful because it is directly observable thus making it possible to compare the prices of goods. A problem that arises with the spot rate however is that it fails to indicate a change in the strength of a home currency with respect to the home country's trading partners (other than the United States of America). The spot rate also fails to indicate the effect of acquiring foreign goods and services on the exchange rate itself (Appleyard et al, 2006:470-471).

The real exchange rate (REER): The REER is the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs. The concept of real effective exchange rate (REER) goes beyond finding the weighted average of currencies to incorporate differences in inflation rates between countries. In other words, it incorporates both the concepts of NEER changes and inflation differentials, with the ultimate aim of deflating the exchange rate indices by corresponding indices of relative prices. Deflating the NEER has a significant benefit under conditions of worldwide inflation at nationally different rates. The REER is thus the NEER of a currency adjusted for inflation differentials between the home country and other nations. One of its most important attributes is that it is a good indicator of the overall economic performance of a country. In this dissertation, the real effective exchange rate between Ghana and its major trading partners is used as a measure of monetary policy through exchange rate channel. The variable is expressed in foreign currency terms, which implies that an increase in the REER indicates an appreciation of the REER whereas a decrease in the REER indicates depreciation. The real effective exchange rate was represented as 'REER' in the models used for the study. (Takaendes, 2006)

4.2 Specification of the Empirical Models

In order to develop strong, robust and reliable model that captures the relationship between monetary policy instruments shocks and real GDP, and following after Sims (1980), the Vector Autoregression (VAR) approach was applied as an estimation technique. According to Sims (1980), VAR is considered as a valuable tool in investigating the dynamic effects of a shock on a given variable. The VAR model expresses the current value of an endogenous variable as a function of deterministic terms and the lagged values of the endogenous variables. In other words, in VAR, each endogenous variable is explained by its lagged or past values and the lagged values of all other endogenous variables in the model. In addition, the VAR is suitable for multiple time series analysis as it supplies different criteria to suggest the optimal lengths for the variables.

In essence, the use of VAR offers two distinct advantages. First, the VAR model explicitly allows for endogeneity of variables, thereby accommodating the interdependence between monetary policy and economic growth. Secondly, and in sharp contrast to a large-scale fully specified structural model, the VAR analysis focuses on reduced form relationship and thus only requires a simple model with a small number of variables to achieve optimal efficiency. In its general form, the real GDP function is expressed as:

RGDP = f (INF, M2, LRATE, CREDIT, REER)

Where the right hand side variables are: Inflation Rate (INF), Broad Money Supply (M2), Real Lending Rate (LRATE), Domestic Credit Ratio (DC) and Real Effective Exchange Rate (REER).

The Base Model for the Vector Autoregression (VAR)

Firstly, a basic reduced form VAR model is estimated using three variables: Real GDP (RGDP), Inflation Rate (INF) and Broad Money Supply (M2) in order to determine the overall impact of money supply on real GDP and inflation. This serves as a base model from which all the other variables are added to determine their individual impacts on real GDP and inflation.

Thus,

$$\text{RGDP}_t = \theta_0 + \sum_{i=1}^{m} \theta_{1i} RGDP_{t-i} + \sum_{i=1}^{m} \theta_{2i} INF_{t-i} + \sum_{i=1}^{m} \theta_{3i} M2_{t-i} + u_t \qquad (4.1a)$$

$$\text{INF}_t = \delta_0 + \sum_{i=1}^{m} \delta_{1i} RGDP_{t-i} + \sum_{i=1}^{m} \delta_{2i} INF_{t-i} + \sum_{i=1}^{m} \delta_{3i} M2_{t-i} + u_t \qquad (4.1b)$$

……

$$\text{M2}_t = \gamma_0 + \sum_{i=1}^{m} \gamma_{1i} RGDP_{t-i} + \sum_{i=1}^{m} \gamma_{2i} INF_{t-i} + \sum_{i=1}^{m} \gamma_{3i} M2_{t-i} + u_t \qquad (4.1c)$$

Where all the variables are already defined, and the 'Us' are the disturbance terms. The 'm' denotes the common lag length in the variables to be determined by statistical criteria. In the base model, equations 4.1a and 4.1b are the equations to be estimated. As such, real GDP and Inflation are the dependent variables while money supply is the explanatory variable. Equation 4.1c was added to the base model to make the theoretical build-up of the VAR model complete.

The broad money supply (M2) is used, in this study, as a measure of monetary policy shocks because the BoG considers growth rate of M2 to be one of the operating targets (apart from reserve money, and the general price level) in formulating and implementing monetary policy, Bawumia et al (2003).This measure can be different for a particular case of a country. In the case of Thailand, Disyatat et al (2003) use real output, the price level and the fourteen-day repurchase rate as a variables in their base model and the fourteen-day repurchase rate is referred to as the proxy of monetary policy shocks. Hwee (2004) used the real effective exchange rate as monetary policy shocks in his analysis for the case Singapore.

A Priori Expectation: Relationship between GDP and Inflation

The relationship between output and inflation is expected to be negative. There is a positive relationship between inflation and interest rate. As inflation increases, interest rate also increases. Interest being the cost of borrowing has a negative impact on investment. A high inflation rate causes interest rate to rise. The rise in interest rate serves as a disincentive to investment. The fall in investment reduces economic growth. Recent cross country studies which found inflation affecting economic growth negatively include: Fischer (1993), Barro (1996), Bruno and Easterly (1998).

Fischer (1993) and Barro (1996) found a very small negative impact of inflation on growth. Yet Fischer (1993) concluded: "however weak the evidence, one strong conclusion can be drawn: inflation is not good for longer-term growth". Barro (1996) also preferred price stability because he believed it to be good for economic growth.

A Priori Expectation: Relationship between GDP and Money Supply

There is an expected positive relationship between money supply and GDP. Money can affect output via different channels, including unanticipated monetary shocks, real and nominal rigidities and menu costs. Some studies that have found a strong support for a positive relationship between money supply and growth include: Mansor (2005), Owoye and Onafowora (2007).

A Priori Expectation: Relationship between Inflation and Money Supply

Most economists suggest there is a direct relationship between the amount of money in an economy, known as money supply and inflation levels. In the quantity theory of money, also called monetarism, the relationship is expressed as MV=PT or Money Supply × Money Velocity = Price level × Transaction. The Velocity and Transactions are considered to be constants. So according to this explanation, money supply and prices have a direct relationship.

The Extended Base VAR Models

The base model is extended to allow for the inclusion of additional variables, at a time, in order to isolate their individual role and hence to determine its impact on real GDP and the other variables including itself. The variables in the extended models are the domestic credit, real lending rate and real effective exchange rate.

The Base Model Adjusted for Lending Rate

$$RGDP_t=\theta_0+\sum_{i=1}^{m}\theta_{1i}RGDP_{t-i}+\sum_{i=1}^{m}\theta_{2i}INF_{t-i}+\sum_{i=1}^{m}\theta_{3i}LRATE_{t-i}+\sum_{i=1}^{m}\theta_{4i}M2_{t-i}+u_t \quad (4.2a)$$

$$INF_t=\delta_0+\sum_{i=1}^{m}\delta_{1i}RGDP_{t-i}+\sum_{i=1}^{m}\delta_{2i}INF_{t-i}+\sum_{i=1}^{m}\delta_{3i}LRATE_{t-i}+\sum_{i=1}^{m}\delta_{4i}M2_{t-i}+u_t \quad (4.2b)$$

……....

$$LRATE_t=\alpha_0+\sum_{i=1}^{m}\alpha_{1i}RGDP_{t-i}+\sum_{i=1}^{m}\alpha_{2i}INF_{t-i}+\sum_{i=1}^{m}\alpha_{3i}LRATE_{t-i}+\sum_{i=1}^{m}\alpha_{4i}M2_{t-i}+u_t \quad (4.2c)$$

$$M2_t=\gamma_0+\sum_{i=1}^{m}\gamma_{1i}RGDP_{t-i}+\sum_{i=1}^{m}\gamma_{2i}INF_{t-i}+\sum_{i=1}^{m}\gamma_{3i}LRATE_{t-i}+\sum_{i=1}^{m}\gamma_{4i}M2_{t-i}+u_t \quad (4.2d)$$

All variables are already defined, and the 'U's' are the disturbance terms. The 'm' denotes the common lag length in the variables to be determined by statistical criteria. In the base model adjusted for lending rate, equations 4.2a and 4.2b are the equations to be estimated. Real GDP and inflation are the dependent variables; lending rate and money supply are the explanatory variables with money supply serving as the monetary policy shock variable. Equations 4.2c and 4.2d are added to complete the theoretical representation of the four variable VAR model.

A Priori Expectation: Relationship between Output and Interest Rate

There is an anticipated inverse relationship between interest rate and output. Under the conventional Keynesian interest rate channel, an increase in short term interest rates occasioned by the manipulation of a policy instrument (e.g. a rise in bank rate) increases the cost of capital, lowers demand for credit and depresses spending on durable goods, albeit increasing in savings. When interest rate is high the consumers will place their money in the saving account and this will lead to decrease in consumption and influence the economy of the country.

A Priori Expectation: Relationship between inflation and Interest Rate

According to Taylor's rule (1995), interest rates will rise if present monetary policy produces inflation. This suggests a positive relationship between inflation and interest rate.

The Base Model Adjusted for Domestic Credit

$$RGDP_t=\theta_0+\sum_{i=1}^{m}\theta_{1i}RGDP_{t-i}+\sum_{i=1}^{m}\theta_{2i}INF_{t-i}+\sum_{i=1}^{m}\theta_{3i}CREDIT_{t-i}+\sum_{i=1}^{m}\theta_{4i}M2_{t-i}+u_t \quad (4.3a)$$

$$INF_t= \delta_0+\sum_{i=1}^{m}\delta_{1i}RGDP_{t-i}+ \sum_{i=1}^{m}\delta_{2i}INF_{t-i}+\sum_{i=1}^{m}\delta_{3i}CREDIT_{t-i}+\sum_{i=1}^{m}\delta_{4i}M2_{t-i}+ u_t \quad (4.3b)$$

……

$$CREDIT_t= \beta_0+\sum_{i=1}^{m}\beta_{1i}RGDP_{t-i}+\sum_{i=1}^{m}\beta_{2i}INF_{t-i}+\sum_{i=1}^{m}\beta_{3i}CREDIT_{t-i}+\sum_{i=1}^{m}\beta_{4i}M2_{t-i}+ u_t \quad (4.3c)$$

$$M2_t=\gamma_0+\sum_{i=1}^{m}\gamma_{1i}RGDP_{t-i}+\sum_{i=1}^{m}\gamma_{2i}INF_{t-i}+\sum_{i=1}^{m}\gamma_{3i}CREDIT_{t-i}+\sum_{i=1}^{m}\gamma_{4i}M2_{t-i} + u_t \quad (4.3d)$$

All variables are already defined, and the 'U's' are the disturbance terms. The 'm' denotes the common lag length in the variables to be determined by statistical criteria. In the base model adjusted for domestic credit, equations 4.3a and 4.3b are the equations to be estimated. Real GDP and inflation are the dependent variables; domestic credit and money supply are the explanatory variables with money supply serving as the monetary policy shock variable. Equations 4.3c and 4.3d are added to complete the theoretical representation of the four variable VAR model.

A Priori Expectation: Relationship between GDP and Domestic Credit

Domestic credit usually exerts a positive impact on output growth. Bernanke and Gertler (1995) describe this in two ways: the balance sheet channel and the bank lending channel. The balance sheet of the lending channel argues that tight monetary policy directly weakens borrowers' balance sheets, lowers their collateral for loans and credit worthiness and increase their external finance premium. Lower net worth for borrowers increases both adverse selection and moral hazard problems, leading to a decline in lending for investment spending. The bank lending channel posits that a disruption in the supply of bank loans resulting from tight monetary policy makes loan-dependent small and medium firms incur costs associated with finding new lenders. This directly increase their external finance premium, lowers the levels of their borrowing and reduces real economic activity.

A Priori Expectation: Relationship between inflation and Domestic Credit

Theory suggest that increasing money supply increases total credit that banks can supply to the economy through the bank lending channel. This has the potential of boosting price level. There is therefore an expected direct relationship between credit and inflation.

The Base Model Adjusted for Real Effective Exchange Rate

$$RGDP_t=\theta_0+\sum_{i=1}^{m}\theta_{1i}RGDP_{t-i}+\sum_{i=1}^{m}\theta_{2i}INF_{t-i}+\sum_{i=1}^{m}\theta_{3i}REER_{t-i}+\sum_{i=1}^{m}\theta_{4i}M2_{t-i}+u_t \quad (4.4a)$$

$$INF_t=\delta_0+\sum_{i=1}^{m}\delta_{1i}RGDP_{t-i}+\sum_{i=1}^{m}\delta_{2i}INF_{t-i}+\sum_{i=1}^{m}\delta_{3i}REER_{t-i}+\sum_{i=1}^{m}\delta_{4i}M2_{t-i}+u_t \quad (4.4b)$$

……

$$REER_t=\mu_0+\sum_{i=1}^{m}\mu_{1i}RGDP_{t-i}+\sum_{i=1}^{m}\mu_{2i}INF_{t-i}+\sum_{i=1}^{m}\mu_{3i}REER_{t-i}+\sum_{i=1}^{m}\mu_{4i}M2_{t-i}+u_t \quad (4.4c)$$

$$M2_t=\gamma_0+\sum_{i=1}^{m}\gamma_{1i}RGDP_{t-i}+\sum_{i=1}^{m}\gamma_{2i}INF_{t-i}+\sum_{i=1}^{m}\gamma_{3i}REER_{t-i}+\sum_{i=1}^{m}\gamma_{4i}M2_{t-i}+u_t \quad (4.4d)$$

All variables are already defined, and the 'U's' are the disturbance terms. The 'm' denotes the common lag length in the variables to be determined by statistical criteria. In the base model adjusted for exchange rate, equations 4.4a and 4.4b are the equations to be estimated. Real GDP and inflation are the dependent variables; real effective exchange rate and money supply are the explanatory variables with money supply serving as the monetary policy shock variable. Equations 4.4c and 4.4d are added to complete the theoretical representation of the four variable VAR model.

A Priori Expectation: Relationship between GDP and Exchange Rate

Exchange rate appreciation usually exerts a negative impact on output growth. Assuming flexible exchange rates, a rise in domestic real interest rates reflective of tight monetary policy makes deposits denominated in domestic currency more attractive than those denominated in the foreign currency. The increase in net capital inflows resulting from the high real interest rate differential leads to domestic currency appreciation as well as a fall in exports, export-oriented investment and output.

Additionally, the appreciation makes imports more competitive in the domestic economy. Changes in the exchange rate, therefore, have implications for aggregate demand and firm's investment behavior, price stability and employment. Al-Mashat and Billmeier (2007) document evidence that the exchange rate channel plays the strongest role in propagating monetary policy shocks to prices and output in Egypt. An exchange rate effect on inflation is also documented for Ghana by Ocran, 2007.

A Priori Expectation: Relationship between inflation and Exchange Rate

There is an expected positive relationship between inflation and exchange rate appreciation. As a general rule, a country with a consistently lower inflation exhibits a rising currency value, as its purchasing power increases relative to other currencies. Those countries with higher inflation typically see depreciation in their currency in relation to the currencies of their trading partners.

4.3 Methods of Estimation and Statistical Tests

4.3.1 Exploratory Data Analysis

The techniques used in this section are mostly graphical and descriptive statistics. This procedure enables the researcher to gain an insight into the data set, extract important variables and their distributions, detects other anomalies. From literature, we notice that it is common to take the natural logarithms of times series which are growing over time. These variables are estimated in natural logarithms and the rationale, among other things, are to obtain residuals that are approximately symmetrically distributed and when the spread of the residuals changes systematically with the values of the dependent variable (heteroscedasticity), the purpose of the transformation is to remove that systematic change in spread, achieving approximate homoscedasticity. Again, to linearize a relation when the relationship is close to exponential and when the marginal changes in the explanatory variables are interpreted in terms of multiplicative (percentage) changes in the dependent variable.

The data distribution was examined using graphs and standard descriptive statistics namely mean median, standard deviation, skewness and kurtosis. The Jarque-Bera (1980) test is also conducted to ascertain the normality of the data distribution. Under the null hypothesis of normal distribution, Jarque-Bera (J-B) is 0. As a result, J-B value greater than zero is said to have deviated from the normal distribution assumption.

Similarly, skewness and kurtosis represent the nature of departure from normality. In a normally distributed series, skewness is 0 and kurtosis is 3. Positive or negative skewness indicate asymmetry in the series and less than or greater than 3 kurtosis coefficient suggest flatness and peakedness, respectively.

4.3.2 Diagnostic and Stability Tests

Preliminary tests performed on the variables included the Augmented Dickey-Fuller and Philip-Perron Tests for unit roots, and Johansen-Juselius test for Cointegration. The reliability of the VAR model was also examined in three diagnostic tests: Breusch-Godfrey (Serial Correlation), L.M. White (Heteroskedasticity) and Multivariate normality test of the VAR residuals for all the models.

The structural stability test is conducted by employing the AR Roots table and the AR Graphs which reports the inverse roots of the characteristics AR polynomial. Stability Test is performed to check whether the estimation regression equations were stable throughout the sample period. This is in accordance with the survey conducted by Lütkepohl (1991). The importance of this test is that the estimated VAR is stable (stationary) if all the roots have modulus less than one and lie inside the unit circle. If the VAR is not stable, certain results (such as the impulse standard errors) are not valid. E-Views statistical Software is used to estimate the time series regressions of the VAR model used.

4.3.3 Lag Length Selection Criteria, Granger Causality Test, Impulse Response Functions and Variance Decomposition

Before estimating the VAR equations, it is important to determine the order of the VAR model. The lag length for the VAR (p) model may be determined using model selection criteria. The most common information criteria are the Akaike Information Criterion (AIC),
Final Prediction Error Criterion (FPE), Schwarz Bayesian (BIC) and Hannan-Quinn (HQ). In this study, the appropriate lag-length (p) is selected with the help of Akaike Information Criterion (AIC) to ensure that the errors are white noise.

Though, VAR is used extensively in econometric analysis because they are easy to specify and estimate if the process is stationary or involves nonstationary cointegrated variables, it is usually difficult to interpret the VAR coefficients directly (Lütkepohl and Saikkonen, 1995). Therefore, a range of alternative approaches have been proposed which help in understanding the relations among variables of the VAR system. According to Stock and Watson (2001), granger-causality tests, impulse responses and forecast error variance decompositions are more informative to understanding the relationships among the variables than the VAR regression coefficients or R^2statistics.

4.3.4 Granger Causality Test

Granger causality test determines whether the lagged values of a particular variable are significant in predicting the regressand and can be based on simple F tests in the single equations of the VAR model (Greene, 2002).
In other words, the rationale for granger causality test is to find out if lagged values of a particular variable add any information to forecasting the endogenous variable.

4.3.5 Impulse Response Analysis

Impulse response analysis is a tool used to study the behavior of the endogenous variables in response to shocks in other variables of the model.

A shock to the i^{th} variable not only directly affects the i^{th} variable but is also transmitted to all the other endogenous variables through the dynamic (lag) structure of the VAR. An impulse response function traces the effect of a onetime shock to one of the innovations on current and future values of the endogenous variables. Plotting the impulse response functions (i.e., plotting the coefficients of the innovations against the time horizon) is a practical way to visually represent the behavior of the series in response to the various shocks.

4.3.6 Variance Decomposition or Forecast Error Variance Decomposition

Variance Decomposition or forecast error variance decomposition indicates the amount of information each variable contribute to the other variables in a VAR model. While impulse response functions trace the effects of a shock to one endogenous variable on to the other variables in the VAR, variance decomposition separates the variation in an endogenous variable into the component shocks to the VAR. In other words, variance decomposition assesses the importance of different shocks by determining the relative share of variance that each structural shock contributes to the total variation of each variable.

Thus, the variance decomposition provides information about the relative importance of each random shock in affecting the variables in the VAR. By way of this, it is possible to ascertain the individual contribution of the shocks of the right hand side variables in forecasting the endogenous variables in each time horizon.

CHAPTER FIVE

EMPIRICAL RESULTS AND ANALYSIS

5.0 Introduction

The chapter presents the empirical findings and discussions of the results in the following sequence: exploratory data analysis, in graphical and descriptive statistical forms; unit root and cointegration test; the VAR results and analysis (i.e. results of the base VAR model, the base VAR models adjusted for lending rate, domestic credit and exchange rate).

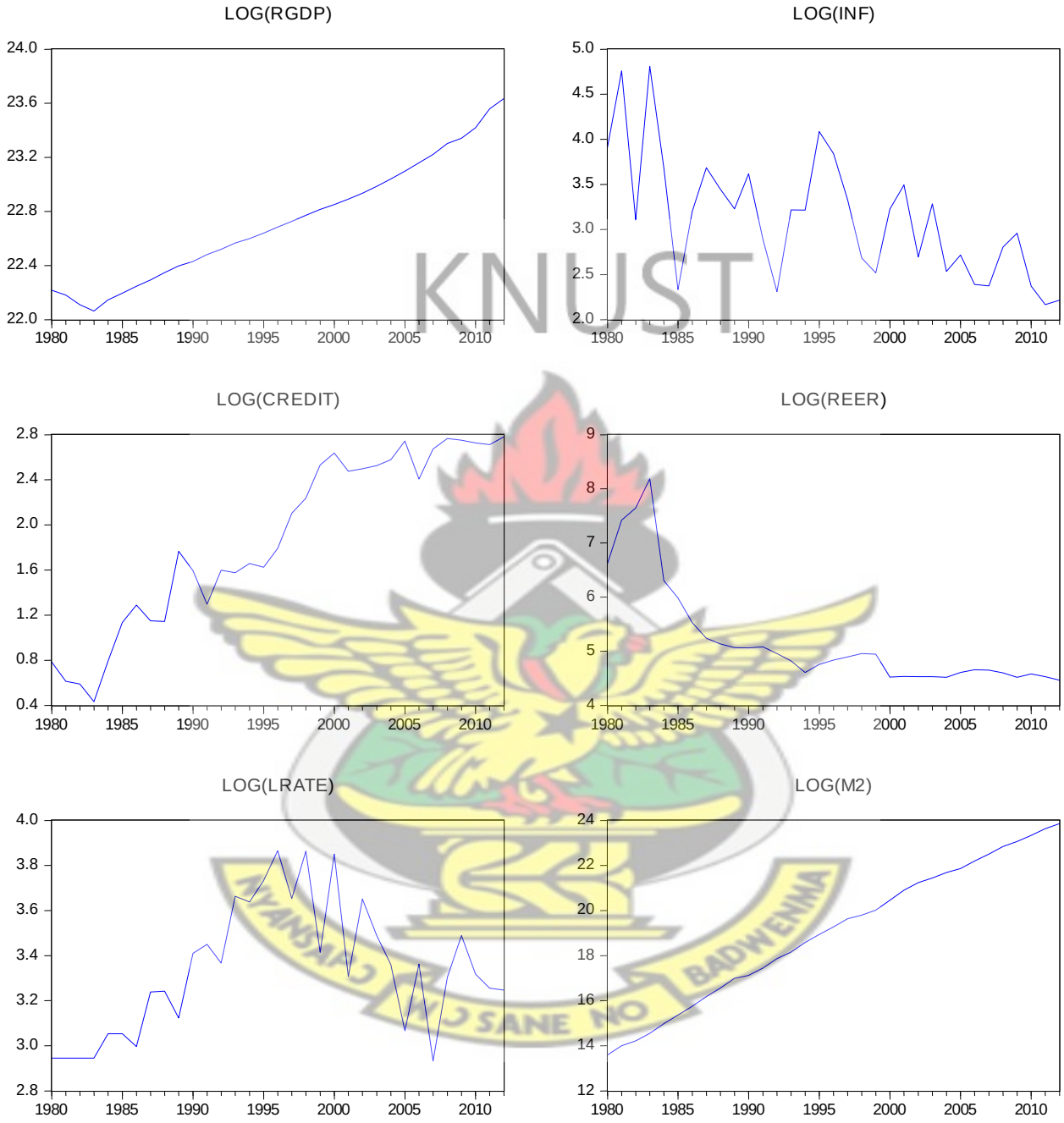
5.1 Exploratory Data Analysis

Two main analyses are presented in this section: namely, graphical analysis of the time series of variables, and descriptive statistical analysis.

Time Series Graphical Analysis

The Graph below shows the trend of the Real GDP, Inflation Rate, Domestic Credit, Lending Rate, Real Effective Exchange Rate and Broad Money (M2) over the period 1980 to 2012 in natural logarithm.

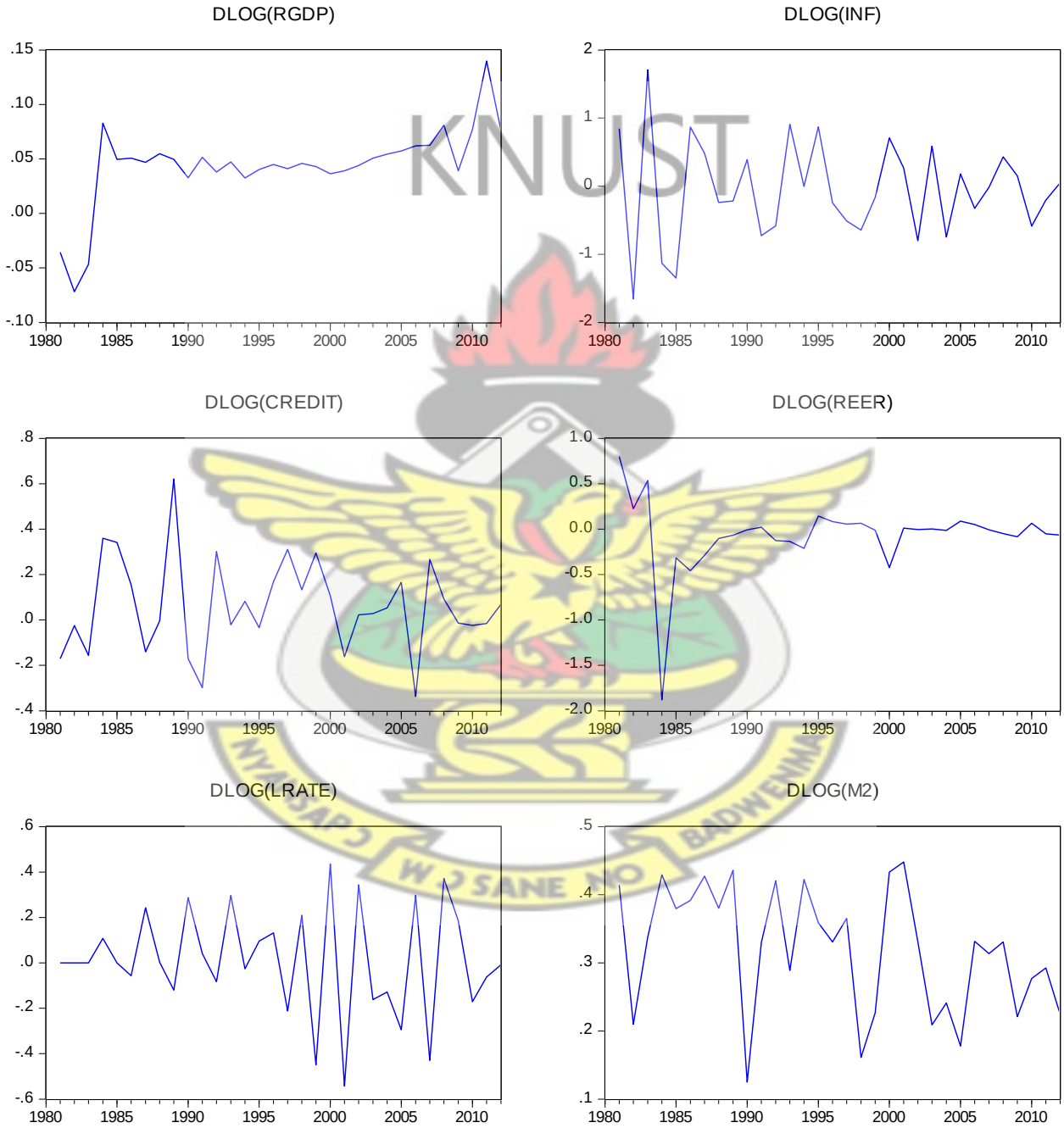
Figure 5.1: Graphs of Variables in Log Levels



Source: Produced from data from Bank of Ghana, International Financial Statistics, Ghana Statistical Service, 2012.

On differencing the series once, they tended to fluctuate around their mean suggesting that they became stationary. That is, they tended to exhibit similar behaviour on differencing. This is depicted in figure 5.2**.**

Figure 5.2:Graphs of Differenced Series



Source: Produced from data from Bank of Ghana, International Financial Statistics, Ghana Statistical Service, 2012.

According to Stigler and Sherwin (1985), unrelated variables might have high correlation coefficient using the levels but on differencing, they exhibited low correlation coefficient. However, two related nonstationary variables tended to have high correlation coefficient both in levels and first differences. The real GDP, inflation, the real effective exchange rates, domestic credit, the lending rate and broad money supply exhibited similar movement in first differences as shown in Figure 5.2.

Descriptive statistical Analysis

This section examines the distribution of the data using mean, median and standard deviation. The normality of distribution of the variables was also ascertained using skewness, kurtosis and Jacque-Bera tests.

Table 5.1. Summary of Descriptive Statistics.

	LnRGDP	LnINF	LnCREDIT	LnREER	LnLRATE	LnM2
Mean	22.72274	3.124015	1.878102	5.189819	3.338438	19.02962
Median	22.68431	3.201340	1.792606	4.836246	3.317816	19.26883
Maximum	23.63421	4.811164	2.779868	8.182881	3.864931	23.85296
Minimum	22.06242	2.166403	0.433254	4.463585	2.932260	13.58617
Std. Dev.	0.448769	0.683323	0.764043	0.973935	0.288180	3.136967
Skewness	0.335660	0.682368	-0.358503	1.846469	0.246028	-0.144779
Kurtosis	2.072206	3.056430	1.773633	5.370085	2.075189	1.801600
Jarque-Bera	1.803273	2.565321	2.774849	26.47575	1.508916	2.090009
Probability	0.405905	0.277299	0.249718	0.000002	0.470265	0.351690
Sum	749.8505	103.0925	61.97737	171.2640	110.1684	627.9774
Sum Sq. Dev.	6.444593	14.94177	18.68039	30.35359	2.657524	314.8981
Observation	32	32	32	32	32	32

Source: Author's Estimation, 2014

The descriptive statistics as evidenced in Table 5.1 reveals the broad money supply (M2) as having a larger standard deviation of 3.14 among all the indexed variables which indicates a high volatility in broad money supply. The mean-to-median ratio of each variable is approximately 1.

The range of variation between maximum and minimum values is quite logical. The standard deviation in comparison with the mean is low for all the variables which indicate small coefficient of variation.

The skewness for log(rgdp), log(inf) and log(lrate) reveals approximate normality of these variables; however, log(credit) and log(m2) indicate distribution of long left tails. Log(reer) shows a distribution of long right tail.

The kurtosis of normal distribution is 3, but the distribution of log(rgdp), log(credit), log(lrate) ,and log(m2) are platykurtic (flat) relative to normality. Log(inf) indicates a normal distribution whilst log(reer) indicates a leptokurtic(peaked) distribution relative to the normal.

The Jacque-Bera statistics also indicate that the distribution of all the variables during the sample period have long left and right tails and flat than normal distribution. On the whole the Jacque-Bera test of the variables do not conform to the normal distribution but display negative, positive and flat distributions. These results are however, based on the null hypothesis of normality and provide no information for the parametric distribution of the series.

5.2 Unit Root and Cointegration Tests Results

The time series property of each variable is examined using the ADF and PP test for the unit root. From Table 5.2, the calculated ADF and PP statistics accept the null hypothesis that there is unit root at 1%, 5%, 10% significant levels when compared with the relative critical values. The inflation rate, log(INF) is however stationary at its level at 1% and 5% significant levels but not at 10% and integrated of order zero I(0). It suffices to state that the ADF and PP tests are all consistent confirming the non-stationarity of each variable with the exception of the inflation rate, log(INF) where at 5% level of significance the null hypothesis of unit root is rejected.

Table 5.2: ADF and PP Unit Root Tests for all Variables

	Type of Test	Variable	Deterministic Term	Lags	Test Value	Critical Values		
						1%	5%	10%
LEVEL	ADF	LnRGDP	Const. & Trend	3	3.259	-4.309	- 3.574	-3.221
		LnINF	Constant	0	-3.488	-3.637	-2.957	-2.617
		LnM2	Const. & Trend	0	-0.898	-4.273	-3.557	-3.212
		LnCREDIT	Constant	0	-0.982	-3.653	-2.957	-2.617
		LnLRATE	Constant	1	-1.658	-3.661	-2.960	-2.619
		LnREER	Const & Trend	0	-1.747	-4.2732	-3.5577	-3.212
	PP	LnRGDP	Const. & Trend	3	-2.493	-4.273	-3.557	-3.212
		LnINF	Constant	1	-3.387	-3.653	-2.957	-2.617
		LnM2	Const. & Trend	13	-0.053	-4.273	-3.557	-3.212
		LnCREDIT	Constant	9	-0.825	-3.653	-2.957	-2.617
		LnLRATE	Constant	2	-2.557	-3.653	-2.957	-2.617
		LnREER	Const & Trend	4	-1.765	-4.273	-3.557	-3.212
FIRST DIFFERENCE	ADF	LnRGDP	Constant	2	-5.046	-3.679	-2.967	-2.622
		LnINF	Constant	0	-8.607	-3.661	-2.960	-2.619
		LnM2	Constant	0	-4.691	-3.661	-2.960	-2.619
		LnCREDIT	Constant	0	-6.225	-3.661	-2.960	-2.619
		LnLRATE	Constant	0	-11.788	-3.661	-2.960	-2.619
		LnREER	Constant	0	-5.803	-3.661	-2.960	-2.619
	PP	LnRGDP	Constant	4	-3.037	-3.661	-2.960	-2.619
		LnINF	Constant	23	-17.880	-3.661	-2.960	-2.619
		LnM2	Constant	2	-4.691	-3.661	-2.960	-2.619
		LnCREDIT	Constant	9	-7.535	-3.661	-2.960	-2.619
		LnLRATE	Constant	3	-11.433	-3.661	-2.960	-2.619
		LnREER	Constant	0	-5.803	-3.661	-2.960	-2.619

Source: Author's Estimation, 2014

It is also evident from Table 5.2 that all the variables under study, with the exception of LnINF, (LnRGDP, LnM2, LnCREDIT, LnLRATE, and LnREER) are of all I (1) behavior at 5% level of significance. LnINF is I (0). However, in the case of first difference of the variables, the null hypothesis of unit roots is overwhelmingly rejected. Using the natural logarithms of the variables is to linearize the relations among them. The observed variations in the series make the relationship among them close to exponential. Hence, the use of the natural logarithms of the series.

In determining the number of cointegrating vectors, Trace test and Maximum eigenvalue test using the more recent critical values of MacKinnon et al. (1999) were performed. The assumption of no deterministic trend and restricted constant was used for all the variables. The choice was tested using (AIC) and Schwartz Information Criterion (SIC). The result for both trace test and maximum eigenvalue for unrestricted cointegration rank test are presented below.

Table 5.3: Cointegration Tests

Hypothesized No. of CE(s)	Eigen Value	Max-Eigen Value	Critical Value (5%)	Trace Statistics	Critical Value (5%)
None∗	0.835880	52.40757	36.63	121.1791	83.93
At most 1∗	0.692692	34.21726	30.43	68.77156	60.06
At most 2	0.563272	24.02492	24.15	34.55430	40.17
At most 3	0.202377	6.557470	17.79	10.52938	24.27
At most 4	0.125061	3.874435	11.22	3.971909	12.32
At most 5	0.003356	0.097474	4.12	0.097472	4.12

Source: Author's Estimation, 2014

(∗) denotes rejection of the null hypothesis at 5% level of significance.

In the table 5.3, it is observed that both Trace test statistic and the Max-Eigenvalue test indicate two cointegrating equations at 5% level of significance. This is indicated by the asterisks in the first column of table 5.3.

The Null Hypothesis (H_O), which says that there are no cointegrating vectors is therefore rejected while the alternative hypothesis of the presence of cointegrating vectors conveniently accepted. Thus, it can be concluded that a long run relationship exists among the variables.

5.3.0 Results of Optimal lag length analysis and other Diagnostic Tests

It is essential, before estimating a VAR model, to determine the optimal lag length of the model. The AIC was used in selecting the number of lags and it proposed three lags. In the regressions of the base and the extended models, three (3) lags were used as maximum number of lags due to the limited number of observations. The results for checking the optimal lag lengths for the VAR model are presented in table 5.4

Table 5.4: VAR model optimal lag lengths check.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	75.80698	NA	3.27e-10	-4.814275	-4.531386*	-4.725677
1	120.9111	68.43377	1.85e-10	-5.442142	-3.461921	-4.821961
2	169.8168	53.96496*	1.08e-10*	-6.332193	-2.654639	-5.180429*
3	206.8265	25.52390	3.15e-10	-6.401825*	-1.026937	-4.718477

Note: * Indicates lag order selected by the criterion; LR: sequential modified LR test statistic (each test at 5% level); FPE: Final Prediction Error; AIC: Akaike Information Criterion; SC: Schwarz Information Criterion; HQ: Hannan-Quinn Information Criterion.

Stability and Reliability of the Optimal lag VAR Model

The inverse roots of the AR characteristics polynomials which lie within the unit circle indicated that there was no problem in terms of stability of three-lag VAR model for both the base and extended models.

Moreover, the reliability of the model whose lag length was determined to be three(3) was also confirmed on the basis of the 0.05 significance level found in three diagnostic tests: namely, the Breusch-Godfrey (Serial Correlation), L.M. White (Heteroskedasticity) and Multivariate normality of the VAR Residuals for all the models. (See Appendix 3)

5.3.1 Results and Analysis of the Base VAR Models

The original VAR regression results are provided in Appendix 5. From the VAR regression results, the granger causality tests, impulse response functions, and forecast error variance decompositions estimates are derived and presented accordingly by beginning with the base VAR model. Vector autoregression is used extensively in econometric analysis because they are easy to specify and estimate; however, if the process is stationary or involves nonstationary cointegrated variables, it is usually difficult to interpret the VAR coefficients directly (Lütkepohl and Saikkonen, 1995). Therefore, granger causality test, impulse response analysis and forecast error variance decomposition are the alternative approaches proposed which help in understanding the relation among variables of the VAR system. According to Stock and Watson (2001), granger-causality tests, impulse responses and forecast error variance decompositions are more informative to understanding the relationships among the variables than the VAR regression coefficients or R^2 statistics.

Granger Causality / Block Exogeneity Test: The Base Model.

This section presents the granger causality analysis for the base model and the rationale is to find out if lagged values of real GDP, inflation, and broad money supply contain any information that could predict real output, and inflation.

Table 5.5: Granger Causality Wald Test Result for the Base model.

DEPENDENT VARIABLES	EXCLUDED/EXPLANATORY VARIABLES		
	RGDP	INF	M2
RGDP	-	0.3277	0.0073
INF	0.0062	-	0.1315

Entries are P-Values for the χ^2 Test

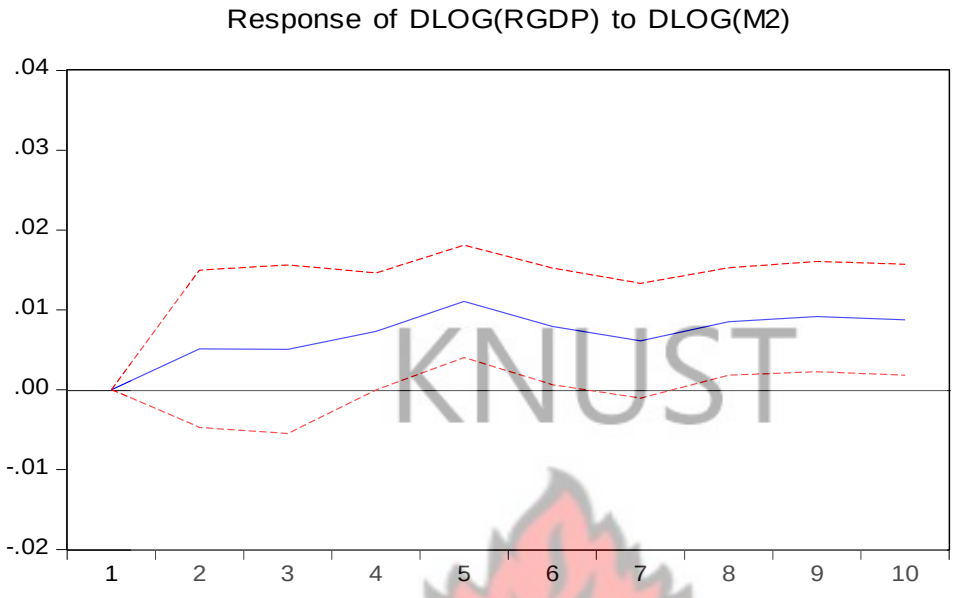
The Granger causality tests in table 5.5 show that money supply granger causes real GDP at the 5% significance level. Real GDP also has a significant granger effect on inflation. However, money supply does not cause inflation. The implication is that Past values of money supply cannot be used to forecast the present value of inflation.

Monetary theory suggests that an increase in the money supply leads to an increase in the price level and a potential increase in real GDP. However, in the base model, money does not Granger cause inflation. This is to some extent puzzling for monetary theory, but can be explained partly by the fact that the price level (inflation) which was obtained from consumer prices could have been affected by other factors such as prices of imported goods and fluctuations of the nominal exchange rate and not much affected by the actual quantity of money.

Impulse Responses for the Base Model

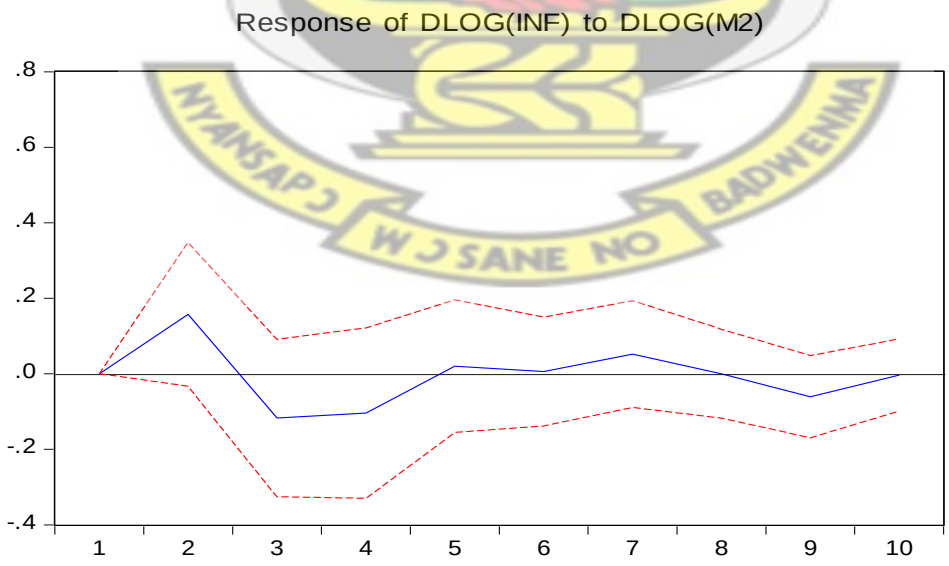
To buttress the information adduced in the granger causality test, a confirmation and direction can be sought by looking at the impulse responses for the overall effect of money supply on real GDP and inflation in figure 5.3a and with the dotted lines representing ±2 standard error confidence intervals and on horizons given 10 year periods.

Figure 5.3a: Responses of Real GDP and Inflation to Broad Money (M2)



A positive shock to money leads to a positive response of real GDP which is persistent and thus last between the first year through to the tenth year as shown in figure 5.3a. This confirms the result obtained in the granger causality test.

Figure 5.3b: Responses of Inflation to Broad Money (M2)



In the case of price level, the monetarists' way at looking at expanding money supply leads to inflation has not been effectively confirmed by this analysis. A one standard deviation monetary shock on price results in a positive impact which is transitory and last between one to two years; responds negatively between the second to the fifth year, and gradually disappears after the fifth year. This inconsistency vis-à-vis the response of inflation to money supply, as explained above, could be attributed to such other factors as instability in the nominal exchange rate and prices of imported goods and not much affected by the actual quantity of money.

Forecast Error Variance Decomposition: The Base Model

The Cholesky Forecast Error Variance Decomposition (FEVD) in table 5.6 gives an idea of the shock of fluctuations in a variable caused by shocks on other variables. The variance decomposition is calculated for the third, sixth and the tenth years.

Table 5.6: Variance Decomposition of Base Model [Ordering reflects Cholesky ordering]

Variable	Period	Decomposition			
		BASE MODEL			
		SE	RGDP	INF	M2
RGDP	3	0.0304	93.7279	0.6969	5.5750
	6	0.0360	74.99	2.7217	22.2853
	10	0.0405	63.128	2.7478	34.123
INF	3	0.6343	27.5833	62.8690	9.5476
	6	0.6903	32.7739	56.7958	10.4301
	10	0.7059	32.9655	55.7653	11.2691

Source: Derived from the VAR Base Model Regression

The variance decomposition demonstrate that money supply shocks are a very important source of fluctuations in real GDP, accounting for 34.12% shocks in real GDP in the longer horizon of ten years. Real GDP own shocks account for most of the shocks, 93% in the third year and 63% in the tenth year.

In the case of inflation too, own shocks account for most of the shocks, 62.8% in the third year and 55.7% in the tenth year. Money supply accounts for only 9.5% of the shocks in inflation in the third year and 11% in the tenth year. This suggests that money supply can affect real GDP but has little effect on inflation.

5.3.2 Results and Analysis of the Base VAR Model Adjusted for Lending Rate

In order to analyze the effect of the traditional interest rate channel, the real lending rate (Lrate) is added to the base model to do a VAR model on four variables: dlog(rgdp), dlog(inf), dlog(m2), dlog(lrate). The real lending is equal to the bank lending rate minus inflation in the same period. This allows for a consideration of how money supply affect lending rates, how lending rates affect real GDP and inflation, and how much change there is in the impact of money on real GDP and inflation after controlling for the role of lending rate. The VAR ordering is RGDP, INF, LRATE and M2 as the endogenous variables. This reflects the fact that a change in money supply will affect lending rate which will, in turn, affect investment. According to the traditional Keynesian economics, an increase in real interest rate discourages investment and eventually leads to a decrease in real output.

Granger Causality / Block Exogeneity Tests: Lending Rate Channel

This section presents the granger causality analysis for the extended lending rate model and the rationale is to find out if lagged values of real GDP, inflation, lending rate and broad money supply contain any information that could predict real GDP, and inflation.

Table 5.7: Granger Causality Wald tests Result for VAR (Lending Rate Channel)

DEPENDENT VARIABLES	EXPLANATORY VARIABLE(S)			
LENDING RATE MODEL				
	RGDP	INF	LRATE	M2
RGDP	-	0.4258	0.8678	0.0353
INF	0.0001	-	0.0335	0.3316

Entries are P-Values for the χ^2 Test

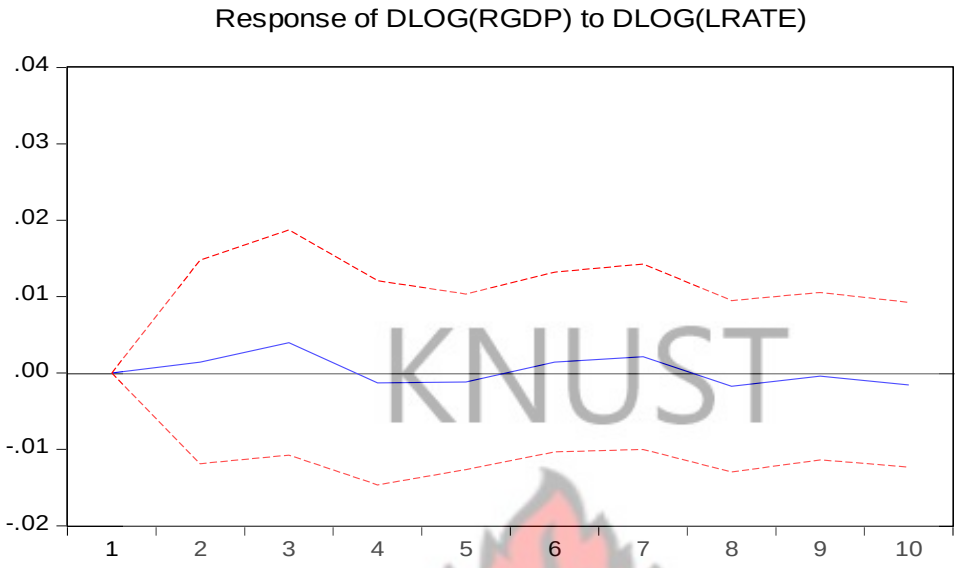
The Granger causality tests show that with the addition of the lending rate to the base model, money supply still Granger causes real GDP; past movements of lending rate do not help to predict current output but it is useful in the forecast of inflation. The relationship between these variables is clearly illustrated by the impulse response function graphs.

Impulse Response Functions: VAR (Lending Rate Channel)

According to traditional Keynesian economics, an increase in real interest rate discourages investment and consequently leads to a decrease in output. That is, there is a negative relationship between interest rate (as cost of investment) and output. However, in the case Ghana, the 95% confidence interval band in figure 5.4a is roughly around 0 indicating a mild evidence to conclude about the effect of lending rate on output. Though, the initial increase in the lending rate adduces a puzzle because output increases mildly from period 1 to period 3. In the rest of the periods output hovers around the 0 line providing enough evidence of the insignificance of the lending rate channel. A leading explanation is could be that high real interest rate may be a sign of a booming economy because the economy is a good place to invest during a boom (the real GDP averaged 7.2% for the past ten years).

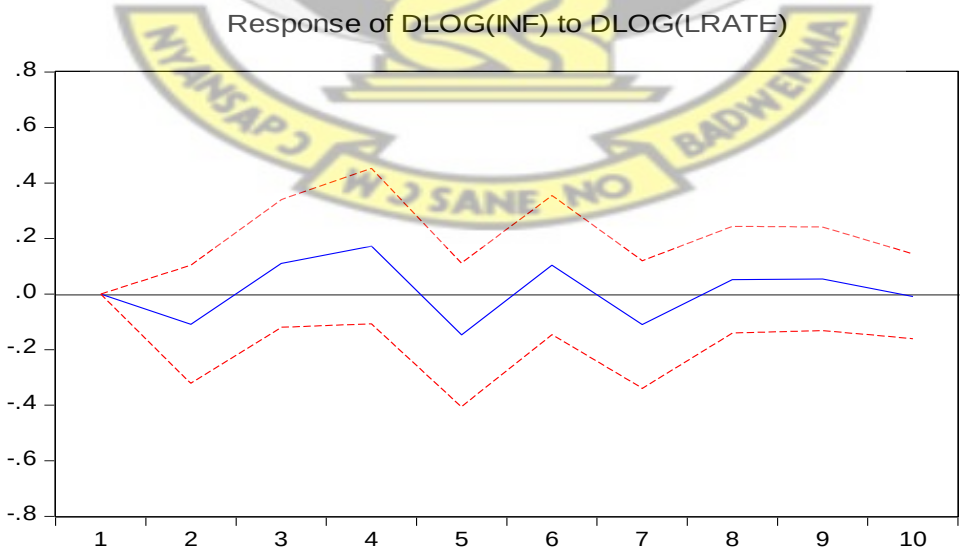
Since investment demand is more cyclical than income and savings (it increases more than income and savings in booms), that leads in the logic of the theory of higher real interest rates, higher savings, and higher investment in boom hence an increase in output.

Figure 5.4a: Response of real GDP to Lending Rate.



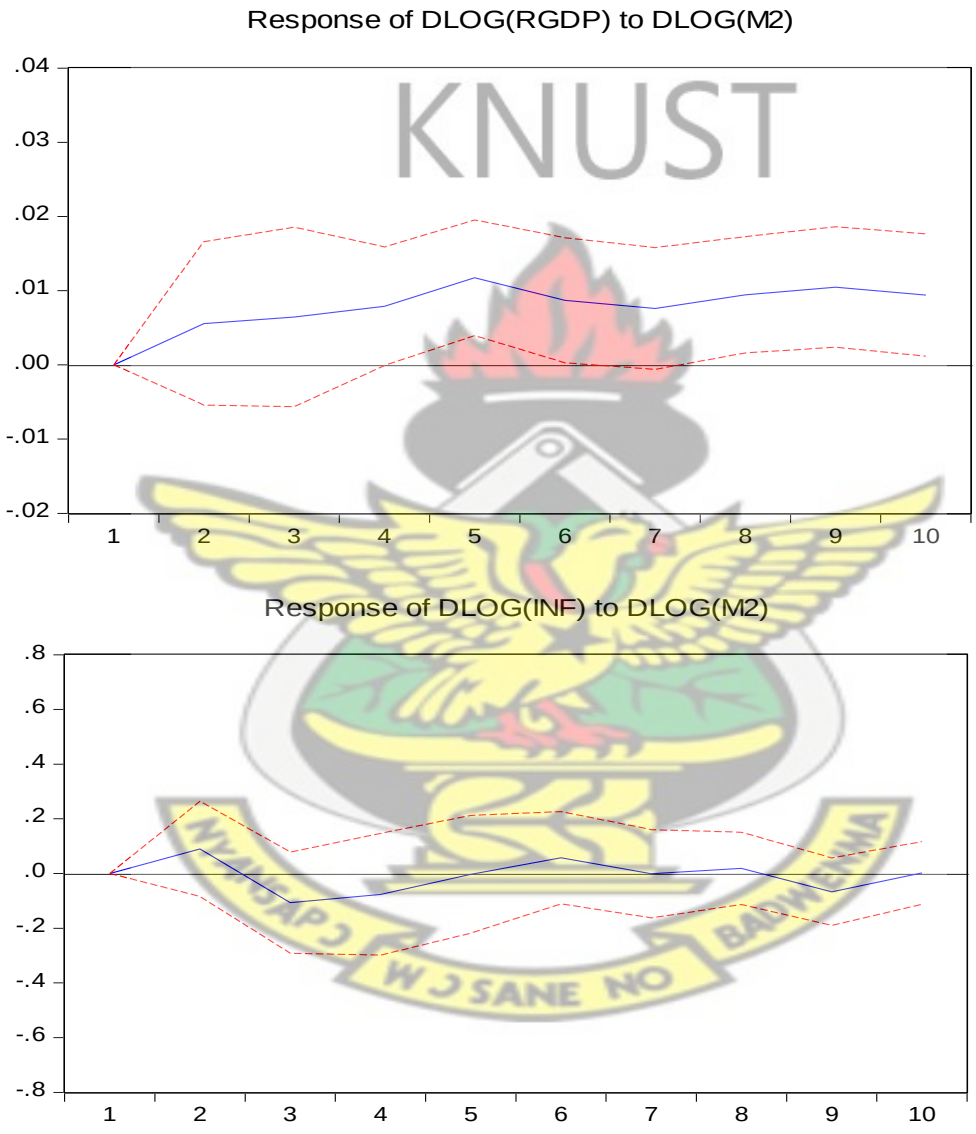
Though the granger causality indicates causality running from lending rate to inflation, the IRF does not show a clear direction of such causality. The 95% confidence interval band is undulating throughout the forecasted period. From year one to year two, an increase in lending rate results in a fall of inflation. In year three to five, there is a clearer proof that inflation increases when lending rate is set higher. The finding is indicative of the economy following a business cycle of boom and bust periods.

Figure 5.4b: Response of Inflation to Lending rate



Moreover, figure 5.4c below also shows that in the case of real GDP, a shock to money has almost the same impact on real GDP whether or not we control for interest rate movements. Money supply has little positive impact on inflation when controlling for the lending rate and from the second year onwards the impact is negative after which it dissipates.

Figure 5.4c: Responses of Real GDP and Inflation to Broad Money (M2) with lending Rate



Forecast Error Variance Decomposition: VAR (Lending Rate Channel)

By adding the lending rate to the basic model, the variance decomposition in table 5.8 shows that about 7%, 24% and 36% of the shocks in real GDP after three, six and ten years were due to shocks in money supply. These values are higher than that in the basic model of the effects of money on real GDP. Moreover, the real lending rate accounted for only 1.62% to 1.7% of the shocks in real GDP for both the short term of three years and longer term of ten years which suggests that the significance of the of the interest rate channel may be small. Again, the real lending rate accounted for 5.66%, 15 and 17%% of the shocks to inflation for the forecasted periods three, six and ten years. This also suggests that the pass through of real lending rate to inflation is small. Most of the changes in real GDP and inflation are still own shocks.

The following reasons might be helpful in explaining the ineffectiveness of the interest rate channel: There is weak correlation between the discount rate and commercial banks interest rate. Kovanen (2011) concludes that in Ghana, wholesale market interest rates respond to changes in the prime rate, but these responses are not immediate but instead gradual and full convergence is achieved only over a longer period of time. He adds that the substantial and prolonged deviations in the markets rates from the policy interest rate raise questions about the BoG's effectiveness in targeting a short term money interest rates. Brownbridge et al (1996) also asserts that financial sector policies in Ghana were characterized by severe financial repression. This could be a contributory factor to the ineffectiveness of the lending rate channel.

Again, because of weak competition banks, interest rates remain high and there is low levels of financial intermediation and demonetization (average given credit to GDP in 1980-2012 was approximately 9%, WDI 2012). Buchs et al (2005) examined the degree of competitiveness and efficiency in the Ghanaian banking system and conclude that Ghana banking system is characterized by monopolistic competition, similar to other banking systems in the region (such as Kenya, Nigeria, and Uganda). High financing needs of the government often lead to a heavy reliance on government bonds as a steady chance of profits for the banks, thus undermining competition between banks over private customers. The study further asserts that the incomplete pass-through, sluggish and asymmetric adjustments of commercial banks' interest rates in the region is due in part to the lack of intense competition within the banking sector and between banks and non-bank financial intermediaries.

Table 5.8: Variance Decomposition [Ordering reflects Cholesky ordering)

Variable	Period	Decomposition				
MODEL WITH LENDING RATE						
		SE	RGDP	INF	LRATE	M2
RGDP	3	0.0330	91.267	0.4777	1.6252	6.6294
	6	0.0388	73.094	2.3221	1.5150	23.837
	10	0.0439	60.111	2.3437	1.7075	35.837
INF	3	0.6490	45.399	44.317	5.6697	4.6133
	6	0.7459	43.022	36.364	15.475	5.1376
	10	0.7794	41.689	35.712	17.101	5.4968

Source: Derived from the VAR Lending Rate Model Regression

5.3.3 Results and Analysis of Base Model Adjusted for Domestic Credit

To analyze the credit channel, the domestic credit variable is added to the base VAR model to run a VAR model on four variables: dlog(RGDP), dlog(INF) ,dlog(CREDIT) and dlog(M2). The ordering is based on the assumption that an increase in the money supply will lead to an increase in credit and eventually to an increase in aggregate demand and GDP.

Granger Causality / Block Exogeneity Tests: VAR (Domestic Credit Channel)

This section presents the granger causality analysis for the extended domestic credit model and the rationale is to find out if lagged values of real output, inflation, domestic credit and broad money supply contain any information that could predict real GDP and inflation.

Table 5.9: Granger Causality Wald Tests for the Extended Domestic Credit model

DEPENDENT VARIABLE	EXPLANATORY VARIABLE(S)			
DOMESTIC CREDIT MODEL				
	RGDP	INF	CREDIT	M2
RGDP	-	0.3882	0.6948	0.0131
INF	0.0043	-	0.4011	0.4364

Entries are P-Values for the χ^2 Test

The Granger causality test indicates that money supply still Granger causes GDP at 5% significance level. However, domestic credit does not cause real GDP and inflation. The specific effect of domestic credit on real GDP and inflation can be considered by the impulse response functions and forecast error variance decomposition calculation.

Impulse Response Functions: VAR (Domestic Credit Channel)

The IRF demonstrate clearly the positive relationship between inflation and domestic credit to the economy from the first year to the second year. Inflation increases as a result from growth in domestic credit and reaches the highest level after a year. It implies that credit to the economy is an important variable to clarify the movement of inflation at least at the initial period. However, the response of inflation to domestic credit after the second year is negative and quickly dissipates from the fourth year onwards. It is not significant as the 95% confidence band fluctuates around 0.

Figure 5.5a: Responses of Inflation to Domestic Credit.

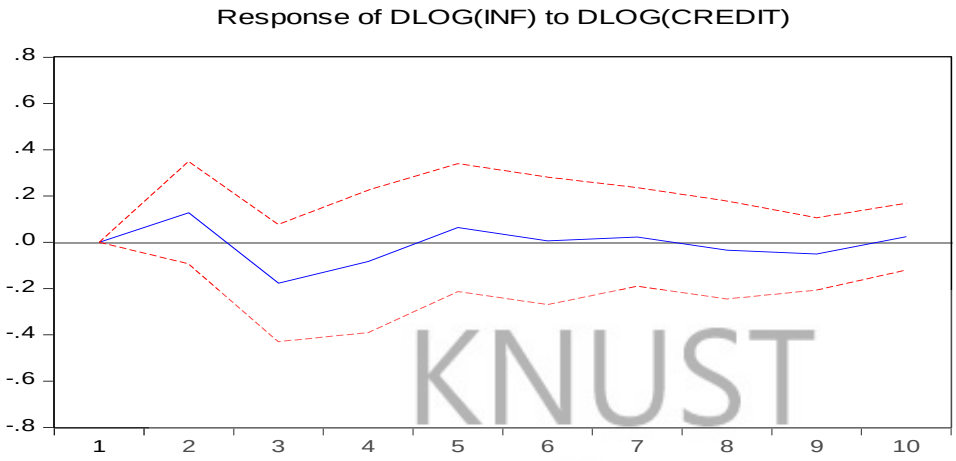
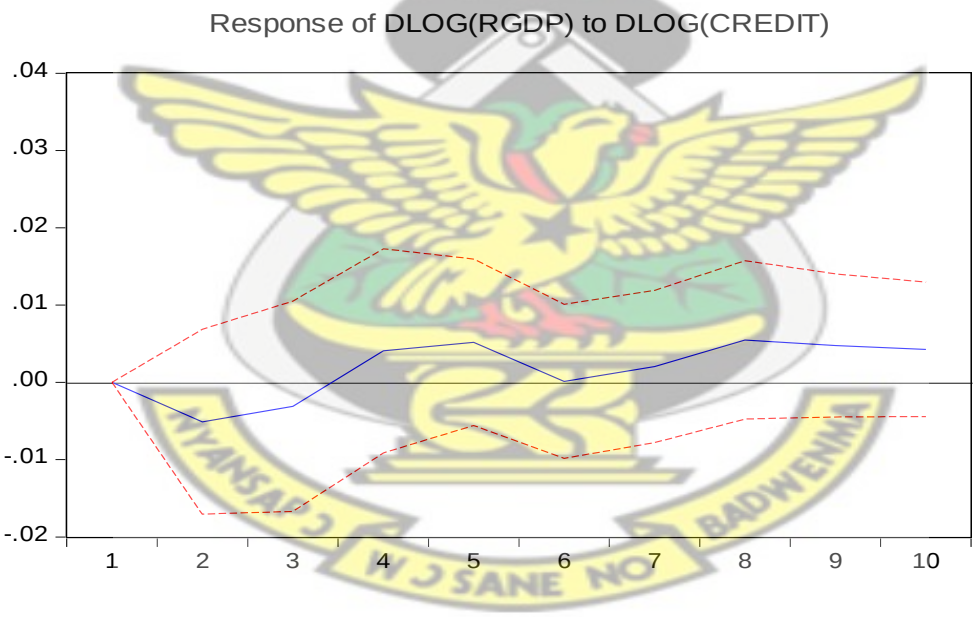


Figure 5.5b: Response of Real GDP to Domestic Credit

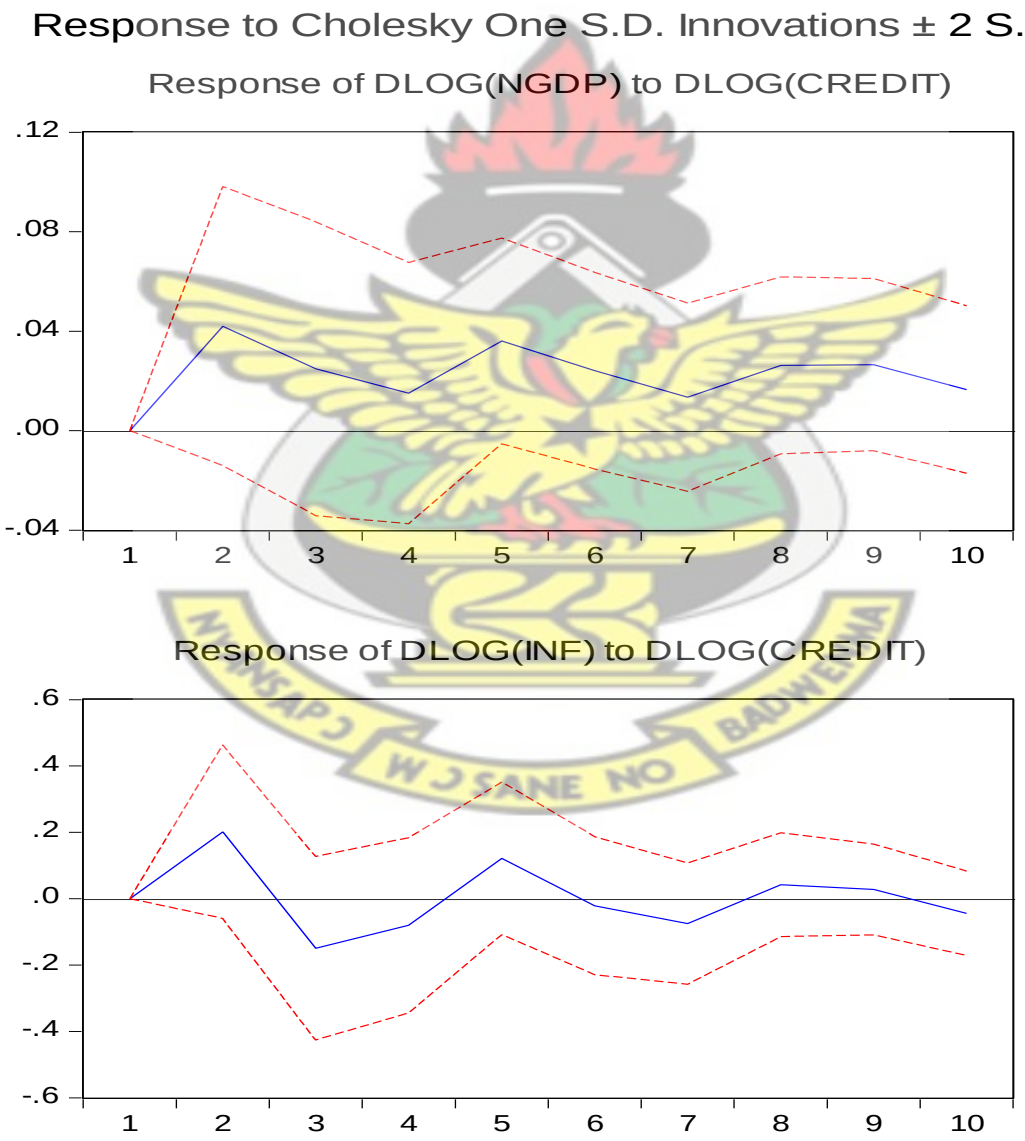


In figure 5.5b, the response of real GDP to a shock in domestic credit in the first two years is puzzling: A rise in the domestic credit obviously leads to a remarkable reduction in real output, though this is transitory. Real GDP responds positively to a rise in domestic credit after the third year. This can be explained as the distortion of price to the nominal GDP.

As in the first two years after a rise in domestic credit, both nominal output and inflation increases but the growth in nominal output is offset by the rise in inflation rate so that real output decreases.

As indicated in figure 5.5c also, both nominal GDP and inflation respond quickly to shock in credit and the implementation comes to an end after two years for inflation and three years for output indicating that this is a short term monetary policy instrument. It is also obvious from table 5.10 below that the relationship between real GDP and money supply has been weakened.

Figure 5.5.c: Responses of Nominal GDP and Inflation to Credit



Forecast Error Variance Decomposition: VAR (Domestic Credit Channel)

The variance decompositions, in table 5.10, show that after three years domestic credit accounted for 3.38% of the shocks in real GDP and 8% in a longer horizon while money supply accounted for only 4.96% of the shocks in real GDP after three years and 28% after years. Domestic credit also accounted for 8.9%, 9.2% and 9.6% of the shocks in inflation for the third, sixth and tenth years. The results indicate that the pass through of domestic credit to real GDP and inflation is sluggish.

Table 5.10: Variance Decomposition [Ordering reflects Cholesky ordering)

Variable	Period	Decomposition				
MODEL WITH DOMESTIC CREDIT						
		SE	RGDP	INF	CREDIT	M2
RGDP	3	0.0325	91.029	0.6275	3.3779	4.9688
	6	0.0379	75.379	2.4148	5.5031	16.702
	10	0.0428	60.991	2.1777	8.3924	28.438
INF	3	0.7300	40.609	46.335	8.908	4.1468
	6	0.7926	44.788	41.843	9.293	4.0740
	10	0.8073	44.642	41.512	9.693	4.1525

Source: Derived from the VAR Lending Rate Model Regression

A leading explanation for the sluggish pass through of credit to real GDP and inflation is that financial intermediation system in Ghana is not operating so as to promote economic growth. This is attributable to lack of access to medium and long-term credit at low lending rates because of the high rates of spread between lending and deposit rate (about 15% in 2012). Banks also hold a large amount of government securities, for example banks investment in Treasury bills as a share of investment increased to 59%, July 2012 from 55.3% July 2011, BoG, 2012). Bank lending has also been constrained by the high ratios imposed by the BoG, in an attempt to restrain monetary growth, Brownbridge et al (1996). Bank lending was only 5.3% of GDP, though this figure has more than tripled to 15% as at 2012 (WDI, 2012).

Another important explanation for the negative response of real GDP to domestic credit is the ineffectiveness in credit allocation and firm's investment. Financial sector policies were characterized by severe financial repression, real interest rates were steeply negative and most of the credit was directed to the public sector, Brownbridge et al (1996).

5.3.4 Results and Analysis of the Base Model Adjusted for Exchange Rate

In order to analyze the effect of the exchange rate channel, the real effective exchange rate is added to the base model to do a VAR model on four variables: dlog(RGDP), dlog(INF), dlog(REER) and dlog(M2) with three lags as suggested by the Akaike Information Criterion (AIC) (appendix 2). The ordering of the variables as Real GDP, inflation, real effective exchange rate and money supply as endogenous variables emanates from the assumption that expanding money supply would lead to a depreciation of domestic currency, thus boosting net exports and aggregate demand.

Granger Causality / Block Exogeneity Tests: VAR (Exchange Rate Channel)

The Granger causality test show that by adding the exchange rate to the base model, money supply does not Granger cause real GDP. The real effective exchange rate also misses Granger causing real GDP and inflation. This suggests that the past movements of real effective exchange rate were not likely to contain predictive information on the current values of real GDP and inflation.

Table 5.11: Granger Causality Wald tests for the Model with Exchange Rate

DEPENDENT VARIABLE	EXPLANATORY VARIABLE(S)			
MODEL WITH EXCHANGE RATE				
	RGDP	INF	REER	M2
RGDP	-	0.5964	0.1730	0.0657
INF	0.2361	-	0.4617	0.1358

Entries are P-Values for the χ^2 Test

Impulse Response Functions: VAR (Exchange Rate Channel)

The impulse response function, as indicated in figure 5.6a shows that a positive shock to the real effective exchange rate (real appreciation) leads to a decrease in output. The dwindling trend in real output continues throughout the forecast horizon of ten years. A leading explanation for this phenomenon is that an expansionary money supply increases the price level and makes domestic goods relatively more expensive than foreign goods so that imports are stimulated while exports reduces. The consequence is dwindled real output growth as shown by the IRFs.

Another possible explanation is the view held by Hirchschman (1949) that currency depreciation gives with one hand, by lowering export prices, while taking away with the other hand, by raising import prices. If trade is in balance and the terms of trade are not changed, these price changes offset each other. But if imports exceed exports, the net result is a reduction in real income within the economy.

Figure 5.6a: Response of Real GDP to Real Effective Exchange Rate

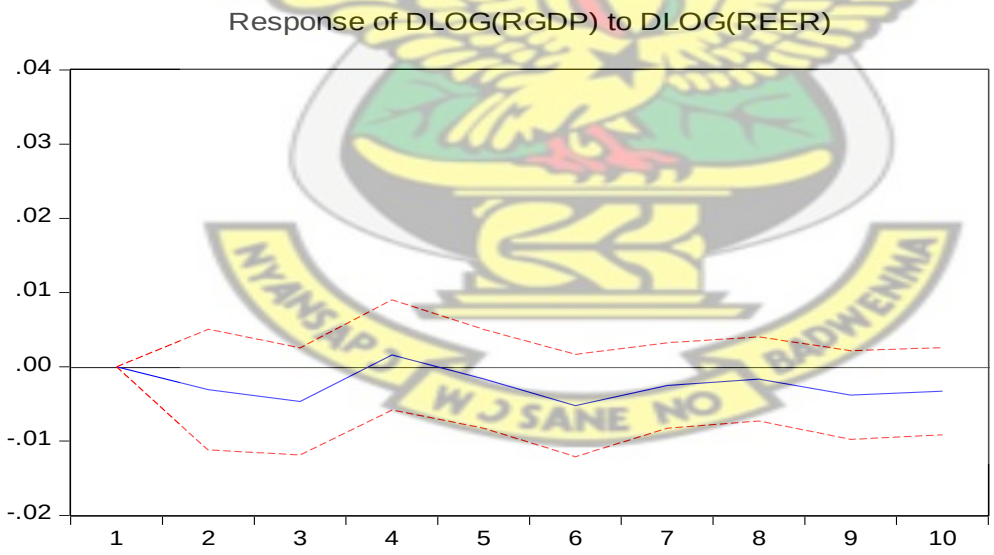
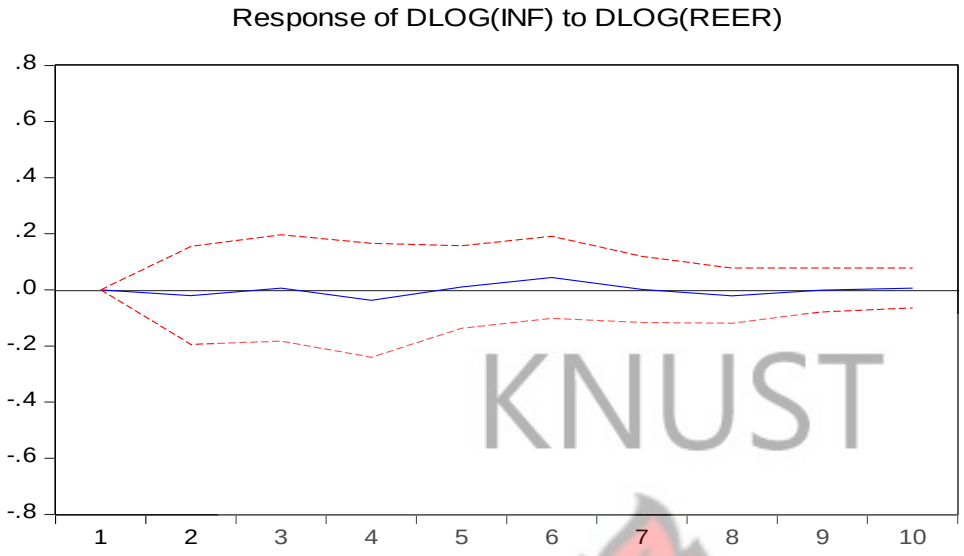


Figure 5.6b: Response of Inflation to Real Effective Exchange Rate



The response of inflation to a positive shock on real exchange rate is rather negligible as indicated in figure 5.6b. The pass through of real effective exchange rate to inflation is very weak.

Forecast Error Variance Decomposition: VAR (Exchange Rate Channel)

The Variance Decomposition, in table 5.12, shows that the real effective exchange accounts for only 3.5% and 6.6% of the fluctuations in real GDP for short term and longer term respectively, suggesting that its effect has not been effective. Although, the real effective exchange rate contributes a higher explanation to the output growth in the tenth year; almost 7%, it is still small compared to other factors. Real effective exchange rate appeared to contribute little to the shocks in inflation accounting for less than 1% for the ten year forecasted period. Although response of real GDP to its own shocks of 91.6% reduces by 2% as compared to that in the base model of 93.7%, the results continue to show that current real GDP and inflation are largely predicted by their past movements. In particular, own shocks account for more than 91.6% change in real GDP and over 61% change in inflation.

Table 5.12: Variance Decomposition [Ordering reflects Cholesky ordering)

Variable	Period	Decomposition				
MODEL WITH EXCHANGE RATE						
		SE	RGDP	INF	REER	M2
RGDP	3	0.02975	91.6993	2.00	3.5127	2.7829
	6	0.03421	79.4643	2.4954	5.4380	12.602
	10	0.03836	68.9697	3.3808	6.6657	20.983
INF	3	0.6597	27.1381	61.496	0.1040	11.261
	6	0.7043	31.5073	55.134	0.7899	12.508
	10	0.7079	31.5678	54.931	0.8794	12.621

Source: Derived from the VAR Exchange Rate Model Regression

5.4 Hypotheses Test Results

The results of the four hypotheses stated and tested in the study are presented as follows.

Hypothesis Test Result of the VAR Base Model

The hypothesis tested was that broad money supply has a significant impact on real GDP and inflation. The joint Wald Test of the significance of the previous values of money having effect on output has been confirmed at 5% level of significance with a p-value of 0.0073% but the past values of money could not help predict the current level of inflation with a p-value of 0.32%. [See Appendix 4]

Hypothesis Test Result of the VAR (Lending Rate Channel)

Lending rate has a significant impact on real GDP and inflation was the hypothesis tested. The Null Hypothesis of the insignificance of lending rate in explaining the current level of output has been confirmed at 5% level of significance with a p-value of 0.86%.

This means that changes in lending rate was not likely to contain any predictive information on changes in real output. At the same time, the past values of lending rate are significant in explaining the current level of inflation with a p-value of 0.03% at 5% level of significance. [See Appendix 4]

Hypothesis Test Result of the VAR (Domestic Credit Channel)

The hypothesis tested was that domestic credit has a significant impact on real GDP and inflation. With a joint Wald test p-value of 0.69% and a significance level of 5%, previous values of domestic credit does not contain any predictive information on changes in output. The previous values of credit also fail to explain current level of inflation with a p-value of 0.40% and 5% level of significance. [See Appendix 4]

Hypothesis Test Result of the VAR (Exchange Rate Channel)

The exchange rate has significant effects on output and inflation was the hypothesis tested and this has been refuted at 5% significance level with p-values of 0.17% and 0.41% values respectively. This means that previous values of exchange rate do not help to explain present values of output and inflation. [See Appendix 4]

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.0 Introduction

This chapter presents a brief overview of the preceding chapters covered in this study. It covers the summary of findings, conclusions, recommendations and suggestions for future study.

The objectives of the study were to determine the relationships between the monetary policy instruments, real GDP and inflation in Ghana; to examine the effectiveness of the various monetary policy instruments used by the Bank of Ghana and to estimate the impact of monetary policy instruments shocks on real GDP and inflation in Ghana. Yearly data spanning 32 years were analyzed using the technique of vector autoregression.

6.1 Summary of Major Findings of the Study

The hypothesis tested in the study was that real GDP and inflation are significantly affected by shocks in monetary policies; however, the joint Wald test revealed that only money supply (M2) has a significant impact on real GDP. The previous values of lending rate, domestic credit, and exchange rate were not likely to contain any predictive information on changes in real GDP. The test also revealed that only lending rate contains predictive information on the current level of inflation.

In the base model, previous values of real GDP and inflation themselves make the largest contribution to the current change in real GDP and inflation. In the base model, about 94% of the real GDP variations are explained by its own shocks. This explanatory value becomes smaller in the extended models but still accounts for the largest part. This means that if the current value of the real GDP is high, it is often anticipated that the future value of real GDP will be high as well. This trend in real GDP movement might be expatiated by the behavior of the economy following a business cycle of boom and bust and each lasts for several years, hence previous real GDP can be used to forecast the future. Again, in the ten year period forecasted horizons of inflation, own shocks accounts for 59% on average.

This is suggestive of the tardy response of monetary policy which slows down the policy's sensitiveness to changes in the macroeconomic environment. As a result, inflation rate often stays high for a long time before being controlled by the Bank of Ghana.

The impulse response functions show that the money supply channel has a positive impact on real GDP and inflation. Innovations to money supply in a broadened horizon account for 34% and 11% fluctuations in real GDP and inflation. Money supply, therefore, seems to have a predictive power for real GDP and inflation, though the effect on inflation is weak. This finding renders mild confirmation of the classical view which posits that impulse run from money supply to prices (Friedman and Schwarts, 1963).

Secondly, from the analysis above both inflation and real GDP have very little response to fluctuation in lending rates. This observation implies that interest rate as a monetary transmission mechanism is not efficient accounting for only 1.6% fluctuations in output and even for a longer horizon the effect is not still much felt, accounting for only 1.7%. However, the effect of lending rate on inflation is somewhat impressive accounting for about 6% of the fluctuations in inflation and in the longer horizon accounting for about 15% to 17%.

Thirdly, the credit channel which accounts on average for about 8% of the movements in real GDP and about 9% inflation does not also seem to have a large influence on the economy. However, the response of the real GDP to changes in domestic credit is not expected because it is distorted by seemly high inflation rates. Although, it is widely accepted that economic growth and inflation often go together in order to stimulate economic activities using credit tool but the channel does not seem to have significant impact on the real GDP and inflation.

Furthermore, the exchange rate channel is noted to be the most important transmission channel in small open economies with floating exchange rate. However, similar to the interest rates channel in this study both real GDP and inflation responds slowly to the real effective exchange rate. Innovations in the real exchange rate account for 3.5% to 6.9% for the movements in real GDP; and 0.15% to 0.8% for inflation. The IRFs in figure 5.6a show a decrease in real GDP from the first to the third year, though it is only about 3.5%, and 7% (for a longer horizon) of the changes in real effective exchange rate as shown by forecast error variance decomposition.

Response of inflation to shocks in exchange rate is entirely negligible and reported as below 1% by the forecast error variance decomposition for the forecast period of ten years.

In all, similar to the credit and interest rate channels, both real GDP and inflation respond slowly to exchange rate policy. It is also obvious that the exchange rate policy does not show any remarkable effect on macro economic variables. This may be attributed to the fact that the exchange rate is still not flexible enough to adjust itself to real output shocks—there is huge exchange rate intervention by the Bank of Ghana when the foreign currency (USA dollar) appreciates. In the view of Radzyner and Riesinger (1997), a pegged or fluctuation with narrow bands exchange rate reduce the possibility of using exchange rate as an effective monetary policy instruments.

Last but not least, in analyzing the banking system in Ghana, it is imperative to note that there is a constraint in the conduct and implementation of monetary policy which hinges on the independence of the Central Bank. Central bank independence is the most prominent example of delegation of macroeconomic policy making in the vast majority of countries. It refers to the central bank's freedom from political influence in the achievement of its monetary policy goals. While there is a general consensus among economists that government should be involved in setting the goals of monetary policy, the central bank must be given the space to pursue those goals.

Monetary policy and fiscal policy are complementary, and the two policies interact at the point of financing of the budget. When the fiscal policy is solvent, monetary policy is truly independent in achieving its stated objectives. However, when government runs a large fiscal deficit, monetary policy is dominated by the fiscal such that achieving its objectives becomes secondary to meeting the financing needs of the government. Governments, for political reasons, often tend to exploit the short-run trade-off between output and inflation by running large budget deficits that they fund by borrowing from the central government. This tendency of the government to create inflation at-will can be a source of macroeconomic instability within the country. For this reason, an independent and longsighted central bank is needed to restrain the politician.

Radzyner and Riesinger (1997) in the research for some transition countries in Europe claim that "high degree of legal central bank independence in the Central and Eastern European Countires-5…was and still necessary to build up the needed credibility of monetary policy in a period of economic transformation and stabilization". This is suggestive of the need for a more independent, responsible and powerful Central Bank of Ghana in planning and conducting monetary policy.

6.2 Conclusions

The principal objective of this study is to estimate the responses of real output to monetary policy instruments shocks in Ghana using the technique of vector autoregression. Theoretical and empirical foundations were established to ensure that results obtained could be interpreted within conventional research requirements. A number of revelations emerged from the study.

Since the broad money (M2) is one of the announced operating targets of the Central Bank of Ghana, shocks to the broad money supply (M2) was identified as monetary policy innovations.

Overall, the granger causality, the impulse response functions (IRFs) and the forecast error variance decomposition (FEVD) reveal that real GDP reacts immediately and significantly to expansionary money supply shock. Also, the lending rate channel appears to be strong for transmitting price level disturbances. Finally, the analysis reveal that the real effective exchange rate, domestic credit, and lending rate channels are not important sources of real GDP fluctuations at least over the sample period under study.

6.3 Recommendations and Policy Implications

In order to provide monetary policy in an effective way, the Bank of Ghana should possess a thorough understanding of the monetary policy transmission. As a whole, the VAR approach analysis has found a weak impact of monetary policy instruments to inflation and real GDP. The monetary policy instruments still lack effectiveness as they are not operating properly.

Ameliorating the performance of these channels will be so imperative for a successful transition to a full-fledged inflation targeting monetary policy framework in Ghana. Though the Bank of Ghana has come a long way in developing the whole arsenal instruments of monetary policy, there are still some limitations. The following recommendations are, therefore, adduced.

1. The results indicate that more expansionary monetary policy has modestly positive effects on real GDP without having large impacts on inflation. The implication is that a more expansionary monetary policy is both feasible and can have positive impacts on real GDP without having significantly negative effects on inflation and economic growth. To this effect, Ghanaian authorities need to implement a set of policies geared towards improving investment efficiency and bolstering consumption. In addition to this, other complementary policies such as vibrant financial market policies might be helpful as well. In this direction, an establishment of strong primary and secondary bonds markets that can also increase the efficiency of monetary policy and reduce the government's need to rely on the central bank for direct financing is highly recommended.

2. Using the credit tool, The Bank of Ghana should loosen its credit ceilings to support credit expansion for economic growth. This will result in a more rapid expansion in credit which can lead to somewhat more rapid real GDP growth. The Bank of Ghana should develop a more active approach to credit policies to support lending by micro finance institutions and rural banks to ensure effectiveness of the credit channel. This will ensure higher integration of economic agents in the banking system.

3. The interest rate (lending rate) should be more liberalized so that it can reflect the supply and demand of the money market better. Interest rate should be controlled in a more responsive way to catch up with inflation rate as well as to mitigate bad effects on the economy. Increasing rate of inflation should accompany increase in lending rates and vice versa. The Bank of Ghana should also see to it that there is a strong correlation between the prime rate and commercial banks interest rates. The sizable structural excess reserves of the banking system should be removed using sales of longer maturity securities and foreign exchange operations.

4. The Bank of Ghana should continue enticing reputable foreign banks, especially Islamic Banks, into the Ghanaian market with a view to importing banking expertise, increasing competition and efficiency of bank operations and lowering interest rate spreads among commercial banks. In the medium term, this is capable of enforcing the deepening of financial intermediation which will be crucial to strengthening the interest rate and bank lending channel.

5. Another useful exercise would be to ensure that government policies emanating from the exchange rate channel aim at striking the right balance between necessary flexibility to ensure competiveness and desirable stability to increase confidence in the domestic currency and the underlying fundamentals that provide support to the currency's value overtime. According to Ghosh et al (1996), floating exchange rates bring higher economic growth rates. Therefore, widening the trading band for official exchange rate is appropriate.

6.4 Practical Limitations of the Study and Suggestions for Future Research

In undertaking a study of this kind, a number of caveats need to be taken into account while interpreting the results. The first weakness has to do with the VAR technique employed in this study. Most often than not, econometric techniques employed in analyzing level relationships among variables may be replete with limitations for policy recommendations. The results from these techniques may be divergent from the many theoretical underpinnings of level relationships. The implication is that their interpretations may be misleading. Moreover, even if the results are in tangency with theoretical foundations, the fact that different econometric software report different critical values depending on the sample size employed may lead to the failure of rejection of a null hypothesis, even if they are untrue.

Secondly, the study is limited in a way that some important data is not available. Due to missing of past data on real exchange rate, lending rate and domestic credit the research could only be carried out since 1980-2012. More importantly, in the regression model, due to difficulty in obtaining data on domestic credit, the data on domestic credit to private sector as a percentage of GDP has been used instead but this sometimes does not perfectly represent the true credit to the private sector.

These limitations offer important guidelines and suggestions for future research purposes. For example, further studies could be undertaken on a longer horizon time scale if supportive data is available. In this case more lags can be applied to have a conspicuous picture of the response of real GDP and inflation to monetary policy shocks.

Again, the study was devoid of any exogenous variable and as such other exogenous variables such as oil price in the world and the US federal funds rate may be considered in the model.

Moreover, a different shock variable (M2 was used in this study) such as M2+ could be used as a measure of monetary policy shock and as part of a different variable mix in addition to the Treasury bill rate.

Additional research can clarify the distinctive potency of the effects of monetary and fiscal policies on real output and price level.

Finally, as an area for further research, the analysis could resort to the use of co integration and error correction techniques to adduce a clearer picture of the short run and long run effects of monetary policy on real GDP and inflation using the same or different variable mix. Also, monthly data could be used, if available, so as to capture large variation in the data which is suited for co integration and error correction techniques.

BIBLIOGRAPHY

Abdul Qayyum (2006): "Money, Inflation and Growth in Pakistan". The Pakistan Development Review 45:2, MPRA Paper No. 2058. Pp.203-212.

Adebiyi, M.A., (2006):" Financial Sector Reforms And The Transmission Mechanism Of Monetary Policy In Nigeria": A Vector Auto-Regression Mechanism China Finance Research Network (CFRN).

Adei (2013): http://www.ghanabusinessnews.com/2013/05/10/ghana-a-middle-income-country-with-low-income-characteristics/#sthash.YzooavOL.dpuf

Ajayi, R.A.,(1974):"An Econometric case study of the relative importance of monetary and fiscal policy in Nigeria". The Bangladesh economic review.2 (2):559-576.

Ajisafe, R.A. and B. Folorunso (2002): "The Relative Effectiveness of Fiscal and Monetary Policy in Macroeconomic Management in Nigeria". The African Economic and Business Review, 3(1): 23-40.

Al- Mashat, R and A. Billmeier (2007): "The Monetary Transmission Mechanism in Egypt". IMF Working Paper No. WP/07/287. International Monetary Fund.

Al-Fawwaz, M. T. And K.A. Mohammed (2012): "Output, Money and Prices: The Case of Jordan". International Business Research: Vol. 5, No. 12. Canadian Center of Research and Education.

Al-Rajoub, S. (2004): "The Output Effect of Monetary Policy in Jordan: Using VAR". Dirasat Administrative Sciences, 31(2), 423-438.

Ando A. and F. Modigliani (1965): "The Relative Stability of Monetary Velocity and the Investment Multiplier", *American Economic Review*, Vol. 55, p.693-728.

Asteriou, D and Hall, S. G. (2007): "Applied Econometrics". Palgrave Macmillan: New York.

Azam, J.P., (2011): “Inflation and macroeconomic instability in Madagascar”. African Development Review, 132.Dec:175-201

Bacchetta, P. and F. Ballabriga. (2000): “The Impact of Monetary Policy and Banks’ Balance Sheets: Some International Evidence”. Applied Financial Economics, 10, 15-26.

Barro (1996): “Inflation and Growth”. Federal Reserve Bank of St. Louis Review, volume 78. Pp 153-109.

Balogun, E. (2007): Monetary Policy and Economic Performance of West African Monetary Zone Countries. MPRA Paper No. 3408.

Bawumia, M., P. Abradu-Otoo and B. Amoah (2003): “An Investigation of the Transmission Mechanism of Monetary Policy in Ghana: A Structural Vector Error Correction Analysis”. Bank of Ghana Working Paper. WP/BoG 2003/02.

Bernanke, B. and M. Gertler(1995): “Inside the Black Box: The Credit Channel of Monetary Policy Transmission”. Journal of Economic Perspectives, 9, 4, 27-48.

Blanchard, O. (2004): “Fiscal Dominance and Inflation Targeting: Lessons from Brazil”. NBER Working Paper No. 10389.

Bogunjoko, J.O. (1997): “Monetary Dimension of the Nigeria Economic Crisis”. Empirical Evidence from a Co-Integrated Paradigm. Nigeria Journal of Economics and Social Studies, 39(2): 145 – 167.

Boivin, J., and M. Giannoni (2002): "Assessing Changes in the Monetary Transmission Mechanism: A VAR Approach," Federal Reserve Bank of New York Economic Policy Review, 8.

Brownbridge, M. and Gockel, A. F. (1996). “The impact of financial sector policies on banking in Ghana”. Research Department of Bank of Ghana.

Buchs, T. and Mathisen, J. (2005). "Competition and efficiency in banking: Behavioral evidence From Ghana". IMF Working Paper WP/05/17. International Monetary Fund.

Cardia. E. (1991): The dynamics of small open economy in response monetary, fiscal and productive shocks. Journal of Monetary Economics, 28:411-434.

Charemza, W.C., and Deadman, D. F. (1992): "New Directions in Econometric Practice", Edward Elgar Publishing, London.

Cheng K.C. (2006): "A VAR Analysis of Kenya's Monetary Policy Transmission Mechanism: How Does the Central Bank's REPO RateAffect the Economy?". International Monetary Fund African Department Working Paper: WP/06/300.

Chimobi, O.P. And U.C. Uche (2010): "Money, Price and Output. A Causality Test for Nigeria". American Journal of Scientific Research, 8: 78-87.

Christiano, L., M. Eichenbaum, and C. Evans. (1996): "The Effects of Monetary Policy Shocks: Evidence from the Flow of Funds". The Review of Economics and Statistics, 7, 1, 16-34.

Coates, K. and E. Rivera. (2004): "Fiscal Dominance and Foreign Debt: Five Decades of Latin American Experience". CEMILA Paper.

Cudjoe, E.A., (2004): "Inflation in Ghana".

De Bondt, G. (2000): "Financial Structure and Monetary Transmission in Europe – A Cross Country Study". Cheltenham: Edward Elgar.

Diamond, R. (2003): "Irvin Fischer on the international transmission of boom and depression through money standard". Journal of Money, Credit and Banking. Vol. 35, Pp.49 online edition.

Dickey, D.A. and Fuller, W.A. (1981):"Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root". Econometrica, 49, pp. 1057-72.

Dickey, D.A. and Fuller, W.A. (1979):"Distribution of the Estimators for Autoregressive Time Series with a Unit Root". Journal of the American Statistical Association, 74, pp. 427-31.

Dickey, D.A., and Fuller, W.A. (1981): "Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root", Econometrica, 49:1057-1072.

Disyatat, P., and Vongsinsririkul, P. (2003): "Monetary policy and Transmission Mechanism in Thailand", the Journal of Asian Economics, 14,389-418.

Doldado, J., Jenkinson, T. and Sosvilla-Rivero, S. (1990): "Cointegration and Unit Roots". Journal of Economic Surveys 4, pp. 249-73.

Easterly, (2001): "The elusive quest for growth: Economists' Adventures and Misadventures in the tropics". Cambridge, MA: MIT Press.

Edwards, F., and F. S. Mishkin (1995): "The Decline of Traditional Banking: Implications for Financial Stability and Regulatory Policy," Economic Policy Review, 1, 27-45.

Edwards, S. (1986): "Are Devaluations Contractionary?," The Review of Economics and Statistics, 68, 501-508.

Eichenbaum, M. and C. Evance (1995): "Some Empirical Evidence of the Effects of Monetary Policy Shocks on Exchange Rates". Quarterly Journal of Economics, November, 975-1009.

Engle, R. F., & Granger, C. W. J. (1987): "Co-Integration and Error Correction: Representation, Estimation, and Testing". Econometrica, 55, 251-276.

Epstein G., Heintz J. (2006): "Monetary Policy and Financial Sector Reform for Employment Creation and Employment Reduction in Ghana", Political Economy Research Institute, University of Massachusetts, Working Paper N0.113, 2006.

Fatima, A., & Iqbal, A. (2003): "The Relative Effectiveness of Monetary and Fiscal Policies an Econometric Study". Pakistan Economic and Social Review, XLI (1&2), 93-116.

Favero, Giavazzi C., F., and L. Flabbi (1999): "The Transmission Mechanism of Monetary Policy in Europe: Evidence from Bank's Balance Sheet". NBER Working Paper No. 7231.

Fischer (1993): The role of Macroeconomic factors in Economic Growth. Journal of Monetary Economics, volume 32 page 485-512.

Folawewo, A.O. and T.S. Osinubi (2006): "Monetary policy and macroeconomic instability in Nigeria": A rational expectation approach. Journal of Social Sciences, 12(2): 93 – 100.

Friedman, B. and K. Kuttner(1992): "Money, Income, Prices and Interest Rates". American Economic Review, 82, 472-492.

Friedman M. (1956): "The Quantity Theory of Money: A restatement", in M. Friedman, editor, Studies in the Quantity Theory of Money. Chicago: University of Chicago Press.

Friedman M. and D. Meiselman (1963): "The Relative Stability of Monetary Velocity and the Investment Multiplier in the United States, 1898-1958", in Commission on Money and Credit, Stabilization Policies. Englewood Cliffs, NJ: Prentice-Hall.

Friedman, M. (1956) "The Quantity Theory of Money: A restatement", in M. Friedman, editor, Studies in the Quantity Theory of Money. Chicago: University of Chicago Press.

Friedman, M. (1968): "The Role of Monetary Policy," The American Economic Review58,1-17.

Friedman, M. and A.J. Schwartz (1963): "A Monetary History of the United States", *1867-1960*. 1971 edition, Princeton: Princeton University Press.

Faust, J. and E. Leeper (1997), "When do long run identifying restrictions give reliable results?" Journal of Business and Economic Statistics, 15, pp. 345–53.

Fry, M.J., (1997): In Favour of Financial Liberalization. Economics Journal, 107:754-770.

Ganev, G., M. Krisztina, R. Krzysztof andW. Prsemyslaw (2002): "Transmission Mechanism of Monetary Policy In Central And Eastern Europe". Centre for Social And Economic Research (CASE) (Report No. 52).

Ghosh, R.A., J.D. Ostry, and A.M. Gulde, H.C. Wolf (1996): 'Does The Exchange Rate Regime Matter for Inflation and Growth,'IMF Economics issues 2.

Gertler, M. and S. Gilchrist (1994): "Monetary Policy, Business Cycles and the Behaviour of Small Manufacturing Firms". Quarterly Journal of economics, 304-340.

Gertler, M. and S. Gilchrist. (1993): "The Role of Credit Market Imperfections in the Monetary Transmission Mechanism: Arguments and Evidence". Scandinavian Journal of Economics, 95, 1, 43-64.

Ghana Shared Growth and Development Agenda (GSGDA), 2010-2013.

Granger, C. W. J. (1983):"Cointegrated variables and error correction models". Discussion Paper, 83-13a, University of California, San Diego.

Granger, C. W. J., &Terasvirta, T. (1993): "Modelling Non-Linear Economic Relationships.Oxford". Oxford University Press.

Granger, C.W.J., & Newbold, P. (1973): "Spurious regressions in econometrics".Journal of Econometrics, 2, 111-120.

Greene, W.H. (2002): "Econometric analysis ".New Jersey: Pearson Education Inc.

Government of Ghana (2006): Growth and Poverty Reduction Strategy (GPRS II, 2006-2009).Volume 1: Policy framework, National Development Commission, Accra- Ghana, pp 14

Gujarati, D. N. (2004):"Basic econometrics". New York: McGraw-Hill Companies.

Hirschman, A.O. (1949): "Devaluation and the Trade Balance: A Note, Review of Economics and Statistics", Vol. 31, Pp. 50-53.

Hug, M.M., (1989): "The Economy of Ghana: The First 25 years since Independence". St. Martin's Press.

Hwee K.C.,(2004): A VAR analysis of Singapore's Monetary Transmission Mechanism, SMU Economics and Statistics working paper series 19.

Irfan, N., and Ume, A., (2011): Impact of Monetary Policy on Gross Domestic Product. Journal of Economics paper no. 35562. Volume 3 No. 1. Iqra University, Pakistan.

ISSER (2001-2005): "The State of the Ghanaian Economy".

Ireland, P.N., (2008): "The Monetary Transmission Mechanism". Federal Reserve Bank of Boston Working Paper No. 06-1. Palgrave Macmillan, Ltd.

Islam, M. and R. Rajam. (2009): "Bank Lending Channel of the Monetary Policy Transmission: India and the Global Financial Crisis". ISAS Working Papers No. 78. National University of Singapore.

Johansen , S. (1991):"Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Model". Econometrica, 59, 6, 1551-1580.

Johansen, S. (1988):" Statistical Analysis of Cointegration Vectors". Journal of Economic Dynamics and Control, 12, 231-254.

Johansen, S. and Juselius, K. (1992): "Testing Structural Hypotheses in a Multivariate Cointegration Analysis of the PPP and UIP for UK". Journal of Econometrics, 53, 211-244.

Johansen, S. (1992): "A representation of vector autoregressive processesintegrated of order 2". Econometric Theory, 8, 188–202.

Keynes, J. (1930): "Treatise on Money. London, Macmillan P. 90

Kim, E.H. (1999): "Was Credit Channel A Key Monetary Transmission Mechanism Following The Recent Financial Crisis In The Republic Of Korea". The World Bank Policy Research Working Paper No. 3003.

Kwakye, J.K., (2010): “Assessment of Inflation Trends, Management and Macroeconomic Effects in Ghana” .IEA, Ghana.

Kovanen, A (2011): Monetary Policy Transmission in Ghana. Does the interest Rate Channel Work? IMF working paper, WP/11/275.

Levine, R., (1997): Financial Development and Growth: Views and Agenda, Journal of Economic Literature.35:688-726.

Le, A. T. (2007): "Monetary Policy in Vietnam: Alternatives to Inflation Targeting,” Political Economy Research Institute paper.

Le, V. H., and D. P. Wade (2008): "VAR Analysis of the Monetary Transmission Mechanism in Vietnam," Applied Econometrics and International Development, 9.

Lewis, K. (1995): “Are Foreign Exchange Intervention and Monetary Policy Related, and Does it Really Matter?”.Journal of Business, 68, 2,185-214.

Lipschitz, L. (2005): “Some Simple Transfer Mechanisms”. IMF Institute Lecture Notes, International Monetary Fund.

Lozano, J (2008): “Budget Deficit, Money Growth and Inflation: Evidence from the Colombian Case”. Borradores De Economia No. 537. JEL Classification H62, E51, E31, C12.

Lüdke, U. (2000): “The Credit Channel in Germany and the UK: Differences in the Transmission of Monetary Policy?” Deutsche Bank Research, Research Notes in Economics and Statistics No.4, August, Frankfurt.

Lutkepohl, H., &Saikkonen, P. (1995):“Impulse Response Analysis in Infinite Order Cointegrated Vector Autoregressive Processes”. University of Helsinki.

MacKinnon, J.G., A. Haug and L. Michelis, 1999. Numerical distribution functions of likelihood ratio tests for cointegration. Journal of Applied Econometrics, 14(5): 563-577

Majid, M.Z.A. (2007): "Causal Link between Money, Output and Prices in Malaysia; An Empirical Re-Examination". Applied Econometrics and International Development, 7(1), 211-220.

Mankiw N.G. (2006):"Macroeconomics, 5th Edition" Thompson Southern-Western Publishers.

Mankiw, G.N., (1983): "Consumer Durables and the Real Interest Rates". National Bureau of Economic Research Working Paper No. 1148.

Mankiw, G.N., (1987): "Taxes And Capital Formation: Consumer Spending and The After Tax Real Interest Rate". National Bureau of Economic Research. Vol. ISBN: 0-226-24079-7. Pp 97-100.

Mathieson, D.J., (1980): Financial Reforms and Stabilization Policy in Developed Economics.Journal of Development Economics,7(3):359-395.

Mccallum, J., (1991): "Credit Rationing and the Monetary Transmission Mechanism, American Economic Review, 81(4):946-957.

Mckinnon, R.I., (1973): Money and Capital in Economic Development. Washington D.C., The Brooking institution.

Mills, J.S. (1929): "Principles of Political Economy". Book 3, Ashley Ed. New York.

Mishkin, F. S. (1996): "The Channels of Monetary Transmission: Lessons for Monetary Policy," BANQUE DE FRANCE BULLETIN DIGEST, 27, 33-44.

Mishkin, F. S. (1995): "Symposium on the Monetary Transmission Mechanism," The Journal of Economic Perspectives, 9, 3-10.

Mishra, P. K., Mishra, U. S., & Mishra, S. K. (2010): " Money, Price and Output: A Causality Test for India". International Research Journal of Finance and Economics, 53, 26-36.

Morsink, J., and Bayoumi, T.(2001): "A Peek Inside the Black Box: The Monetary Transmission Mechanism in Japan". *IMF Staff Papers*. Vol. 48(1), pp. 22-57.

Ocran, M. (200): "A Modelling of Ghana's Inflation Experience: 1960-2003". AERC Research Paper 169, African Economic Research Consortium. Nairobi.

Oduro, A.D., (2002): "Enhanced HIPC Initiative: Benefits and Implications ". Centre for Policy Analysis Paper, Accra.

Ogunmiyiwa and Eken (2010): Money supply-Economic Growth Nexus in Nigeria. Journal of Social Science 22(3):199-204.

Onyeiwu, C. (2012):"Monetary Policy and Economic Growth of Nigeria". Journal of Economics and Sustainable Development, 3(7): 62 -70.

Perron, P. (1990): "Testing For a Unit Rootin a Time Series with a Changing Mean". Journal of Business & Economic Statistics, 8, 153-162.

Phillips, P. C. B. and Perron, P. (1988):"Testing for a Unit Root in Time Series Regression". Biometrika, 75, pp. 335-46.

Phillips, P. C. B., &Perron, P. (1987):"Testing For a Unit Root in Time Series Regression". Cowles Foundation for Research in Economics, Yale University.

Radzyner, O., And S. Riesinger (1997): "Central Bank Independence in Transition: Legislation and Reality in Central and Eastern Europe," Oesterreichische National Bank Publication.

Rafiq, M.S. And S.K. Mallick (2007): "The Effect of Monetary Policy on Output in Emu3: A Sign Restriction Approach. Journal of Macroeconomics 30(2008) 1756-1791.

Ramaswamy, R. and T. Slok (1998), "The Real effects of monetary policy in the European Union: What are the differences?" IMF Staff Papers, 45, pp. 374–96.

Rasheed, M.A. (2011): The relationship between money and real variables: Pakistan's Experience 1972-2008.Pakistan Business Review, Jan, 2011.

Robinson (1952): The Generalization of the General Theory. In the Rate of interests and other essays, Pp: 547-582.

Romer, C. and D. Romer. (1989): “Does Monetary Policy Matter? A New Test in the Spirit of

Romer, C. D., and D. H. Romer (1994): "What Ends Recessions?". NBER Macroeconomics Annual, 9, 13-57.

Samuelson, P. A., and W. D. Nordhaus (2010): “Macroeconomics”. McGraw-Hill Irwin.

Shaw E.S., (1973): Financial Deepening in Economic Development. New York: Oxford University Press. Sims CA 1992. Money Income Causality. American Economic Review, 62:540-542.

Sims, C. (1980): “Macroeconomics and Reality”. Econometrica, 48, 1-49.

Sims, C., J. Stock, and Mark W.Watson (1990), “Inference in linear time series models with some unit roots,” Econometrica, 58, pp. 113-144

Sims, C. (1998) “Comment on Glenn Rudebusch’s Do Measures of Monetary Policy in a VAR Make Sense?”.International Economic Review, 39, 933-941.

Sims, C. (2008): “Government and Central Bank Balance Sheets, Inflation and Monetary Policy”. Princeton University Lecture Notes.

Sims, C. A. (1980): "Macroeconomics and Reality," Econometrica, 48, 1-48.

Starr, M. (2005): “Does Money Matter In The CIS? Effects of Monetary Policy on Output and Prices”. Journal of Comparative Economics 33: 441-461.

Stiglitz, J.E., and A. Weiss (1981): “Credit Rationing In Markets with Imperfect Information.” American Economic Review, Pp393-410.

Stigler, G.J., & Sherwin, R.A. (1985). The extent of the market. Journal of Law and economics, 28, 555-585.

Stock, J. H. and Watson, M. W. (1993):"A Simple Estimator of Cointegrating Vectors in Higher Order Integrated Systems". Econometrica, Vol. 61, No.4 (Jul., 1993), pp. 783-820.

Stock, J. H., & Watson, M.W. (1988):"Testing For Common Trends". Journal of the American Statistical Association, 83, 1097-107.

Stock, J. H., & Watson, M.W. (2001): "Vector Autoregressions". Journal of Economic Perspectives, 15, 101-115.

Takaendes, P. (2006): "The Behaviour and Fundamental Determinants of the Real Exchange Rate in South Africa". University of Rhodes.

Taylor, J. (2001): "The Role of Exchange Rate in Monetary Policy Rules". American Economic Review Papers and Proceedings, 91, 263-267.

Taylor, J. (1995) "The Monetary Transmission Mechanism: An Empirical Framework". Journal of Economic Perspectives, 9, 4, 11-26.

Temin, P. (1976): "Did Monetary Forces Cause The Great Depression?" New York, Norton.

The Coordinated Programme of Economic and Social Development Policies, 2010 – 2016.

Tobin J. (1970) : "Money and Income: Post Hoc Ergo Propter Hoc?", Quarterly Journal of Economics, Vol. 84 (2), p.301-17.

Tobin, J. (1969): "A General Equilibrium Approach to Monetary Theory". Journal of Money, Credit and Banking, 1, 15-29.

Upadhyaya, K. P. (1999): "Currency Devaluation, Aggregate Output, and the Long Run: An Empirical Study," Economics Letters, 62, 197-202.

Vo, V.M., (2009): "Exchange Rate pass-through and its implications for inflation in Vietnam". VDF Working paper, 0902.

Wash, C, (2003): "Monetary Theory and Practice". Cambridge, MA: The MIIT Press.

APPENDICES

Appendix 1: ADF and PP Unit Root Test for all Variables

	Type of Test	Variable	Deterministic Term	Lags	Test Value	Critical Values		
						1%	5%	10%
LEVEL	ADF	LnRGDP	Const. & Trend	3	3.259	-4.309	- 3.574	-3.221
		LnINF	Constant	0	-3.488	-3.637	-2.957	-2.617
		LnM2	Const. & Trend	0	-0.898	-4.273	-3.557	-3.212
		LnCREDIT	Constant	0	-0.982	-3.653	-2.957	-2.617
		LnLRATE	Constant	1	-1.658	-3.661	-2.960	-2.619
		LnREER	Const & Trend	0	-1.747	-4.2732	-3.5577	-3.212
	PP	LnRGDP	Const. & Trend	3	-2.493	-4.273	-3.557	-3.212
		LnINF	Constant	1	-3.387	-3.653	-2.957	-2.617
		LnM2	Const. & Trend	13	-0.053	-4.273	-3.557	-3.212
		LnCREDIT	Constant	9	-0.825	-3.653	-2.957	-2.617
		LnLRATE	Constant	2	-2.557	-3.653	-2.957	-2.617
		LnREER	Const & Trend	4	-1.765	-4.273	-3.557	-3.212
FIRST DIFFERENCE	ADF	LnRGDP	Constant	2	-5.046	-3.679	-2.967	-2.622
		LnINF	Constant	0	-8.607	-3.661	-2.960	-2.619
		LnM2	Constant	0	-4.691	-3.661	-2.960	-2.619
		LnCREDIT	Constant	0	-6.225	-3.661	-2.960	-2.619
		LnLRATE	Constant	0	-11.788	-3.661	-2.960	-2.619
		LnREER	Constant	0	-5.803	-3.661	-2.960	-2.619
	PP	LnRGDP	Constant	4	-3.037	-3.661	-2.960	-2.619
		LnINF	Constant	23	-17.880	-3.661	-2.960	-2.619
		LnM2	Constant	2	-4.691	-3.661	-2.960	-2.619
		LnCREDIT	Constant	9	-7.535	-3.661	-2.960	-2.619
		LnLRATE	Constant	3	-11.433	-3.661	-2.960	-2.619
		LnREER	Constant	0	-5.803	-3.661	-2.960	-2.619

APPENDIX 2: OPTIMAL LAG LENGTH CHECKS FOR THE VAR MODEL

Table 1: Optimal VAR lag selection for all variables

Lag	LogL	LR	FPE	AIC	SC	HQ
0	75.80698	NA	3.27e-10	-4.814275	-4.531386*	-4.725677
1	120.9111	68.43377	1.85e-10	-5.442142	-3.461921	-4.821961
2	169.8168	53.96496*	1.08e-10*	-6.332193	-2.654639	-5.180429*
3	206.8265	25.52390	3.15e-10	-6.401825*	-1.026937	-4.718477

Table 2: Optimal lag length checks for the Basic VAR model

Lag	LogL	LR	FPE	AIC	SC	HQ
1	67.43676	NA	3.58e-06	-4.030121	-3.605788*	-3.897225
2	78.74643	17.93949*	3.10e-06*	-4.189409*	-3.340743	-3.923617*
3	86.72635	11.00678	3.48e-06	-4.119058	-2.846059	-3.720371

Table 3: Optimal lag length checks for the VAR model with Lending Rate

Lag	LogL	LR	FPE	AIC	SC	HQ
1	79.32484	NA	1.50e-07*	-4.367230	-3.612860*	-4.130971*
2	95.93631	24.05798	1.52e-07	-4.409400*	-2.900660	-3.936882
3	109.1974	15.54750	2.13e-07	-4.220511	-1.957401	-3.511733

Table 4: Optimal lag length checks for the VAR model with Domestic Credit

Lag	LogL	LR	FPE	AIC	SC	HQ
1	80.25727	NA	1.41e-07	-4.431536	-3.677166*	-4.195277*
2	98.46048	26.36326*	1.27e-07*	-4.583481*	-3.074741	-4.110962
3	109.6356	13.10189	2.07e-07	-4.250732	-1.987622	-3.541954

Table 5: Optimal lag length checks for the VAR model with Exchange Rate

Lag	LogL	LR	FPE	AIC	SC	HQ
1	68.69324	NA	3.13e-07	-3.634017	-2.879647	-3.397758
2	96.95327	40.92832*	1.41e-07	-4.479536	-2.970796*	-4.007018
3	117.5698	24.17115	1.20e-07*	-4.797920*	-2.534810	-4.089142*

APPENDIX 3: AUTOCORRELATION, HETEROSKEDASTICITY, NORMALITY AND AR ROOTS TESTS

Table 1: VAR Residual correlation LM TEST

MODEL/CHANNEL	LAGS	LM STAT	P-VALUE
BASE MODEL	3	13.1977	0.1539
LRATE MODEL	3	22.0258	0.1424
CREDIT MODEL	3	21.4732	0.1610
EXRATE MODEL	3	11.6398	0.7684

HETEROSKEDASTICITY TESTS

Table 2: VAR Residual Heteroskedasticity Test for the Base Model

MODEL/CHANNEL	JOINT TEST P-VALUES
BASE MODEL	0.3340
LRATE MODEL	0.4109
CREDIT MODEL	0.5056
EXRATE MODEL	0.5555

VAR NORMALITY TESTS

TABLE 3: VAR RESIDUAL NOMALIYT TESTS

CHANNEL/MODEL	JOINT PROBABILITY VALUES		
	SKEWNESS	KURTOSIS	J-B TEST
BASE MODEL	0.0650	0.2871	0.0884
LRATE MODEL	0.5438	0.6632	0.7051
CREDIT MODEL	0.3558	0.7804	0.6307
EXRATE MODEL	0.6545	0.9555	0.9272

ROOTS OF CHARACTERISTIC POLYNOMIAL

TABLE 4: VAR STABILITY TEST

BASE MODEL (MODULUS)	LRATE MODEL (MODULUS)	CREDIT MODEL (MODULUS)	EXRATE MODEL (MODULUS)
0.965384	0.782582	0.949884	0.922859
0.843913	0.782582	0.705751	0.922859
0.843913	0.759688	0.705751	0.815048
0.736028	0.737180	0.678142	0.815048
0.730862	0.737180	0.678142	0.790750
0.730862	0.735373	0.625884	0.636306
0.642929	0.735373	0.625884	0.636306
0.642929	0.690602	0.424962	0.626473
0.271779	0.690602	0.395419	0.524587

No Root lies outside the unit circle

VAR satisfies the stability condition

APPENDIX 4: WALD TEST ON SIGNIFICANCE OF VAR COEFFICIENTS

INDEPENDENT VARIABLES	DEPENDENT VARIABLES	
COEEFICIENTS OF	INFLATION	REAL GDP
	JOINT P-VALUES	
MONEY	0.1315	0.0073
LENDING RATE	0.0335	0.8678
CREDIT	0.4011	0.6948
EXCHANGE RATE	0.4617	0.1730

APPENDIX 5: VAR MODEL REGRESSION RESULTS

TABEL 1: REGRESSION RESULTS FOR THE BASE VAR MODEL

Standard Errors in ( ) & t-Statistics [ ]

	DLOG(RGDP)	DLOG(INF)	DLOG(M2)
DLOG(RGDP(-1))	0.475836	-8.326140	0.291024
	(0.22035)	(4.19885)	(0.94234)
	[2.15942]	[-1.98296]	[0.30883]
DLOG(RGDP(-2))	-0.382807	12.60664	0.127164
	(0.26429)	(5.03615)	(1.13026)
	[-1.44841]	[2.50323]	[0.11251]
DLOG(RGDP(-3))	0.306099	0.186713	-0.411713
	(0.23029)	(4.38823)	(0.98485)
	[1.32918]	[0.04255]	[-0.41805]
DLOG(INF(-1))	-0.001472	-0.326443	0.031098
	(0.01087)	(0.20710)	(0.04648)
	[-0.13541]	[-1.57629]	[0.66909]
DLOG(INF(-2))	-0.005136	-0.319221	-0.034294
	(0.00854)	(0.16273)	(0.03652)
	[-0.60144]	[-1.96171]	[-0.93903]
DLOG(INF(-3))	0.010448	-0.163937	-0.040063
	(0.00810)	(0.15434)	(0.03464)
	[1.28998]	[-1.06219]	[-1.15661]
DLOG(M2(-1))	0.049769	1.530746	0.536825
	(0.04751)	(0.90539)	(0.20320)
	[1.04746]	[1.69070]	[2.64191]
DLOG(M2(-2))	0.001267	-1.048883	0.083142
	(0.05647)	(1.07609)	(0.24151)
	[0.02244]	[-0.97472]	[0.34427]
DLOG(M2(-3))	0.050548	-1.214588	0.324317

	(0.04614)	(0.87924)	(0.19733)
	[1.09549]	[-1.38141]	[1.64356]

R-squared	0.348685	0.526617	0.2125647
Serial Correlation LM	Prob. Value {0.1539}		
Normality (J-B Test)	Prob. Value {0.088}		
Heteroskedasticity	Prob. Value {0.3340}		

TABLE 2: REGRESSION RESULTS FOR THE LENDING RATE VAR MODEL

Standard Errors in ( ) & t-Statistics [ ]

	DLOG(RGDP)	DLOG(INF)	DLOG(LRATE)	DLOG(M2)
DLOG(RGDP(-1))	0.510581	-9.713832	-0.320485	0.620554
	(0.24274)	(3.84084)	(1.87209)	(0.95936)
	[2.10339]	[-2.52909]	[-0.17119]	[0.64684]
DLOG(RGDP(-2))	-0.465917	19.14750	1.218564	-0.965312
	(0.32063)	(5.07320)	(2.47276)	(1.26717)
	[-1.45315]	[3.77425]	[0.49280]	[-0.76178]
DLOG(RGDP(-3))	0.368990	-5.333236	-1.622732	0.499441
	(0.28006)	(4.43134)	(2.15991)	(1.10685)
	[1.31753]	[-1.20353]	[-0.75130]	[0.45123]
DLOG(INF(-1))	-0.004441	-0.070312	0.143297	-0.011031
	(0.01312)	(0.20762)	(0.10120)	(0.05186)
	[-0.33846]	[-0.33865]	[1.41601]	[-0.21270]
DLOG(INF(-2))	-0.007923	-0.182030	-0.000286	-0.063695
	(0.01034)	(0.16361)	(0.07975)	(0.04087)
	[-0.76620]	[-1.11256]	[-0.00358]	[-1.55860]
DLOG(INF(-3))	0.010415	-0.249525	-0.035488	-0.028218
	(0.00931)	(0.14726)	(0.07177)	(0.03678)
	[1.11907]	[-1.69450]	[-0.49443]	[-0.76718]

DLOG(LRATE(-1))	0.008399	-0.529026	-0.786745	0.137562
	(0.03344)	(0.52909)	(0.25789)	(0.13216)
	[0.25118]	[-0.99988]	[-3.05073]	[1.04091]
DLOG(LRATE(-2))	0.013786	0.040055	0.130619	0.061727
	(0.03928)	(0.62149)	(0.30292)	(0.15523)
	[0.35100]	[0.06445]	[0.43119]	[0.39764]
DLOG(LRATE(-3))	-0.012003	1.325123	0.339892	-0.182969
	(0.03445)	(0.54516)	(0.26572)	(0.13617)
	[-0.34836]	[2.43070]	[1.27913]	[-1.34369]
DLOG(M2(-1))	0.055052	0.884372	-0.086360	0.642097
	(0.05382)	(0.85162)	(0.41509)	(0.21272)
	[1.02285]	[1.03846]	[-0.20805]	[3.01857]
DLOG(M2(-2))	0.004769	-1.070342	0.420518	0.085006
	(0.06058)	(0.95857)	(0.46722)	(0.23943)
	[0.07871]	[-1.11661]	[0.90004]	[0.35504]
DLOG(M2(-3))	0.039046	-0.576017	-0.188557	0.198807
	(0.05249)	(0.83050)	(0.40480)	(0.20744)
	[0.74390]	[-0.69358]	[-0.46581]	[0.95839]

R-squared	0.453267	0.686907	0.577609	0.29751
Serial Correlation LM	Prob. Value {0.1424}			
Normality (J-B Test)	Prob. Value {0.7051}			
Heteroskedasticity	Prob. Value {0.4109}			

TABLE 3:REGRESSION RESULTS FOR THE DOMESTIC CREDIT VAR MODEL

Standard Errors in ( ) & t-Statistics [ ]

	DLOG(RGDP)	DLOG(INF)	DLOG(CREDIT)	DLOG(M2)
DLOG(RGDP(-1))	0.443321	-9.817229	0.557917	0.793825
	(0.25091)	(4.59861)	(1.84613)	(0.95981)
	[1.76683]	[-2.13482]	[0.30221]	[0.82707]
DLOG(RGDP(-2))	-0.318294	14.89700	-1.701927	-0.028161
	(0.30495)	(5.58903)	(2.24374)	(1.16652)
	[-1.04375]	[2.66540]	[-0.75852]	[-0.02414]
DLOG(RGDP(-3))	0.238588	0.257776	-1.380353	-1.042498
	(0.25932)	(4.75277)	(1.90802)	(0.99198)
	[0.92004]	[0.05424]	[-0.72345]	[-1.05093]
DLOG(INF(-1))	-0.005005	-0.246001	-0.087639	0.033406
	(0.01262)	(0.23128)	(0.09285)	(0.04827)
	[-0.39663]	[-1.06366]	[-0.94390]	[0.69204]
DLOG(INF(-2))	-0.009758	-0.293758	-0.003792	-0.058005
	(0.00985)	(0.18053)	(0.07248)	(0.03768)
	[-0.99058]	[-1.62716]	[-0.05233]	[-1.53941]
DLOG(INF(-3))	0.007860	-0.262871	0.020549	-0.024193
	(0.01018)	(0.18650)	(0.07487)	(0.03893)
	[0.77241]	[-1.40948]	[0.27445]	[-0.62152]
DLOG(CREDIT(-1))	-0.034336	0.496899	-0.359075	-0.122020
	(0.03054)	(0.55964)	(0.22467)	(0.11681)
	[-1.12445]	[0.88788]	[-1.59822]	[-1.04463]
DLOG(CREDIT(-2))	-0.013759	-0.637257	-0.244943	0.022792
	(0.03385)	(0.62035)	(0.24904)	(0.12948)
	[-0.40651]	[-1.02725]	[-0.98354]	[0.17603]
DLOG(CREDIT(-3))	0.000818	-0.355115	-0.025415	0.222864
	(0.03205)	(0.58739)	(0.23581)	(0.12260)
	[0.02552]	[-0.60457]	[-0.10778]	[1.81785]

DLOG(M2(-1))	0.050838	1.079714	0.157469	0.509794
	(0.05522)	(1.01201)	(0.40627)	(0.21122)
	[0.92067]	[1.06690]	[0.38759]	[2.41353]
DLOG(M2(-2))	0.021660	-1.047960	0.075043	0.229315
	(0.06395)	(1.17211)	(0.47055)	(0.24464)
	[0.33868]	[-0.89408]	[0.15948]	[0.93736]
DLOG(M2(-3))	0.043228	-0.744361	0.451475	0.199160
	(0.05063)	(0.92789)	(0.37250)	(0.19367)
	[0.85383]	[-0.80221]	[1.21200]	[1.02837]

R-squared	0.651949	0.596402	0.448335	0.243708
Serial Correlation LM	Prob. Value {0.1610}			
Normality (J-B Test)	Prob. Value {0.6307}			
Heteroskedasticity	Prob. Value {0.5056}			

TABLE 4: REGRESSION RESULTS FOR THE EXCHANGE RATE VAR MODEL

Standard Errors in ( ) & t-Statistics [ ]

	DLOG(RGDP)	DLOG(INF)	DLOG(REER)	DLOG(M2)
DLOG(RGDP(-1))	0.445901	-6.716679	-1.310744	0.138751
	(0.24904)	(5.02891)	(1.79257)	(1.10669)
	[1.79047]	[-1.33561]	[-0.73121]	[0.12537]
DLOG(RGDP(-2))	-0.615861	13.61722	6.424163	-1.062550
	(0.35093)	(7.08638)	(2.52596)	(1.55947)
	[-1.75494]	[1.92161]	[2.54325]	[-0.68135]
DLOG(RGDP(-3))	0.742312	-5.068107	3.119104	1.830981
	(0.36167)	(7.30315)	(2.60324)	(1.60718)
	[2.05248]	[-0.69396]	[1.19816]	[1.13925]

DLOG(INF(-1))	-0.004664	-0.297230	-0.033385	0.028190
	(0.01084)	(0.21883)	(0.07800)	(0.04816)
	[-0.43034]	[-1.35826]	[-0.42800]	[0.58536]
DLOG(INF(-2))	-0.007701	-0.275585	0.257492	-0.042065
	(0.00827)	(0.16699)	(0.05953)	(0.03675)
	[-0.93115]	[-1.65027]	[4.32575]	[-1.14464]
DLOG(INF(-3))	0.006986	-0.148023	0.114459	-0.029875
	(0.01079)	(0.21786)	(0.07766)	(0.04794)
	[0.64754]	[-0.67943]	[1.47388]	[-0.62312]
DLOG(REER(-1))	-0.013914	0.286913	-0.255445	-0.131494
	(0.02864)	(0.57834)	(0.20615)	(0.12727)
	[-0.48582]	[0.49610]	[-1.23912]	[-1.03316]
DLOG(REER(-2))	-0.015213	0.031339	0.122837	-0.094189
	(0.01963)	(0.39638)	(0.14129)	(0.08723)
	[-0.77498]	[0.07906]	[0.86939]	[-1.07978]
DLOG(REER(-3))	0.034556	-0.493261	-0.137615	0.119366
	(0.01594)	(0.32181)	(0.11471)	(0.07082)
	[2.16833]	[-1.53277]	[-1.19967]	[1.68549]
DLOG(M2(-1))	0.031135	1.778334	-0.856918	0.432192
	(0.04752)	(0.95958)	(0.34205)	(0.21117)
	[0.65519]	[1.85323]	[-2.50526]	[2.04663]
DLOG(M2(-2))	0.007472	-1.091475	0.202837	0.018699
	(0.05893)	(1.19000)	(0.42418)	(0.26188)
	[0.12679]	[-0.91720]	[0.47819]	[0.07140]
DLOG(M2(-3))	0.046104	-1.208269	-0.743097	0.364054
	(0.04718)	(0.95274)	(0.33961)	(0.20967)
	[0.97716]	[-1.26820]	[-2.18810]	[1.73635]

R-squared	0.614538	0.588913	0.859840	0.143617
Serial Correlation LM	Prob. Value {0.7684}			
Normality (J-B Test)	Prob. Value {0.9272}			
Heteroskedasticity	Prob. Value {0.5585}			

APPENDIX 6: THE IMPULSE RESPONSE FUNCTIONS

Figure 1: Impulse Response Function Graphs for the Basic Model

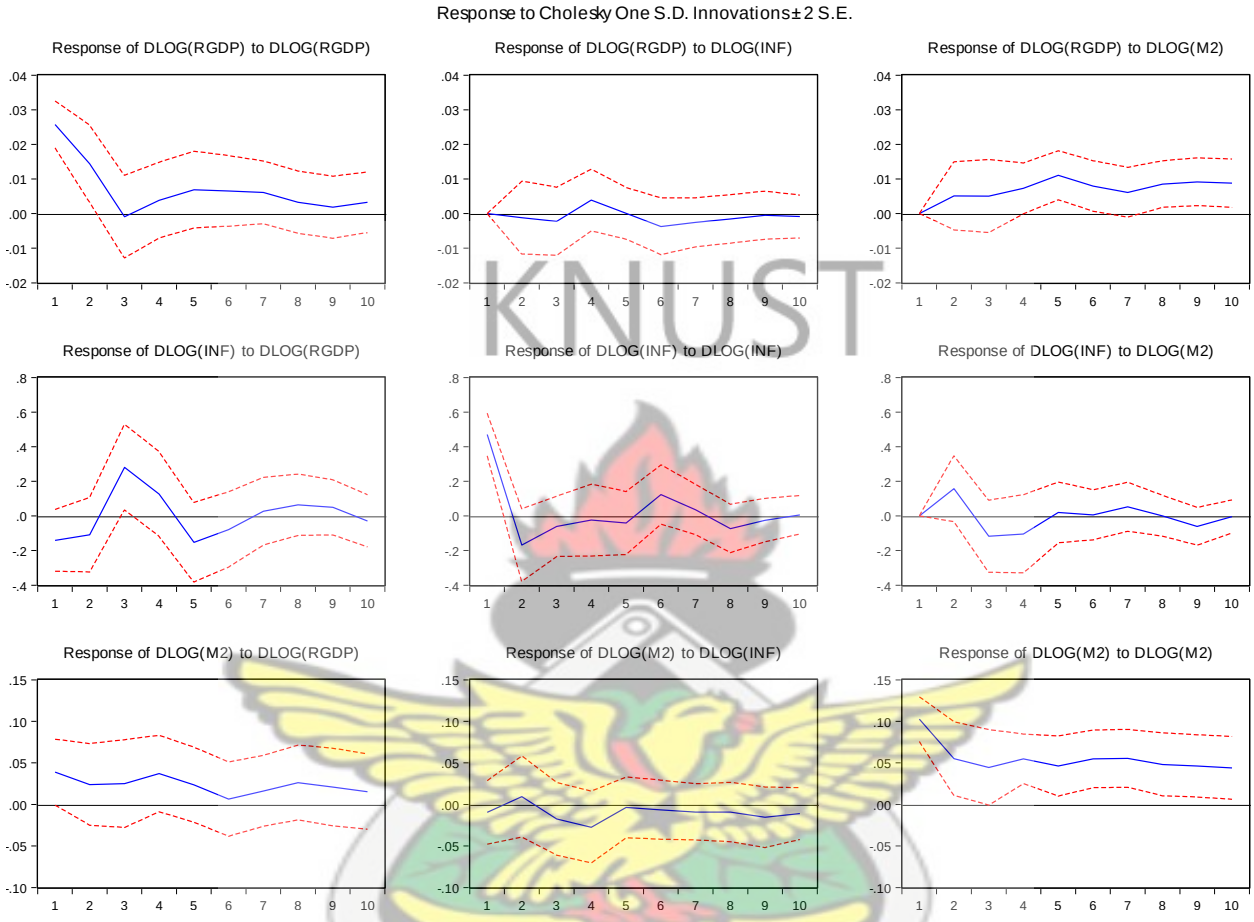


Figure 2: Impulse Response Function Graphs for the Model with Lending Rate

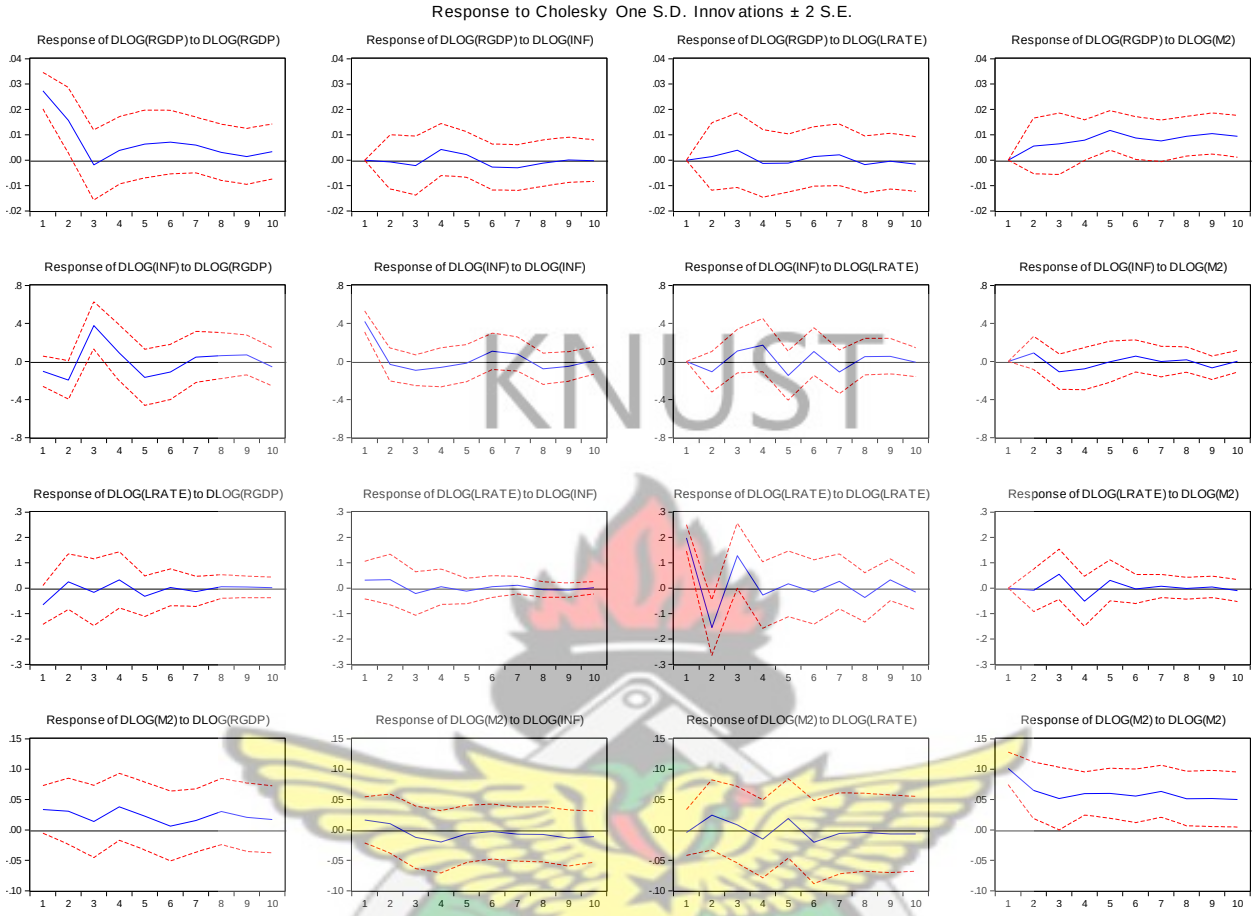


Figure 3: Impulse Response Function Graphs for the Model with Domestic Credit

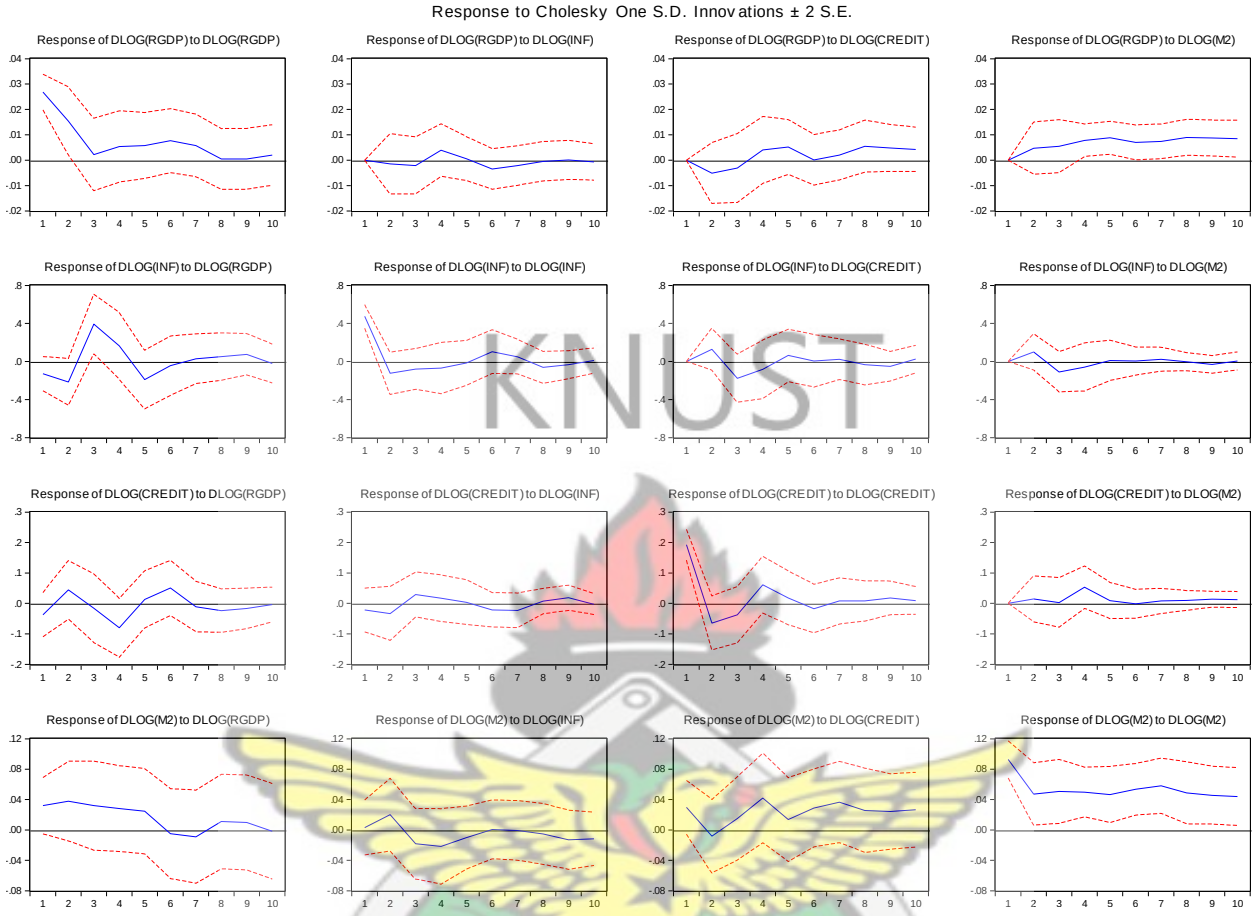


Figure 4: Impulse Response Function Graphs for the Model with Exchange Rate