EFFECTS OF MONETARY POLICY ON MACRO ECONOMIC PERFORMANCE: THE CASE OF NIGERIA

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DECLARATION

I certify that this research work has not been accepted in substance for any degree, and is not concurrently being submitted for any degree other that of the Ph.D being studied at University of Greenwich. I also declare that this work is the result of my own investigation except where otherwise identified by references and that I have not plagiarized another's research work.

Signed:

Student----------Date ----------

Supervisor----------Date ----------

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Abstract

The objective of this study is to empirically examine the effects of monetary policy on macroeconomic performance in Nigeria.The study uses Quarterly data between 1970 Q1 to 2011Q4, being a sample period of forty one years.The study further, introduces structural break to investigate the presence of a possible structural change which takes into account the effects of the Structural Adjustment Programme introduced by the Nigerian government in the 1987. The data was split into two sub-periods from 1970Q1–1986Q4, era before the Structural adjustment programme, and from 1987Q1 – 2011Q4, period after the Structural Adjustment Programme in Nigeria. In this study, three approaches were utilised in the methodology. First, estimation and analysis was based on coefficients of the variables using long-run and co-integrating Vector Error Correction Model (VECM). The results confirm my a priori expectation, although many of the variables were not statistically significant. The study also estimates the period 1970Q1–2011Q4, without a structural break for the GDP model having been confirmed in a structural break test. Therefore, we accept the null hypothesis which means that there was no structural break in real domestic growth during the structural adjustment programme, introduced in 1987. However, the structural break tests for consumers' price index (CPI) and balance of payments (BOP) show that the parameters of the analysed equations were not stable given that recursive errors cut across the critical lines for both tests. As a result of the foregoing, we reject the null hypothesis meaning that there was a structural break for the CPI and (BOP) models. This means that the structural adjustment programme introduced in 1987 brought about a change in CPI and BOP in the Nigerian economy. In the second approach of the methodology, a macroeconomic model was simulated to demonstrate the effects of monetary policy on macroeconomic performance. Thus, the results obtained from the simulation are impressive and generally satisfactory; the results suggest the effectiveness of monetary policy implementation for counter cyclical income stabilization, BOP stabilization and CPI stabilization in Nigeria. In the third approach of my methodology, three structural vector autoregressive (SVAR) econometric models were formulated to trace the effects of monetary policy shocks on domestic output, consumers' price index and balance of payments position in Nigeria. Structural effects of monetary shocks or innovations were captured by the impulse response functions and the forecast error variance decomposition. The empirical impulse-response assessment indicates that an exogenous shock to the short-term interest rate has the most significant positive effect on real domestic output and consumers' price followed by a transitory effect of the broad money. The response of the country's external payments'

position to a structural shock as measured by a one-standard deviation innovation in all the policy variables is almost zero. The policy implication is straightforward- monetary policy in Nigeria is effective in maintaining internal balance and ineffective in achieving external balance. Overall, the results suggest that monetary policy affects macroeconomic performance in Nigeria.

CHAPTER ONE

1.0 INTRODUCTION

This thesis is a study on the effects of monetary policy on the macro economic performance of Nigerian economy. It presents an extensive review of the theoretical and empirical literature on macroeconomics policy targets (domestic growth, inflation, balance of payment stability and unemployment) and monetary policy instruments (interest rate, money supply, exchange rate and domestic credit) in general and in the context of a developing economy such as Nigeria. The theoretical analysis is followed by empirical assessment of the effects of monetary policy on macroeconomic performance in Nigeria. The study also provides the link between monetary policy and economic performance; this is done by linking the theoretical framework of the study to the model specification. From the theoretical framework, the conceptual framework for the study is formulated. Furthermore, three hypotheses are formulated from the theoretical framework for three of the macro economic objectives (dependent variables) namely gross domestic product (GDP), consumer's price index (CPI) and balance of payments (BOP). Linear equations are specifically used only for the estimation of the coefficients of long and short run equations.

In addition the study introduces structural breaks and breakpoints to the data. The structural break is applied to the two sub-periods from 1970Q1–1986Q4, before the Structural adjustment programme in Nigeria and from 1987Q1–2011Q4, period of Structural Adjustment Programme in Nigeria. The study also estimates the period 1970Q1–2011Q4, without a structural break for the GDP model having been confirmed in a structural break test. The Central Bank of Nigeria commenced an extensive financial system and monetary policy reforms in 1986 which brought about a structural break. These reforms were based on the financial liberation theory by McKinnon and Shaw (1973) as part of a structural adjustment programme introduced by the World Bank in the early 1980s based on Washington Consensus. The structural break test, therefore, establishes whether the structural reforms of 1986 in Nigeria brought a structural change. A structural change is said to have taken place when a change is observed in the regression parameters of the estimable model. Any structural break is (by definition) accompanied by the change in relevant model coefficients (Page, 1954)

The Procedure of Estimation is divided into two broad processes. The first estimation is based on the interpretation of the coefficient of the variables of the specified models of the three linear functions. In the first procedure, the data were divided into two sub periods from 1970Q1– 1986Q4 and from 1987Q1–2011Q4 to capture the structural breaks for the CPI and BOP models. Second is the transformation of all variables to real except the interest rate which is already in percentage. Thirdly, we take the logs of all the variables, then we determine the lag criteria for the three models ie model1 (GDP), model 2 (Consumer price index) and model 3 (Balance of payments). In addition, we test for stationarity of all variables and we determine co-integrating equations for the three models (GDP, Inflation and BOP). Fourthly, we estimate the long run and short run of the three models. The study employs the Johan son (1991) Vector Error Correction Mechanism (VECM) estimation technique. The VECM estimation technique incorporates time series analysis within a dynamic framework that enables us to discern long run and short run relationships between the variables. It allows testing whether there are feedback effects and testing for indirect effects between the variables in the model. Finally, we carry out the diagnostic test on the three models.

For the second analysis, the results of the structural VAR are interpreted as linear combinations of exogenous shocks. The study estimates the period 1970Q1– 2011Q4 for the GDP model and the result shows that there was no structural change. The second stage is the two sub periods 1970Q1–1986Q4 (The era before structural adjustment) and the time period 1987Q1–2011Q4 (The era of structural adjustment).

One of the criticisms against Structural Vector Auto regression (SVAR) is that individual coefficients in the estimated SVAR models are often difficult to interpret hence, the estimation of impulse response function (Gujarati 2007). Impulse response variance decomposition and granger causality are also utilized in this study. Impulse response functions trace the effects of a shock from one endogenous variable on other variables in the SVAR. So, for each variable from each equation separately, a unit shock is applied to the error, and the effects upon the SVAR system over time are noted (Brooks, 2008). The empirical evidence on impulse function will enable policy makers to predict the consequences of these unanticipated shocks in advance so that they are prepared to react to these changes in future (Lutkepohl, 2005).

SVAR estimation provides reliability in the response of policy targets to monetary policy shocks. It is therefore employed to track such monetary policy innovations on the performance of the overall economy and hence, for forecasting and policy analysis. Also, SVAR has the ability to clearly describe the interactions and interrelationships between economic variables in the model while maintaining theoretical coherence [Serven and Solimano (1991)]. The monetary policy instruments in Nigeria include the broad money stock, short-term interest rate, domestic credit and the nominal effective exchange rate. The policy targets include real GDP, the consumer price index (CPI) and the position of the balance of external payments. Quarterly data are utilized in this study and span over a sample period, 1970q1-2011q4. The rationale for using quarterly data series is to have sufficient degree of freedom. Data for this study are obtained from International Financial Statistics CD Rom (2011).

Finally, the study also simulates a small–sized macroeconomic model of the Nigerian economy designed to be used for forecasting, counterfactual analysis and policy analysis. The simulation result is generated from the coefficient of the estimated model using system equation (three stage least square, software is E-Views). The simulation is for the period 1987-2011,a period chosen to represent the Structural Adjustment Program me era.

1.1.BACKGROUND TO THE STUDY

Monetary policy refers to the use of instruments and measures designed and implemented by the Central Monetary Authority to regulate the value, supply and cost of money in an economy, consistent with the anticipated level of economic activity. The policy is broadly implemented as a stabilization policy mechanism to guide the economy in the direction of achieving sustainable economic growth, price stability and external balance. The effects of monetary policy are often a function of policy makers in making precise assessment of the timing and the outcome of the policy on economic activities and prices. The time lag is basically an aggregation of the impact of several lags which include recognition, decision, delivery, replacement and production (Junz and Rhomberg, 1973). Moreover, monetary policy influences the level of money stock and/or interest rate, i.e. availability, value and cost of credit in consonance with the level of economic activity. Macroeconomic aggregates such as output, employment and prices are in turn, affected by the stance of monetary through the monetary tools, including interest rate, money stock, credit and exchange rate channels (Anyanwu, 2004).

The objectives of monetary policy may be different according to the level of economic growth of the economy in question, but invariably include achievement of price stability, maintenance of external payments equilibrium, and promotion of employment, national output growth and sustainable economic development. Irrespective of the type of economy, these objectives are critical for the attainment of internal and external balance and ultimately the promotion of long-run economic growth. This explains why countries establish specialized institutions, such as the central bank, to formulate and execute appropriate monetary policies for the attainment of macroeconomic objectives. The economic policy of Nigeria is premised on the objectives of monetary policy in the country. This has a relationship with reforms in infrastructure, power supply and the diversification of the economy. However, the focus of the economy has mainly been on privatizing the oil sector with a view to increasing productivity. In Nigeria, the government often overshoots its budget to the extent that funds earmarked for infrastructure and social development are almost never fully employed. On the other hand, inflationary pressures are on the increase, forcing the CBN to raise the interest rate.

The high interest rates and the fact that banks remain risk averse, continues to constrain domestic credit, increasing food prices as well as an expected increase in government expenditure, or spending keeps inflation in double-digits. The Nigerian inflationary rate averaged 12% from 14% in 2010, while credit growth was low (Sanusi, 2010). In 2009, the government liberalized the exchange rate system. In theory, this means that the currency is free to float against other currencies. However, in practice, the Nigerian government still attempts to manage the rate of the local currency Naira against the US Dollar. Even at that, falling exports and increased capital flight have in recent times weakened the naira against the US dollar and other currencies.

Furthermore, as regards the position of external balance, Nigeria suffers from an undiversified export basket and a somewhat rigid import basket. More than 95 percent of the country's total exports are made up of oil and gas (Sanusi, 2010). As a result, the inflow of export receipts is highly dependent on oil prices, and hence on the performance of the oil sector. In effect, external shocks are often transmitted to the domestic economy through oil price shocks. Imports on the other hand consist of a wide range of goods, including manufactured and capital

goods. The rigidity of the import basket stems from the fact that Nigeria lacks a manufacturing sector, and thus has to import almost all of its consumable goods.

It is also a fact that the oil producing sector requires a balanced inflow of capital goods. However, in spite of the strong domestic demand for foreign goods and low oil prices in 2008 and 2009, Nigeria had a negative trade balance (CBN Annual Report 2010). Given the enormous inflow of foreign capital, Nigeria is supposedly to acquire large increases in reserves. However, between 2008 to 2009, reserves shrunk rather than increased a reflection of the lack of confidence in the domestic economy by foreign capital owners and investors. This has greatly been attributed to capital flight with a negative productivity spillover effect (Iyoha, 2002). High level of capital outflow makes the country's external balance position to be worrisome. Some researchers point out that the production of oil after independence led to the neglect of agriculture and eroded its significance in contributing to GDP (Uchendu, 2000). There was increased share of the oil sector in exports from less than 60 per cent in 1970 to over 90 per cent in 1973 (Uchendu, 2000). The growing importance of oil revenue, expanding role of the public sector, and the unsustainable dependence on the external sector, dictated post 1970 economic performance.

As a result of the significant increase in capital formation sustained by oil revenues, domestic output grew rapidly, but the agriculture sector became a drag on the economy owing to its sluggish performance. With large increase in foreign exchange earnings from oil which was largely monetized, public sector involvement in direct economic activities dramatically increased. The enhanced government revenue and the concomitant fiscal deficits, particularly in the 1980s ascended. Unfortunately, investments and reforms that could strengthen the non-oil economy were streamlined. Thus, the domestic economy had become extremely vulnerable to world shocks.

1.2. STATEMENT OF THE PROBLEM

In the early 1980s, Nigeria experienced economic problems there was a down turn in the economy. The decline experienced in the banking sector was a major issue as the inability to moderate boom time with consumption habits in line with the realities of the depressed economy was the order of the day. Thus, the financial condition of individuals, companies and

government at all levels worsened, making them unable to honour their contractual obligations on loans repayment to banks. The economic downturn, combined with factors such as mismanagement, liquidity and under-capitalization adversely affected the fortunes of many banks (Sanusi, 2002).

Between 1989 and 1993, the number of distressed banks leapt to 28 a 300 percent increase. At the end of 1995, the banking system in Nigeria got not only distressed, but terminally insolvent with depositors losing billions of naira in the crises. All these brought about a loss of confidence in the banking system. In 1998, about 50 percent of money supply in the country was outside the banking system (NDIC, 2001)

Furthermore, Soludo (2007) reports that over 373.1billion naira was outside the banking system due to failure of banks to mobilize savings by offering reasonable interest rate to small depositors, and partly due to the dwindling confidence in the banking sector, resulting from distress in the banking sector. All these, coupled with a large informal sector that undermined the monetary policy, further weakened the effects of monetary policy on economic performance in Nigeria. It therefore becomes necessary to tackle this problem on an adequate scale. It is also necessary to identify some of the obstacles that hinder the implementation of monetary policy to bring about more economic performance.

It may be reiterated that, in principle, the effects of monetary policy depend on the structure of the economy under analysis, the approach being adopted, the choice of variables used and the identifying restrictions imposed on the models (Chuku, 2009). An appropriate measurement of the effects of monetary policy on policy targets is therefore essential for effective policy-making and for choosing among alternative macroeconomic frameworks. Effects of monetary policy on economic performance have been studied by several scholars, such as, Starr (2005); Cortis and Kong (2007), Olorunfemi and Faloye (2008). To measure the effects of monetary policy on economic performance, they use one monetary policy target variable, domestic growth (GDP) as an indicator for the measurement of economic performance.

Furthermore, a number of empirical studies assess the effects of monetary policy on economic performance using two monetary policy targets variable, domestic output (GDP) and consumer's price index (CPI) as indicators for the measurement of economic performance such

as, Gamber and Hakes (2005), Hsing and Hsieh (2004, 2009) Adebiyi (2007), Saizar and Chalk (2008), Barakchian and Crowe (2010) and Mugume (2011).

Given the coverage of previous studies on effects of monetary policy on economic performance, provision was made for the scope to include balance of payments equilibrium. This study improves on previous studies by employing three monetary policy targets variables, as indicators for the measurement of economic performance. In addition to domestic output (GDP) and consumer's price index (CPI) used by previous studies, this study includes balance of payment (BOP) to the monetary policy target variables as indicators for the measurement of economic performance to assess the effects of monetary policy on economy. The inclusion is based on the objective of monetary policy in Nigeria which is to maintain a healthy balance of payments position. It is also the objective of a macro economy to maintain satisfactory balance of payments such that exports equal to imports over the long run. In addition, the monetary approach to the balance of payments views the balance of payments as purely monetary phenomena (Frenkel and Johnson, 1976; Lanciaux, 1990).

Secondly, it is more appropriate to use quarterly data in monetary policy, but quarterly data are not available in data sources of Nigeria. Showing evidence of this, [Obadan and Iyoha (1996)] report that the scarcity of quarterly data means that existing econometric models for Nigeria have been estimated with annual data, yet quarterly data seems to be better for econometric model especially in monetary policy. I constructed my data by converting the monthly data obtained from IMF to quarterly data by average of three months per quarter. Third, the comparison of the impulse response results from SVAR to linear equation results is an innovation in methodology. No empirical study has compared impulse response results from SVAR to linear equation results. Among the studies that have investigated the effects of monetary policy on macroeconomic performance in Nigeria, many have focused on the traditional VAR methodology. Others used the structural VAR to measure the effects of monetary policy innovations in Nigeria, but did not specify structural VAR model specification. Others used structural VAR in their methodology and did not use quarterly data. My novelty is contribution to an area that is underworked.

Another significant contribution to knowledge of this study is that it utilizes longer period of estimation. The study extended the time series data backward to 1970 to cast down doubts

about the outcome of the estimated results on the effects of monetary policy in Nigeria. Hence, the present empirical evidence in support of the effects of monetary policy on macroeconomic performance in Nigeria cannot be regarded as being contentious and inconclusive.

1.3. OBJECTIVES OF THE RESEARCH

The overall objective of this study is to empirically determine the effects of monetary policy on the macroeconomic performance of Nigeria economy. Specifically, the study attempts to empirically assess the significance of interest rate on economic performance in Nigeria; determine the significance of exchange rate on economic performance in Nigeria and determine the significance of domestic credit on economic performance in Nigeria.

1.4. RESEARCH QUESTIONS

Consequent upon the above objectives, the following research questions are formulated: The general research question is: what are the effects of monetary policy on Macro economic performance? The specific research questions are:

[i] What are the effects of interest rates on macro-economic performance in Nigeria?

[ii] What are the effects of exchange rates on macro-economic performance in Nigeria?

[iii] What are the effects of money supply on macro-economic performance in Nigeria? and

[iv] What are the effects of domestic credit on macro-economic performance in Nigeria?

To address the main research question, "what are the effects of monetary policy on macroeconomic performance"?, the study proceeds to explain how macroeconomic performance is measured and the indicators or tools used to determine the effects of monetary policy on macroeconomic performance. Furthermore, the study proceeds to explain the link between monetary policy and macroeconomic performance.

In this study the variables used for the measurement of economic performance are based on macroeconomic and monetary policy objectives which are: to achieve and sustain a high rate of economic growth (proxy by GDP), to maintain a low level of unemployment, to maintain a relatively stable consumer price level and maintain satisfactory balance of payments position (Aigbokhan,1995).

However, the study did not include unemployment as a variable for measuring of economic performance, because of the absence of data on unemployment. Therefore, non–policy variables or target variables were used in this study. The choice of variables in this study is based on the objectives of macroeconomic and monetary policy objectives (see Aigbokhan, 1995; and Fifty Years of Central Banking in Nigeria Hand Book, 1959-2009 draft, Pp 28-30). Saizar and Chalk (2008) argue that it is first necessary to adopt a metric by which to measure economic "macro-economic performance". One approach is to look at how far away monetary policy is from minimizing fluctuations in inflation and output. Moreover, Cecchetti (2008) argues that what determines effects of monetary policy depends on that analysis which examines how close monetary policy is to the "optimal" monetary policy that entirely offsets shocks to aggregate demand and minimizing a weighted average of inflation and output volatility.

The study further considers some of the indicators or tools needed to establish the effects of monetary policy. Several channels are highlighted in literature based on monetary transmission mechanism (Mishkin, 1995; Kuttner and Possen, 2000), demand for money theory and monetary approach to balance of payments theory. Broadly, the indicators or tools used to determine the effect of monetary policy includes interest rate, domestic credit, money supply, and exchange rate. These monetary policy variables are used as policy variables in this study. The choice of the use of these variables is based on the monetary transmission mechanism, theory of demand for money and monetary approach to balance of payments theory as these tools are the instruments used by the monetary authority of Nigeria. These monetary instruments have been used by other researchers in Nigeria. [Balogun,(2007); Odusola, (2006); Uchendu, (1996); and Nnnana, (2004)]. The study proceeds to determine how to measure effects of monetary policy on economic performance.

To measure effects of monetary policy on macroeconomic performance, the study first addresses the link between monetary policies and economic performance. This objective is achieved by linking the theoretical framework discussed in chapter two of my study to the model specification in chapter four. The link between the monetary policy and economic performance is the theoretical basis of the study. Ajayi (2007) describes monetary transmission mechanism as how changes in monetary policy are transmitted through the financial system, via the monetary tools to the real economy to affect economic performance. The study adopts

the Neo classical monetary transmission mechanism describe effects of monetary policy on macroeconomic performance.

To explain the link between the monetary policy and economic performance, the theoretical framework is discussed. The theoretical bases for the studies are: the monetary transmission mechanism, motivation for using the monetary transmission mechanism, which demonstrates effects of monetary policy on macroeconomic economic performance (domestic output, consumer's price index and balance of payments). The second theoretical basis for this study is the theory of demand for money. The reason for choosing the theory of demand for money is to explain how money supply, as a tool of monetary policy, affects domestic output and consumers price levels.

The third theoretical basis is the monetary approach to balance of payments. The theory views the balance of payments as purely monetary phenomena (Frenkel and Johnson, 1976; Lanciaux, 1990). From the theoretical framework, the conceptual framework was formulated to demonstrate the effects of monetary policy tools on macroeconomic performance derived from the theoretical works. From the conceptual framework, I formulated the hypothesis of the study. From the hypothesis, three models are specified for the three non-policy variables or monetary policy target variable, namely domestic growth output (GDP), consumer's price index (CPI) and balance of payments. The policy variables are money supply, interest rate, exchange rate and domestic credit. The link between monetary policy and economic performance is discussed in detail in chapter three.

1.5 SCOPE OF STUDY

This study covers a period of forty one years, using quarterly data from 1970Q1 – 2011Q4, with 168 observations. Structural break was applied to only two sub-periods from 1970Q1 – 1986Q4 before the Structural adjustment programme in Nigeria and from 1987Q1 – 2011Q4 period after the Structural Adjustment Programme in Nigeria. It is long enough for meaningful statement to be made on the results obtained. The quarterly data gave the study sufficient degree of freedom. Essentially, it is a dynamic analysis of the effects of monetary policy macroeconomic performance in Nigeria. The indicators for measuring macroeconomic performance are domestic growth rate, consumer price index, balance of payment stability and

low level of unemployment. This study did not include low level of employment because of absence of data. Furthermore the economy of Nigeria is made up of formal and a large informal sector, but the study is limited to the formal sector and did not consider the informal sector because of absence of data in that sector. The simulation of the macroeconomic model in this study is limited to only the monetary sector as against a complete macroeconomic specification of the Nigerian economy.

1.6 STRUCTURE OF STUDY

This study is divided into eight chapters as follows: Chapter 1 is the introductory chapter discussing the background to the study, statement of the research problem, research questions and scope of study; Chapter 2 is the review of theoretical and empirical links of monetary policy and evaluates the findings of previous empirical studies; Chapter 3 provides an overview of structure of Nigerian economy, Chapter 4 lays out the theoretical and conceptual frame work, hypothesis and model specification; Chapter 5 presents data source and description of variables, summary of descriptive statistics, effects and problems encountered. Chapter 6 presents empirical results and the effects of monetary policy on macroeconomic performance; Chapter 7 presents result on simulation of macroeconomic model; Chapter 8 summarizes the main findings, discusses policy implication, draws conclusion and high lights key contribution to the study. It also predicts areas for future research.

CHAPTER TWO

2.0. THEORETICAL AND EMPIRICAL LINKS OF MONETARY POLICIES

The purpose of this chapter is to review some theories of monetary policy that could address the link between monetary policy and macroeconomic performance in order to provide a framework for an empirical assessment of the effects of monetary policy on economic performance in Nigeria. This objective is achieved by linking the theoretical framework of my study to the model specification. From the theoretical framework, the conceptual framework was formulated for the study. Furthermore, three hypotheses are formulated from the theoretical framework for the three monetary policy variable targets (dependent variables) namely, gross domestic product (GDP), consumer's price index (CPI) and balance of payments (BOP). Some theories for the theoretical framework include: Financial liberation theory, rational expectation theory, reaction function, theory of demand for money and monetary approach to balance of payments.

This chapter proceeds with a review of the main theory of the study, the financial liberation theory is particularly relevant to this study as it refers to the issue of financial dualism, highly relevant to the content of the Nigerian economy. Financial reforms of monetary policy and financial institutions under the Structural Adjustment Program me (SAP) was based on financial liberation theory. The financial liberation theory also influenced the empirical section of this thesis where structural break was incorporated in the data to take account of the period of financial liberation in Nigeria ie 1970Q1-1986Q4 (era before financial liberation) and 1987Q1-2011Q4 (era of the financial liberation).

Finally, a selective review of empirical studies follows the theoretical literature. In addition to the reason given above for including the financial liberation theory, Aderibigbe (1997) notes that there are close linkages between financial sector reforms of the financial liberation and the conduct of monetary policy. The importance of these linkages becomes more obvious when a country embarks on the transition process from direct[1] control of interest rates and credit to the use of indirect instruments of monetary management. Thus, a major objective of financial sector reforms is to develop an efficient framework for monetary management. Mbutor (2007);

[1] Direct control is the intervention of government in monetary policies such as official fixing of interest rate. While in indirect market forces is allowed to determine the interest rate.

Odularu and Okunrinboye (2009) hold the same opinion and argues that the impetus for reforms follows from the understanding that a sound financial system will render monetary policy more effective, and plays crucial role in the conduct of monetary policy on macroeconomic performance. The study proceeds to discuss the financial liberation theory.

2.1. MCKINNON-SHAW HYPOTHESIS (FINANCIAL LIBERATION THEORY)

The literature of the financial liberation theory started with the seminal work of McKinnon (1973) and Shaw (1973) that initiated the theory of financial liberation[2] and highlighted the adverse effects of financial repression on economic growth. They termed developing economies as "financially repressed". Their central argument is that financial repression causes indiscriminate "distortions of financial prices including interest rates and foreign-exchange rates" (Fry 1995). In other words, financial repression – a combination of heavy taxation, interest rate controls and government participation in the credit-allocation process- would lead to both a decrease in the depth of the financial system and a loss of efficiency, with which savings are intermediated (Sen and Vaidya 1997).

The proponents of financial reform (McKinnon-Shaw) argue that financial liberalization tends to raise ratios of domestic private savings to income (Shaw 1973). Therefore, financial liberalization will lead to significant economic benefits through a more effective domestic saving mobilization, financial deepening and efficient resource allocation. Interest rate ceilings are imposed to stifle competition in public sector funds raised from the private sector. Measures such as the imposition of foreign exchange controls, interest rate ceilings, high reserve requirements, and the suppression or non-development of private capital markets can all increase the flow of domestic resources to the public sector without higher tax, inflation, or interest rates (Fry 1973).

[2] According to Gemech and Struthers(2003) "The Mckinnon-Shaw Hypothesis, in its' various forms, is now thirty years old. Over that period literally hundreds of empirical studies have been completed examining the hypothesis in many different contexts. Initially, the hypothesis focused on the effects of so-called "Financial Repression" (low or negative real interest rates) on savings and investment levels in developing countries. In more recent times, researchers have extended the debate to consider other effects of financial repression on: economic growth; financial crises and poverty (for example the effects of overvalued exchange rates). Currently, significant research is being conducted on the potentially destabilizing effects of financial liberalization (the converse of financial repression) on global financial markets".

Furthermore, McKinnon (1973) and Shaw (1973) referred to the distortion of the domestic official financial markets such as ceilings on interest rates and credit expansion, selective allocation of credit, and high reserve requirements as misguided policies which have damaged the economies of many developing countries and have led to reduction of savings and encouraged investment in inefficient and unproductive activities. They argue that positive real interest rate should be established on loans and deposits by eliminating interest rate ceiling and credit allocation, and lowering reserve requirements. Their focus was on their savings-investment hypothesis, and according to them, real interest rates was thought to have influence on economic performance through savings and investment. In their model, investment is a negative function of real interest rates, and savings are influenced by interest rate. The interest rate ceiling applies to deposit rates only, and that banks can charge what they like on loans and the margin will be used in non-price competition.

The financial liberalization theory of McKinnon and Shaw (1973) was also based on the premise that the higher the real rate of interest, the greater will be the degree of financial deepening, the more saving there will be, and financial saving will be allocated and invested more efficiently than if saving is invested directly in the sector in which it takes place, without financial intermediation (Thirlwall 2005). Till the 1960s, the dominant view in the finance and growth literature was the neo-Keynesian perspective, which argued that interest rates should be kept low in order to promote capital formation (Sen and Vaidya 1997). During this period, the guiding philosophy of governments in several less developed economies was one of economic planning with directed credit programmes and interest rate controls. These became popular as a means of allocating scarce resources to 'preferred sectors' at low cost.(Iftekhar 2008).

However, there has been a re-assessment of the neo-liberal view of financial markets. New theoretical developments- in particular, the application of the theories of 'asymmetric information' to financial markets- suggests that financial markets are different from other markets (such as commodity markets), where 'market failures' are more pervasive in financial markets than in other markets in the economy. This indicates that there exists 'forms of government intervention' that will not only make (financial) markets function better but will also improve the performance of the economy (Stiglitz 1993:20). Two assumptions of the neo-liberal paradigm have come increasingly under scrutiny. The first is the assumption of perfect information which implies that all relevant information is freely available to all agents in the

market. However, in reality, most financial markets are characterized by asymmetries of information that exist between providers of capital and those seeking capital. Secondly, the assumption of the neo-liberal approach that has been questioned in the literature is the supposition that individuals and firms may write and enforce richly detailed financial contracts at any cost. However, this "completeness" of financial markets may not be a reasonable approximation of reality if either information or the ability to enforce contracts is severely limited (Gertler and Rose 1994).

The Financial Repression approach also incorporated the adverse effects of high reserve ratios and Government directed credit programme, which together contributed to low savings, credit rationing and low investment (Gemech and Struthers, 2003). The central argument is that financial repression –indiscriminate "distortions of financial prices including interest rates and foreign-exchange rate"- reduces the real rate of growth and real size of the financial system relative to nonfinancial magnitudes. In all cases, this strategy has stopped or gravely retarded the development process (Shaw 1973). Their prescription is the removal of these distortions imposed by so many governments in developing countries. For example, money and the banking system are favoured and protected because reserve requirements and obligatory holdings of government bonds can be imposed to tap this source of saving at zero or low-interest cost to the public sector. Interest rate ceiling are imposed sector. Measures such as the imposition of foreign exchange controls, interest rate ceilings, high reserve requirements, and the suppression or non-development of private capital markets can all increase the flow of domestic resources to the public sector without higher tax, inflation or interest (Fry1973, Nichols 1974).

As a further development, the Neo-structuralist critique provides a different observation of the effects of financial liberation than that proposed by McKinnon and Shaw. This critique, which counts scholars such as Van Wijnbergen, Taylor, and Buffie considers the effects of incorporating financial dualism into the original McKinnon-Shaw models, and finds that freeing of interest rates, far from resulting in output growth, may have the opposite effect.
Considering the unexpected effects of early liberalization measures, "Neo-structuralist" economists have argued that the reason why higher bank interest rates lead to larger bank deposit is simply that funds are transferred out of alternative asset holdings (Taylor 1983), such as informal credit markets (Van Wijnbergen, 1982). These alternative financing sources, such

as informal credit markets, might be a more efficient means of financing investments, since these are unregulated and do not need to keep holdings in reserve as recommended for the banks. The Neo-structuralist therefore posit that raising the interest rates on bank deposits would decrease, rather than increase, the rate of investment in the economy, because the portion of bank deposits that must be kept in reserve does not find its way into investment in the economy.

A key characteristic of the Neo-structuralist critique is the emphasis on informal credit markets as an important source of residual financing. They argue that if this important institutional characteristics of less–developed countries is taken into account, the effects of increasing the bank interest rates, particularly the short run "portfolio-shift" effects, depends critically on the degree of substitutability in household portfolios of bank deposits for loans to the informal market and/or for what are labelled "unproductive" assets. If portfolio substitution leads to an increase in the rate of interest in informal loans, output will fall and, even if allowance is made for the positive effects of higher bank interest rates on savings, medium term growth and the total supply of loans may be reduced (Maswana, 2003).

Moreover, Campbell and Mankiw (1990) opine that it is reasonable to assume that not all households have access to credit markets, and hence, some households have no ability to smooth consumption over time. Therefore, for such liquidity constrained households, consumption decisions are completely determined by current income. Specifically, Campbell and Mankiw say that there are two types of consumers in an economy. Household faced the problem of liquidity constrained whose consumption is determine by current income and those that have free access to capital markets can smooth their consumption inter -temporarily. It was upon their assumption; they challenge the implicit Mackinnon-Shaw assumptions that all relevant households had free access to capital markets in the economy (Gemech and Struthers, 2003)

Montiel et al (1993) argue that informal finance is not subjected to the interest rate ceilings that are often imposed on the formal sector. As such, interest rates on loans from financial institutions in the informal sector tend to be market determined. Besides, because the government has no means by which to impose reserve or liquidity requirements on these

institutions, they are able to escape the form of disguised tax and may therefore operate at a competitive advantage relative to institutions in the formal sector.

The successful development stories of a test on the controversial assumptions in McKinnon-Shaw Hypothesis versus Neo- Structuralist propositions, involving Taiwan, Berthelemy and Varoudakis (1996) note that informal financial systems have provided small investors with financing instruments with which they could gain access through the formal system, on account of credit rationing. As proposed by McKinnon-Shaw model, informal activities would be reduced with the liberalization of the financial sector. However, most sub-Saharan African countries have experienced the negative effect. Chandravarkar (1989) explains that there is "autonomous" informal sector, which developed indigenously prior to the formal sector, and a "reactive" side that emerged in reaction to regulations and other constraints (Maswana, 2004).

Fischer (1997) holds a contrary view with the financial liberation and argues that markets in developing countries are badly distorted, the financial markets are shallow, exchange rate overvalued, capital controls in place, high tariff and subsidies everywhere. In addition, Aryeetey and Udry (1994) corroborate with this view, argue that in developing economy, where there are financial market dualisms, the unofficial markets operate alongside with the official markets; so where large size of financial intermediation takes place in the informal sector, savings may not be sensitive to real interest rate. According to them, the growing incidence of bank distress with its contagious effect scares savers from saving in official institutions despite the rising real interest rate.

Therefore, the structuralist theory (Taylor 1983; Van Wijnbergen 1983) suggests that the higher interest rates, which follow financial liberalization, might be left unchanged or, indeed, decreases total supply of productive investment funds. The wide spread financial crises have drawn attention to the short comings of financial policy under liberalization. Financial liberalization which involves giving banks and other financial intermediaries more freedom of action, can increase the opportunities to take on risk, thereby increasing financial fragility (Caprio et al.2001). This is not necessarily bad for the economy, as high-risk, high returns investment projects may be acceptable over low-risk and low-return ventures. However,

because of limited liability compounded with other forms of implicit and explicit guarantees, banker's appetite for risk is likely to be greater than what is socially desirable.

Furthermore, the McKinnon-Shaw type of models is based on the unrealistic assumption of perfect competition in financial markets. The banking sector departs from perfect competition in at least two respects. First, banking sectors are rather oligopolistic, and the result of financial liberalization could very well be decreased in loans and the increase in the real interest rates is higher magnitudes than that under perfect competition. Also, perfect competition involves the assumption that economic agents can borrow or lend as much as they wish at the prevailing rate of interest, and in contrast credit rationing is a pervasive feature of the banking sector.

Also criticizing the McKinnon-Shaw Hypothesis, Sundararajan and Balino (1991) argue that financial liberalization brings about flexibility which results in free entry into the industry which may result in high bid for funds through interest rates that may lead to excessive risk-taking, mismatch[3] of assets, and high increase in interest rates. Furthermore, they argue large scale bank failure often takes place immediately after deregulation of the financial sector. Secondly deregulation is often accompanied by increased market competition. As banks go into aggressive drive for deposit, they are exposed to high risk.

A contrary view of financial liberation theory is the stabilization approach; the stabilization school did not criticize the financial liberation theory but, argued that stabilization factors need to be put in place for financial liberalization to be effective. Following the argument Chapple (1990) posits that financial liberalization can only be successful if implemented after monetary stability has been attained. He argues that in developing countries, fiscal deficits constitute the major source of monetary expansion; hence attention should be paid to achieving a significant reduction in the size of the public sector deficit prior to the introduction of a financial liberalization program me. In a similar view, Dornbusch and Reynoso (1993) emphasize the importance of attaining macroeconomic stability before financial liberalization. While the preceding study focuses on fiscal deficit, this study in addition discusses inflation and exchange rates as stabilization factor. They argue that high and unstable inflation often leads to increase

[3] Mismatch of asset refers to a system of borrowing funds from short term and lending for long term .

in demand for financial liberalization, but this might spark off further increase in inflation especially if fiscal deficits by government are large and the exchange rate depreciates at a fast rate. They recommend that before embarking on financial liberalization, fiscal deficits by government should be reduced drastically and exchange rate should also be stabilized.

In addition, Smith and Spooner (1992), following the stabilization view, identified a number of reasons why there should be policy stabilization before embarking on financial liberalization. They lay emphasis on those variables that are likely to inhabit financial liberalization from being successful. Financial and income policies have to be put in place as a prerequisite for financial liberation. Furthermore, to enhance the growth of savings and investments, it is necessary to control inflation. Similarly, Mehran *et al.* (1996) focused on the pre-conditions before any financial reforms. The first elements in the precondition include the establishment of banks and other financial institutions, instruments and markets as well as of infrastructure, such as payments systems. The instrument refers to the development of a range of financial instruments available to market participants to investment and trade. Development of the third component markets presupposes the free operation of the price mechanism across financial markets. In the same view Loayza and Ranciere (2006) argue that the improvements on the financial sector, due to financial liberation would have a positive impact in the long run, once the country's financial system has stabilized. The financial sector reforms are based on growth theories, in which case, GDP growth is used as a proxy for economic performance in this study.

In summary, financial markets are characterized by imperfect and costly information, risk, and market segmentation, which taken together result in credit rationing. This is one of the underlying factors in the coexistence of the formal credit markets that serve the needs of the different segments of the economy. Policy based and structural-institutional explanations attempt to attribute the coexistence of the two markets to policy and structural-institutional rigidities influence on economic performance through savings and investment. In their model, investment is a negative function of real interest rates, and savings are influenced by interest rate. The interest rate ceiling applies to deposit rates only, banks can charge what they like on loans and the margin will be used in non-price competition.

Another effect of Financial Repression, "credit rationing" effect which results from the consequences of excessive government intervention in money and credit markets in developing countries. Interest rates are prevented from adjusting to clear the market, other "non-market" forms of clearing have to take their place. These may involve various forms of "queuing" arrangements to "ration" the available credit such as auctions, quantitative restrictions (for example quotas), and different types of "bidding" systems (Gemech and Struthers, 2003).

Nevertheless, the influential analysis of financial liberation school initiated by the liberal school has been strongly criticized by a group of economists adhering to the new Structuralist School. The Neo-Structuralists recognized the neglect of the informal financial market which led to their criticizing the financial liberation theory by McKinnon and Show (1973). Fischer (1997) holds a contrary view with the financial liberation and argues that markets in developing countries are badly distorted, the financial markets are shallow, exchange rate overvalued, capital controls in place, high tariff and subsidies everywhere.

2.2. RATIONAL EXPECTATION

This section explores the timing and political economic reasons for changes in monetary policy from one policy rule to another, and it examines the effects of different monetary policy rules on the economy. The rational expectations theory which is centered in the recent monetary theoretical literature is discussed. In the field of macroeconomic theory (Lucas, Sargent, and Wallace) have developed a theoretical framework which has quite far-reaching consequences in conducting economic policy. This school of thought within the monetarist camp, known as the "rationalist", can be considered as a continuation of the Keynesian revolution of the thirties, and of Friedman's monetary counter-revolution in the fifties.

The nucleus of their theoretical views essentially regards the economic policymakers as being unable to implement a systematic ant-cyclical economic policy to stabilize employment and to achieve a target of real national income. Tightly interconnected in this theory are the expectations procedures of economic agents in building up their expectations of the rate of inflation, the rate of interest, the foreign exchange rate and so on (Sijben 1980). The macroeconomic theorists mentioned above assume that the public builds up its expectations rationally, and therein makes use of all the available relevant information about the variables,

which according to the economic theory, determine the development of the economic variables to be predicted.

However a systematic monetary policy implementation mitigating the fluctuations in economic activity will be doomed to failure in the long run, because economic agents will anticipate this policy after a learning period and will adjust their economic decisions appropriately. In this way the economy appears to be resistant to an activism in economic policy. (Lucas 1976; Sargent and Wallace 1976; Barro 1976). The influence of the "rationalists" who proclaim the end of Keynesian era and who would abandon Keynesian stabilization policy, is growing steadily also with respect to the development of macroeconomic theory.

Rational expectations theories were developed in response to perceived flaws in theories based on adaptive expectations. Under adaptive expectations, expectations of the future value of an economic variable are based on past values. The hypothesis of rational expectations addresses the criticism by assuming that individuals take all available information into account in forming expectation. The hypothesis of rational expectations means that economic agents forecast in such a way as to minimize forecast errors, subject to the information and decision—making constraints that confront them. It does not mean they make no forecast errors; it simply means that such errors have no serial correlation, no systematic component. Most economists would not object to this general proposition. The hypothesis becomes controversial however, when strong assumptions are made about the constraints. In much of the macroeconomics literature it is assumed (mainly for simplicity) that these constraints are negligible, so that agents have an almost perfect knowledge of the structure of the economy.

A crucial aspect of the rational expectations hypothesis is the assumptions it makes about the way in which people update their beliefs regarding the future, in response to new information. Suppose a person has some prior expectation about the distribution of the aggregate price level. For example, by looking at past aggregate price levels could have determined the mean and variance of that distribution. Her prior expectation of the price level would then equal the mean. However, suppose that while she does not actually know the aggregate price level, she can observe directly some prices in the economy. Then she might use that information to update her priors and form a new posterior distribution of the aggregate price level.

In the1970s the question of not considering rational expectation of economic agents as part of the structure of the economy to be captured in a macroeconomic model attracted the attention of modelers. What has come to be known as Lucas (1976) critique was an attempt to address the laxity in the existing models to reflect microeconomic foundations and economic realities to a robust predictive accuracy. On its own, the Lucas model may not have had much impact outside a small group of theoretical macroeconomists. However, almost immediately after that paper was published, its predictions appeared to become accurate. Following the first oil price shock of 1973, policy—makers attempted to offset the effects of the ensuing downturn through a monetary expansion. Implicitly they were trying to exploit a presumed trade off along the short—run Phillips curve. If inflationary expectations had adjusted in a sluggish fashion then this may have worked. However, it appeared that within a short period of time firms and households figured out what was happening and adjusted their expectations of inflation upwards. These expectations were then built into employment contracts and supply relationships, thereby fuelling high inflation with little impact on output or employment. This combination of low output and high inflation became known as stagflation.

The after effect of the Lucas Critique was the incorporation of expectations into macroeconomic models, beginning with the adaptive expectation and latter rational expectation. The model simply seeks to make adjustments for long run economic optimization of various economic units in a system. Today, the backward and forward-looking models have become major contributions to modern macroeconomic forecast. The development of macroeconomic models to reflect country specific macroeconomic condition influenced the emergence of other groups of macro-econometric models void of any known theory – the theoretical macroeconomic models.

There are different reasons behind the rise of rational expectations. Sent (1998), one of the reasons was the expiration of the Phillips curve in the late 1960s to early 1970s; policy makers used trade-off between inflation and unemployment to lower unemployment. However, they faced high inflation rates accompanied by high unemployment rates in the 1970s. In other words, the result of policy making was higher, inflation with no benefits in terms of lower unemployment. Rational expectations economists were able to explain the expiration of the Phillips curve and demonstrated that government actions caused an adverse shift of the Phillips curve. They justified the ineffectiveness of government intervention in the context of the failure

of traditional Keynesian policies in the 1970s. Also, they recognized the limitations of their profession, maintaining that the economy would basically be stable if it were not subjected to the shocks administered by the government.

Using available techniques: Rational Expectation Economists used sophisticated mathematical techniques in order to predict. They learned and used the techniques of intertemporal optimization developed by mathematicians and control scientists. They also improved the tools of optimal prediction and filtering of stochastic processes. Some of these techniques such as classical linear prediction theory[1] was developed in 1940s to1950s. However, Peter Whittle made this theory, more accessible to economists, since it was heavily used by Rational Expectation Economists. This delay explains the lagged effect of Muth's contributions. Thus Rational Expectation Economists were able to calculate rational expectation equilibrium using new techniques.

According to rational expectation hypothesis, optimization over perceptions implies that agents did the best they could and formed their views of the future using available information, including their understanding of how the economy works. Rational expectation theorists extended expectation theory into the optimizing behaviours theory. If perceptions were not optimally chosen, unexploited utility or profit-generating possibilities would exist within the system. Hence, these economists insist on the disappearance of all such unexploited possibilities.

Criticisms of the rational expectation hypothesis (hence forth REH) are as follows (Attfield et al, 1991). The plausibility of rationality assumes that people use all the information about the process determining a variable when forming expectations. This is a criticism that holds that behind rational expectations is implausible. The advocates of REH respond to this criticism in a manner that suggests the idea that a typical individual being capable of making the best of opportunities open to him is a common one in economics. For example, in demand theory, it is assumed that the typical person chooses to consume goods at a point given by the tangency of an indifference curve and a budget constraint. The reason behind this choice strategy is highly sophisticated for most people. Yet it is assumed that people act as if they understand it. If such assumption leads to a theory which makes accurate predictions, then the assumption of mathematical awareness is thereby shown to be a useful one. People forming expectations

depend on firms who specialize in providing service of making economic forecasts, or government bodies who forecast publicly.

Some economists also criticize the role of rationality in REH. Advocates of the hypothesis state that the role of rationality has been used in REH, in that the process of acquiring information has been carried out up to the point where the marginal cost of acquiring more information equals the marginal benefit of making more accurate forecasts. But this point does not necessarily correspond to the point at which the forecasting error is equal to the purely random component of the determining process. It may be that knowledge about some determining variable could be obtained and extra accuracy thereby achieved, but only at a price which it is not worth paying. In that case the forecasting error will tend to be absolutely greater than the random element in the determining process. Advocates of REH accept this criticism but they assert that for most purposes it is not of great significance. The reason for this is that forecasting errors themselves are observed at no cost. For example, any error in your forecast about the level of prices is observed as a costless side-effect of shopping. In other words, it must be worthwhile to exploit this information fully until its marginal benefit is zero.

Rational expectation hypothesis assume that information is availability, it assumes that the process X is known and that the values of variables in that process are known at the end of period t-1. But what happens if we do not know the process determining the variable (X) and if we are not able to acquire the necessary information. Advocates of the REH state that it is true that people cannot automatically know which variables are important in the process determining X but it is also true that the hypothesis does not claim that they do. Furthermore, some economists have criticized that rational expectation hypothesis is not testable. Rational expectations theorists state that there are several layers to this criticism. First, if REH is taken rather loosely to imply that people make the best of their available information, then it may always be possible to define the available information so that the hypothesis becomes immune to falsification.

This criticism is valid if tests of REH tended to employ the loose form of the hypothesis. But if they tend to employ strong versions of the hypothesis in which people's knowledge of the process determining a variable is assumed to be the same as the best estimate that can be made of that process by econometric techniques then this criticism is hardly a strong one. Because

this assumption leads to predictions which are both clear and different from the predictions derived from other theories about expectations. An important criticism is that expectations about a variable are almost always only part of a model. Thus there are joint tests of the REH itself and the rest of the model. If the model fails the tests to which it is subjected one can always 'rescue' the REH by arguing that it is the rest of the model which is wrong. It is at times possible to distinguish between the restrictions imposed on the data by REH itself and the restrictions imposed by the rest of the model. However, the usefulness of the REH, in this way, can be tested informally and less satisfactory. If, time after time, this kind of models were rejected then we can reject the REH. The final type of criticism of testability of REH is what is known as 'observational equivalence'. For many rational expectations models which 'fits the data' there will always be a non-rational expectations model which fits the data equally well. The data themselves cannot discriminate between two theories, which are therefore said to be observationally equivalent. The implication of this is that, even if a rational expectations model 'passes' conventional empirical tests, this does not necessarily imply that one should accept the hypothesis. Whether you do or do not, depends on whether you find it more 'plausible' than the non-rational expectations model on some other unspecified grounds.

Moreover the models of Muth and Lucas assume that at any specific time, a market or the economy has only one equilibrium (which was determined ahead of time), so that people form their expectations around this unique equilibrium. If there is more than one possible equilibrium at any time then the more interesting implications of the theory of rational expectations do not apply. In fact, expectations would determine the nature of the equilibrium attained, reversing the line of causation posited by rational expectations theorists.

2.3. TAYLOR RULE

Taylor rule is used in various scenarios to assess the effects of monetary policy in influencing macro econometric variables. The Taylor rule was formulated explicitly for determining the short-term interest rate of the Central Bank and states that "keep the real-short-term interest rate constant as a neutral policy stance, and make a surcharge (discount) when the output gap is positive (negative) and/or inflation is above (below) a target rate". The model is closed by a policy reaction function of the monetary right (a Taylor rule, Taylor, 1993).

Notwithstanding the level of attention that has been given to modeling the effects of monetary policy on macroeconomic performance, macroeconomists are also interested in modeling the Central Bank reaction to developments in the economy. These responses which are prompted by different economic realisations in addition to the particular objective of price stability are captured in econometric models commonly referred to as "monetary policy reaction functions". The reaction functions relate economic policy variables to lagged values of other economic variables. These policy reaction functions can be estimated and then be incorporated in the prediction of the expected rate of inflation. In other words, rational economic agents are making use of their experiences with monetary behaviour of the authorities in the past (feedback information) to predict the future monetary policy actions. Ultimately on the basis of these predictions, they make a correction beforehand with regard to the influence of the expected monetary policy behaviour on real variables by making the appropriate price and wage adjustments.

In consequence stabilization measures, when they actually take place will have no influence on the ultimate goals in the real sector because they have already been discounted in the economic decision-making process, thereby neutralizing the effectiveness of this policy activism. The only way in which economic policy can generate a short–run effect with regard to the real variables is to make monetary policy totally unpredictable. This means that in these circumstances monetary authorities will operate in a random and completely unreliable way or will change the policy reaction function secretly (Sijben 1980).

In addition, Taylor's rule simple links mechanically, the level of the policy rate to deviations of inflation from its target and of output from its potential (the output gap).This implies that central banks aim at stabilizing inflation around its potential. Positive (negative) deviations of the two variables from their target or potential level would be associated with a lightening (loosening) of monetary policy. While the calibration of the reaction coefficients by Taylor is not normative, it incorporates important properties of desirable rules from the perspective of modern macroeconomic models of the New Keynesian type. Initially proposed as a simple illustration for the United States of desirable policy rules that had emerged from the academic literature at that time, it has become a popular gauge for assessments of the monetary policy stance in both advance economies and emerging market economies.

In 1979 Taylor introduced rational expectations in a simple general equilibrium model of the US economy. Taylor concluded that "there is no long-run trade-off between the level of output and the level of inflation in the model-the Phillips curve is vertical in the long run. However, there is a long run trade-off between fluctuations in output and fluctuations in inflation. In other words, there is a 'second order' Phillips curve which is not vertical in the long run" (Taylor, 1979). His conclusion triggered off a new perception in the relationship between inflation and output. He continued with his work in 1993 on inflation targeting which later formed the core of analysis on inflation and output. The onus of his work is that the Central Bank seeks to minimize a loss function, that is, a weighted average of two terms: one based on deviations from the inflation target and the other based on deviations from the output target.

Since 1993, the literature on monetary policy reaction has been largely influenced by the work of John Taylor. Taylor's (1993) monetary policy rule specifies the Federal Reserve as aiming to close a specified output gap and a (pre-determined) inflation target. It is a monetary policy rule that sets the Central Bank as particularly concerned with the rate of domestic inflation. In his rule, he shows that the Federal funds rate is determined as a function of the economy's real rate of interest at a zero rate of inflation plus target inflation, deviation of inflation from its target rate and deviations of output from its desired level (termed the output gap).

For over a decade or so, researchers have investigated the interest rate setting behaviour of the Central Banks in developed countries, using the simple Taylor rule earlier proposed in 1993. It was originally demonstrated by Barro and Gordon at the beginning of the 1980s that an independent central bank may have an important role aim at guaranteeing the success of anti-inflationary monetary policy. Barro and Gordon suggested that an independent central bank, perhaps following a strict, mechanistic rule, would provide an efficient solution to the well known time inconsistency problem.

More recently, similar works have been undertaken in emerging economies following appropriate modifications of the standard Taylor specification which takes into account the realities of underdeveloped financial markets and vulnerability to external shocks typical in these countries. While the results seem inconsistent, there is, nevertheless, evidence that the central banks in these economies also follow some rule-like policy. Notwithstanding the level of attention given to modeling the impact of monetary policy on macroeconomic aggregates,

macroeconomists are also interested in modeling the central banks' reaction to developments in the economies. These responses which are prompted by various economic realisations, in addition to the particular objective of price stability, are captured in econometric models commonly referred to as "monetary policy reaction functions". The analysis of the monetary authorities' reactions, although a sensibly researched topic (Khoury, 1990), was sparsely undertaken until recent interest was (mainly) motivated by Taylor (1993).

The Taylor rule was formulated explicitly for determining the short-term interest rate of the central bank, and states that "keep the real-short-term interest rate constant as a neutral policy stance, and make a surcharge (discount) when the output gap is positive (negative) and/or inflation is above (below) a target rate". The model is closed by a policy reaction function of the monetary authority (a Taylor rule, Taylor, 1993). For simplicity, we take the three-month interest rate to be the instrument of monetary policy, and the authority is assumed to respond to deviations of next-period inflation from its target and to the output gap. The last-period policy stance may also affect the current policy stance:

Some researchers, such as Ball (1999) suggest that in an open economy, the central bank could use a weighted average of the nominal interest rate and the exchange rate as an instrument. As to the choice of policy instrument in conducting monetary policy in emerging economies, Ball states that, given the specific nature of markets in developing countries, the policy instrument could not only be short-term interest rate, but also the monetary base or some other monetary aggregate.

Taylor (2001) further argues that even though the effect of monetary policy on real variables through the financial markets is limited, because of the less developed nature of these markets, still monetary policy could have significant impacts through changes in wages and property prices. Thus, a predictable behaviour of central banks in emerging economies considerably improves the transmission and effectiveness of monetary policy. In line with this theoretical argument, over the past few years, the monetary policy regime in emerging economies has shifted towards adopting a rule like policy. For instance, Mohanty and Klau (2003) indicate that, out of 13 leading emerging economies in their study, only two had not adopted inflation targeting (IT), a related type of rule-based policy. Since inflation targeting leads to a more

systematic response by the central bank to inflation, the interest rate setting process in these economies has been guided by such a rule-like policy.

In spite of the vast literature on what the Central Bank should target, there are no clear cut conclusions on the application of policy. This is for two reasons. First, the literature is still inconclusive on the trade-off between inflation and output as given by the standard Philips curve. Even the most dogmatic inflation targeting framework still provides for output growth. The practice could be quite different from the theory. Often, even the most 'independent' Central Banks get caught up in the broad policy environment and so get involved in growth policy design. The Central Bank provides technical assistance to other institutions and collaborates with such institutions to achieve improved growth. Central Bank reports often show supports to real sector development programmes (Agu 2007).

The basic study for the real trade-off between inflation and output growth started with the Phillips curve which demonstrated the relationship between inflation rate and level of employment. The Phillips curve was not initially intended to serve as a policy tool, but Samuelson and Solow (1960) later gave the policy implications of the relationship establishing it as one. The reasoning behind the trade-off seems to be consistent with the classical Keynesian structure that prevailed at the time, and so was widely accepted. Later, Friedman proves that Phillips curve showed a short term relationship and that in the long term, there exist a natural unemployment rate which can combine with any rate of inflation. Friedman's view was also widely accepted.

According to Friedman, the trade-off in Taylor curve is not an inference from experience; rather an implication of a policy choice. A zero weight on the output term reduces the bank's objective to inflation alone while a zero weight on the inflation term reduces the bank's objectives to output alone. As the weight varies between these two extremes the bank's objective shifts, and corresponding to each weight is a policy rule that is optimal for the Taylor economic model. This policy rule will in turn imply for that model which is a variance of inflation and a variance of output.

The general case can be particularized by specifying or estimating the reaction parameters, and by specifying whether policy responds to past, current or future expected values of the reaction

variables. That is to say, when output and inflation are at their desired levels, the central bank set its policy rate equal to the sum of the equilibrium real interest rate and inflation target. When the inflation is above its target or output is above its potential, then the real interest rate will be increased above its equilibrium level by the central bank to calm down the overheated economy. Similarly, in the case of deflation and high unemployment rate, real interest rate is decreased.

Reaction functions or interest rate 'rules' have a strong intuitive appeal since they provide a simple organizing principle for assessing monetary policy and second-guessing how central banks will set their instrument. But they need to be used and interpreted with considerable caution. In the first instance, central bankers say that they do not follow rules (Kohn 1999); the economy and decision making are much more complex. Simple rules are only ever approximations to reality; other factors, like dealing with financial instability and economic uncertainty, impinge on decision making (Taylor 1993).

2.4. THEORIES OF MONEY DEMAND

The theory of demand for money is the main theoretical base for the consumer price index (henceforth CPI) and partially for domestic output (henceforth GDP). It demonstrates the effects of money supply on CPI and GDP. The study of demand for money function has long dominated research in monetary economics. Busari (2004) opines that the effectiveness of monetary policy based on controlling monetary aggregates, hinges on the stability of the demand for money, the interest rate elasticity of the demand for money, the interest rate elasticity of expenditure and the ability of the authorities to control the money supply. Applying this to developing economies like Nigeria, a stable demand function forms the core in the conduct of monetary policy. It is crucial to the determination of the effects of monetary policy as a stable money demand function enables a policy-driven change in monetary aggregates to have measurable or indeed predictable influence on domestic output (GDP), interest rates and ultimately on the consumer's price level (Ajayi and Ojo , 2006; Gbadebo and Oladapo, 2009).

Uwubanmwen and Olagun (2002) define demand for money as the quantity of money or the total amount of money balances that people want to hold for certain purposes. The use of monetary policy as a tool for macro-economic stabilization depends mainly on the behaviour of

the demand for money or cash balances in the hand of the public. The monetarists emphasize the function of money in explaining short term changes in domestic output. They argue that the role of money was neglected by Keynesians. Friedman and Schwartz (1963) suggest that changes in the money supply cause changes in domestic output. The monetarists believe that all recessions and depressions are caused by contraction of money and credit to the private sector, and booms and inflations are caused by excessive increases in the money supply.

Furthermore, the monetarists hold the view that the money supply is an important factor affecting consumer's price levels and domestic output in the short run and of the price levels in the long run. They maintain that other factors apart from money supply affect the domestic output price levels and employment. A change in the money supply will inevitably affect the consumer's price levels and domestic output in the short run. However in the long run, the effect of change in the money supply will affect the entire price level. In addition, as the economy is assumed to be close to full employment in the long run, increase in national income, will consist mainly of higher prices. Thus, changes in money supply affect domestic output directly, due to the assumption that the velocity of circulation of money is stable.

The monetarists contend that the money supply is not influenced by interest rates. This argument is based on the quantity theory of money traced back to Irving Fisher's work on the Quantity of Money. He presented one of the earliest modern statements of the quantity theory of money, in his theory of (transaction) demand for money, Fisher placed primary emphasis on the role of money as a medium of exchange and developed the famous quantity theory equation (Aigbokhan, 1995). This identity is expressed as:

$$M\,V = P\,T \qquad (2.4)$$

Where M is the stock of money supply, V is the velocity of circulation of money, P is the price level, T is the number of transaction in a given period. V and T are assumed to be constant. Its implications are clear, with the equilibrium values of V and T constant and M exogenous, there must be a proportional relationship in equilibrium between money supply (m) and the general price level (p) (Iyoha, 2002). M causes changes in P since T and V are held constant and independent of M equation (2.4) becomes:

$$\% \Delta M = \% \Delta p \quad (2.5)$$

Equation (2.5) in per centage form:

Thus equation (2.5), says that a per centage change in money supply will bring about a proportionate per centage change in price, given that money demand will produce inflation in the economy. From another perspective, increase in money supply also increases the supply of investible fund in the economy and therefore increases the real output of goods and services (Enoma, 2004). Given this condition, a rise in money supply will lead to a fall in the market rate of interest, thus induce an increase in investment demand, which will eventually result in the expansion of the economy.

2.5. MUNDEL-FLEMING MODEL

The inability of the original Keynesian model to link the demand side to the supply side of the economy was however addressed by the Neo-Keynesian models starting with the Hicks (1937) IS-LM model, which tried to simultaneously solve the product and money markets, and showed income and interest rates as linking variables that clear the two markets. Today the simple IS-LM model as extended by Mundell-Fleming (1963) has metamorphosed into a large scale model that links the real and nominal variables. The dominance of the large Keynesian models like the Classical was unable to address what has come to be known in economic theory as stagflation–the combined effect of unemployment and inflation contrary to the Keynesian theory of the inverse relationship between inflation and unemployment.

Mundell was of the opinion that in order to achieve internal balance and external balance simultaneously, there is a need to apply monetary and fiscal policy simultaneously. Internal balance refers to domestic balance, i.e. full employment with price stability. External balance refers to equilibrium in the balance of payments. He highlights the fixed exchange rate system so as to achieve equilibrium in the balance of payments since a freely fluctuating exchange rate system external balance is automatically achieved. The achievement of external balance does not mean that internal balance is in equilibrium. In order to obtain internal balance it is necessary to reduce inflation and unemployment. (There is a tradeoff between inflation and unemployment).

In order to achieve external balance, there is a need to bring about equality between imports and exports, i.e. debits and credits. Expansionary monetary policy, i.e. the cheap money policy, can be resorted to by reducing the rate of interest. It will lead to increase in the level of income and employment. It will also increase imports as imports are the function of level of income. M = f (Y) Contractionary monetary policy, i.e. the dear money policy can be resorted to by enhancing the rate of interest which will lead to reduced investment, income and employment. It will also lead to reduction in imports, i.e. it will reduce inflation and deficit in the balance of payments. Expenditure increasing policy consists of expansionary monetary and fiscal policy, i.e. reduction in the rate of interest and increase in public expenditure. Expenditure reducing policy consists of contractionary monetary and fiscal policy, i.e. increasing the rate of internal and reducing public expenditure. Both of these policies are referred to as expenditure adjustment and changing policy. If a country faces the problem of internal and external imbalance, i.e. internally inflation and externally deficit in the balance of payments, then it is advisable that a country should follow concretionary monetary and fiscal policies.

A remarkable achievement of Mundell-Fleming model, also known as the IS-LM-BOP model, is the extension of the Keynesian traditional IS-LM Model to incorporate the balance of payments equilibrium condition (and a BP curve). The extension allows discussion of the interplay between monetary policy and exchange rate policy. In particular, the model emphasizes the differences between fixed and floating exchange rates. The Mundell-Fleming model shows that the short-run relationship between an economy's nominal exchange rate, interest rate, and output (in contrast to the closed-economy IS-LM model, which focuses only on the relationship between the interest rate and output). The Mundell-Fleming model has been used to argue that an economy cannot simultaneously maintain a fixed exchange rate, free capital movement, and an independent monetary policy. This principle is frequently called the "Mundell-Fleming trilemma" or "irreconcilable trinity".

In a series of articles, Mundell reintroduced the idea of a self-regulating adjustment mechanism that had been central to the classical framework. In line with the evolution of world financial markets since Meade's book, Mundell put private international capital flows at center stage in his dynamic analysis. Had his achievement been entirely technical, it might have had little impact. Instead, through a rare combination of analytical power and Schumpeterian "vision," Mundell distilled from his mathematical formulations important lessons that permanently changed the way we think about the open economy. Mundell followed Meade in emphasizing

the monetary sector, using a liquidity preference theory of money demand to tie down the short-run equilibrium. Metzler (1968), in his work done around the same time, took a similar tack, but he was less successful, whether his work is judged by its theoretical elegance or by immediate policy relevance. Fleming (1962), working in parallel, developed a model quite similar to Mundell's basic short-run equilibrium framework, and the two justly share credit for this contribution. Fleming did not, however, formally address the long-term adjustment process implicit in Keynesian models; he confined himself to some prescient remarks on the long- versus short-term responsiveness of the capital account.

Mundell focused squarely on the dynamic effects of payments imbalances in his paper on "The International Disequilibrium System" (Mundell, 1961). Even in a world of rigid prices, Mundell argued, an "income-specie-flow mechanism" analogous to Hume's price-specie-flow mechanism ensures long-run equilibrium in international payments. An increase in a country's money supply, for example, would depress its interest rate, raise spending, and open an external deficit that would be settled, in part, through money outflows. For a small economy, the end process would come only when the initial equilibrium had been reestablished. Mundell clarifies the role of sterilization operations, showing that they can be at best a temporary response to permanent disturbances affecting the balance of payments. This work was influential in indicating the ubiquity of self-regulating mechanisms of international adjustment and, as a corollary, the limited scope for monetary policy with a fixed exchange rate, even under Keynesian conditions.

By the mid-1960s, Mundell's dissatisfaction with his own early version of monetary dynamics led him to pursue the monetary approach to balance of payments. The monetary approach was developed by Jacques Polak, of the International Monetary Fund, Harry G. Johnson and Robert Mundel in late 1950s and early 1960s. There was concern that traditional approaches for analyzing the balance of payments ignored monetary considerations, while placing emphasis on the impact of changes in income and exchange rate on the balance of payments. Alternatively, the monetary approach to the balance of payments views the balance of payments as purely monetary phenomena (Frenkel and Johnson 1976; Lanciaux, 1990).

In particular, Johnson (1977) notes that monetary approach emphasizes balance of payments problems in monetary world economic system, and should be explained by models that clearly

specify monetary behaviour and integrate it with the real world. In addition, money is a stock, not a flow, and monetary equilibrium and disequilibrium require analysis of stock equilibrium conditions and stock adjustment processes. Monetary approach is based on Walras‘s Law which says that increase in demand for goods and services, securities, bonds, and money should sum up to zero. Excess money demand can be controlled by sale of domestic goods and services, or through securities in foreign market. Similarly, excess money supply can be reduced by purchasing foreign goods and services or by investment abroad resulting in reserve outflow.

The balance of payments is in equilibrium when the sum of reserve inflow equals sum of outflow. The disequilibrium of balance of payments is automatically adjusted if the monetary authorities do not generate money by expansionary policy, i.e. creating new domestic credit (Adamu 2004). The monetary base is assumed to have two components: a domestic component controlled by the central bank, and a foreign component (foreign exchange reserve) outside the control of the central bank. Estimating the balance of payments is simply a matter of collecting data on the change in reserves, price levels, real income, the interest rate and domestic component of the monetary base and running a regression to see if you get the “right” signs. The approach concludes that BOP deficits are the result of excessive monetary growth and that in the absence of unnecessary intervention, any external imbalance will be self- correcting.

Furthermore, Kemp (1975) notes that the monetary approach to balance of payment approach may be summarized by the proposition that the transactions recorded in balance of payments statistics reflect aggregate portfolio decisions by both foreign and domestic economic units. Therefore, in analyzing the rate of change of international reserve, the monetary approach focuses on the determinant of surpluses demand for or supply of money. According to this perspective, surpluses (deficit) in the money account measure the rate at which money balances are accumulated in the domestic economy. That is, balance of payments flow is one of the mechanisms by which actual money balances are adjusted to their desired levels, this is a function of the monetary authority.

From the monetary approach theory, an increase in domestic credit raises money supply relative to money demand, so the balance of payments must go into deficit to reduce the money supply and restore money market equilibrium. Because the balance of payments equals the sum

of the current and (non reserve) capital account surpluses, an important contribution of the monetary approach was to stress that in many situations, balance of payments problems result directly from imbalance in the money market, and a policy solution that relies on monetary policy is therefore most appropriate. A large balance of payments deficit may be the result of excessive domestic credit creation. Because of output, and thus money demand falls, the monetary approach also predicts that a balance of payments deficit will result from a fall in export demand. It would be wrong, however, for policy makers to conclude that because the balance of payments deficit is associated with a fall in money demand, a contraction of domestic credit is the best response. If the Central Bank were to restrict domestic credit to improve the balance of payments, unemployment would remain high and might even rise.

For overall balance, the current account, capital account and the official settlement (also known as change in reserves) balance must sum up to zero, the official settlements is the inverse of the overall balance. Economists refer to the overall balance as the best measure of the balance of payments ((Howard & Mamingi, 2002). It was a step for the monetarists to develop that focus on the change in reserve as the measure of BOP. Despite criticism on, monetary approach to the balance of payments continued to dominate theories on trade, the MABP seems to involve a slight modification and improvement over the traditional method of measuring the balance of payments. Moreover, it previously overlooked money as an important factor and did not rely on the assumptions of excess capacity.

The model's mechanics workings can be described in terms of an IS-LM-BOP graph with the domestic interest rate plotted vertically and real GDP plotted horizontally. The IS curve is downward sloped and the LM curve is upward sloped, as in the closed economy IS-LM analysis; the BOP curve is upward sloped unless there is perfect capital mobility, in which case it is horizontal at the level of the world interest rate. In this graph, under less than perfect capital mobility the positions of both the IS curve and the BOP curve depend on the exchange rate , since the IS-LM graph is actually a two-dimensional cross-section of a three-dimensional space involving all of the interest rate, income, and the exchange rate. However, under perfect capital mobility the BOP curve is simply horizontal at a level of the domestic interest rate equal

to the level of the world interest rate. In a system of flexible exchange rates, central banks allow the exchange rate to be determined by market forces alone.

An increase in money supply shifts the LM curve to the right. This directly reduces the local interest rate relative to the global interest rate. This depreciates the exchange rate of local currency through capital outflow. (To the extent that funds are internationally mobile, they flow out to take advantage of the interest rate abroad, which has become relatively more attractive, and hence the currency depreciates.) The depreciation makes local goods cheaper compared to foreign goods, and this increases exports and decreases imports. Hence, net exports are increased. Increased net exports lead to the shifting of the IS curve to the right, partially or entirely mitigating the initial decline in the domestic interest rate. At the same time, the BOP curve shifts rightward, since with a depreciated currency, it takes a lower interest rate or higher income level to give a zero balance of payments surplus (which is what the curve describes). The combined effect of these three curves shifting is to increase the economy's income. A decrease in the money supply causes the exact opposite process.

A rise in the global interest rate shifts the BOP curve upward and makes capital flow out of the local economy. This depreciates the local currency and boosts net exports, shifting the IS curve to the right. Under less than perfect capital mobility, the depreciated exchange rate shifts the BOP curve somewhat back down. The net effect is an increase in income and the local interest rate. Under perfect capital mobility, the BOP curve is always horizontal at the level of the world interest rate. When the latter goes up, the BOP curve shifts upward by the same amount, and stays there. The exchange rate changes enough to shift the IS curve to the location where it crosses the new BOP curve at its intersection with the unchanged LM curve; now the domestic interest rate equals the new level of the global interest rate. A decrease in the global interest rate causes the reverse to occur.

In a system of fixed exchange rates, central banks announce an exchange rate (the parity rate) at which they are prepared to buy or sell any amount of domestic currency. Thus, net payments flows into or out of the country need not equal zero; the exchange rate is exogenously given, while the variable BOP is endogenous. Under the fixed exchange rate system, the central bank operates in the foreign exchange market to maintain a specific exchange rate. If there is pressure to depreciate the domestic currency's exchange rate because the supply of domestic currency exceeds its demand in foreign exchange markets, the local authority buys domestic

currency with foreign currency to decrease the domestic currency's supply in the foreign exchange market. This keeps the domestic currency's exchange rate at its targeted level **(**Michael 1976).

An increase in government expenditure shifts the IS curve to the right. The shift causes both the local interest rate and income (GDP) to rise. The increase in the local interest rate causes increased capital inflows, and the inflows make the local currency stronger compared to foreign currencies. On the other hand, the higher GDP increases spending on imports, tending to make the currency weaker. For example if capital mobility is relatively strong, the former effect will dominate and the currency will become stronger. The stronger exchange rate also makes foreign goods cheaper compared to local goods. This encourages greater imports and discourages exports, so net exports become lower. As a result of this exchange rate change, the IS curve shifts back toward its original location. The stronger currency also shifts the BOP curve upward, as higher levels of the interest rate would now be consistent with a zero payments surplus in the presence of the stronger currency exchange rate. The LM curve is not at all affected in the short run. The net effect of all this is that, if there is perfect capital mobility, the level of income of the local economy is unchanged from original, while it has gone up, if capital is less than perfectly mobile. A decrease in government expenditure reverses the process.

The balance of payments is in equilibrium when the sum of reserve inflow equals sum of outflow. The disequilibrium of balance of payments is automatically adjusted if the monetary authorities do not generate money by expansionary policy, i.e. creating new domestic credit (Adamu 2004). The monetary base is assumed to have two components: a domestic component controlled by the central bank, and a foreign component (foreign exchange reserve) outside the control of the Central Bank. Estimating the balance of payments is simply a matter of collecting data on the change in reserves, price levels, real income, the interest rate and domestic component of the monetary base and running a regression. The approach concludes that BOP deficits are the result of excessive monetary growth and that in the absence of unnecessary intervention, any external imbalance will be self-correcting.

Furthermore, Kemp (1975) notes that the monetary approach to balance of payment approach may be summarized by the proposition that the transactions recorded in balance of payments statistics reflect aggregate portfolio decisions by both foreign and domestic economic units.

Therefore, in analyzing the rate of change of international reserve, the monetary approach focuses on the determinant of surpluses demand for or supply of money. According to this perspective, surpluses (deficit) in the money account measure the rate at which money balances are accumulated in the domestic economy.

From the monetary approach theory, an increase in domestic credit raises money supply relative to money demand, so the balance of payments must go into deficit to reduce the money supply and restore money market equilibrium. Because the balance of payments equals the sum of the current and (non reserve) capital account surpluses, an important contribution of the monetary approach was to stress that in many situations, balance of payments problems result directly from imbalance in the money market and a policy solution that relies on monetary policy is therefore most appropriate. A large balance of payments deficit may be the result of excessive domestic credit creation. Because output and thus money demand falls, the monetary approach also predicts that a balance of payments deficit will result from a fall in export demand. It would be wrong, however, for policy makers to conclude that because the balance of payments deficit is associated with a fall in money demand, a contraction of domestic credit is the best response. If the central bank were to restrict domestic credit to improve the balance of payments, unemployment would remain high and might even rise.

While most economists agree that the inclusion of money in the discussion of international trade and balance of payments has constituted an improvement, the MABP has been criticized for having unrealistic assumptions (full employment output, only one price exists, changes in money supply do not affect level of income). In reaction, Lanciaux (1990) argues that criticisms of the MABP focusing on its unrealistic assumptions are ignored on the basis that all models leave out certain things in an effort to be simple; this is consistent with methodology of positive economics. Similarly, the MABP theory has been criticized many times because it considered only monetary variables and ignoring real factors which also play an important function on BOP (Howard & Mamingi, 2002).

The MABP also focuses at the change in reserves, while other aspects are ignored including information about the trade deficit/surplus, the current account position, and the extent of international burrowing. In addition, overlook imperfections in data collection when it takes the change in reserves to be the inverse of the overall balance. In reaction, the balance of payments

is a statement of a balance sheet and as such, debits must be equal to credits, and the current account balance, the capital account balance and the official settlements balance must be equal to zero. Earlier analyses of the balance of payments account focused on only the current account expected. It was not clear, if current account was the relevant measure of the BOP, because changes in capital account also exert pressure on the exchange rate.

For the overall balance, the current account, capital account and the official settlement (also known as change in reserves) balance must sum up to zero, the official settlements is the inverse of the overall balance. Economists referred to the overall balance as the best measure of the balance of payments ((Howard & Mamingi, 2002). It was a step for the monetarists to develop that focused on the change in reserve as the measure of BOP. Despite the criticism, monetary approach to the balance of payments continued to dominate theories on trade, the MABP seems to involve a slight modification and improvement over the traditional method of measuring the balance of payments. Moreover, it included previously overlooked money as an important factor and did not rely on the assumptions of excess capacity.

2.6. EMPIRICAL STUDIES ON FINANCIAL LIBERATION

A large body of empirical studies exists to support financial reforms theories. Testing the financial liberation theory, Nnanna and Dogo (1998) evaluated the changes which have occurred in Nigerian financial system since the introduction of structural reforms based on ”Financial Liberalization” theory in the mid 1980s. Their empirical analysis carried out in the study has confirmed deepen the Nigerian financial system despite the emergence of distress in the banking industry and the consequent liquidation of 31 banks.

Galindo *et al.* (2003) in a related study evaluate the success of financial reforms that have been implemented in developing countries. They used panel data from twelve developing countries and the econometric result shows a significant and sizeable effect of financial liberalization on the efficiency with which investment funds are allocated. Attullah and Hang (2006) take a different approach to access the relationship between three elements of economic reforms which are: fiscal reforms, financial reforms, and private investment liberalization and bank

efficiency in developing countries. In their methodology two step procedures were adopted. To measure the efficiency of banks in Indian he used the data envelopment analysis and estimated his equation with ordinary least square.

Sanjeev (2006),in a related study examines the technical efficiency of the banks operating in Indian in the post reform era. In his methodology, the author uses a non-parametric linear programming-based technique, Data Envelopment Analysis (DAE) to determine the technical efficiency of public, private and foreign banks operating in India. The results show that the efficiency of the banks improved over time, and that the foreign banks have outperformed both private sector and public sector banks.

Lee and Shin (2007) examine the effect of financial liberalization on economic growth by combining the results of a panel model with those of a probit model. They collected data for 58 countries around the world, mainly from industrialized countries and most crises-experienced countries. The result shows that financial liberalization is positively associated with economic growth. Their study also tests the effect of financial liberation on interest rates, and demonstrates that financial liberalization increases interest rates and makes the nominal interest rate positive. Shrestha and Chowdhury (2007) empirically investigate the deregulation of interest rate after the financial liberation in Nepal. Using autoregressive distributed lag, their findings indicate that interest rates is positively related to savings and investment. Shehzad and de Haan (2008) empirically examine the impact of financial liberalization on systemic and non-systemic banking crises, using parameters for measuring financial liberalization for developing and developed countries with a scope from 1981-2002. In their findings, financial liberalization reduces the likelihood of systemic crises.

Mahesh and Rajeev (2008) attempt to measure productive efficiency of Indian commercial bank, after the financial sector reforms, initiated in 1992. The productive efficiency of a commercial bank gives a measure of the performance of a bank in producing financial services. Their studies applied stochastic frontier technique to estimate bank specific deposit, advance and investment efficiencies for the period 1985-2004. Their findings also show that deregulation has significant impacts on all three types of efficiency measures. While deposit and investment efficiencies have improved, advance efficiency has declined marginally.

Contrary to earlier empirical studies on financial liberation theory discussed above, these empirical studies focus on the structural approach. Bandiera et al (1998) approach their studies differently, their empirical work was based on the structuralist approach theory which criticized financial liberation theory's opinion that the backwardness of developing countries was not as a result of financial low interest rate (financial repression), but structural problems such as market inefficiencies . They focus on saving-investment hypothesis of McKinnon-Show. They use the principle component for measuring financial liberalization for eight developing countries; Chile, Ghana, Indonesia, Korea, Malaysia, Mexico, Turkey and Zimbabwe. In their study, there was no evidence of significant positive and sizeable interest rate effects on saving and liberalization.

Kaminski and Reinhart (1999), in a related study, investigated the links between banking crises and currency crises. They use cross country probit estimation technique on 20 countries for the period 1970-1995. In their empirical result, bank crises were absent before the financial liberation period of 1970's, this was attributed to highly regulated nature of financial markets. On the contrary, the number of bank crises multiplies in the post-liberalization period of the 1980's and 1990's.

Demirgue-Kunt and Detragiache (1998,2000) similarly investigated the relationship between banking crises and financial liberalization. Their scope of study covered a period from 1980-1995 on 53 countries. Their results reveal that banking crises are more likely to take place in liberalized financial systems. Their argument was based on the fact that liberalization induces risk taking behaviour and causes bank crises. Unlike the earlier empirical studies on financial liberation theory and structuralist approach, these empirical works are based on stabilization approach, which favours macroeconomic stability before adopting financial liberation.

Villanueva and Mirakhor (1990) posit that countries that experience relatively long periods of economic stability attained through sound and efficient macroeconomic policies are countries that can operate full interest rate liberalizations. Furthermore, they state that for high inflation countries, it is better for them to stabilize their economy before full interest rate stabilization .In this case, the attainment of price stability and adequate regulatory and supervisory framework

for the financial markets is a necessary condition for moving towards market determined interest rates.

In Nigeria, Ikhide and Aboyemi (2001) investigated the correlation between the timing and order in which reforms are implemented. Their study identifies a wrong sequencing as a factor responsible for poor performance of the financial sector reform. Brownbidge and Kirkpatrick (2002), examine the reforms implementation made in some less developing countries. They focused on the effects of sound financial regulation and supervision system. Their empirical result indicate that financial liberation may increase the vulnerability of financial system to financial crises and prudential regulation and supervision can reduce the vulnerability of financial system to financial crises.

Kui-Wai and Jun Ma (2005) studies on stabilization focus on banking reforms of financial liberation in China to examine some of the economic constraints facing the efficient performance of Chinese banks; they asserted that large non performing loans and lack of international accounting standards was a serious threat in the banking system. They equally examine the theory of financial liberation and the social function of banks and use bank data to simulate the effective operations of four policy instruments of greater interest rate spread, tax and cost reduction, and capitalization. From their findings recapitalization either by the government or from foreign sources, is the most effective tool of reducing non performing loans. Balogun (2007) uses both descriptive statistics and econometric methods, by adopting descriptive statistics and simultaneous equation model to test the various phases of banking sector reforms. From his empirical results, the eras of pursuits of market reforms are characterized by improved incentives.

Singh (2009) examines the relationship between financial development and economic growth in Indian. A reduced-form model was estimated to examine the long-run equilibrium and short run dynamic relationship between financial development and economic growth. The long run co-integrating relationship was examined, using the maximum likelihood system estimator, while the short run dynamic relationship was examined and the null of granger non-causality was tested, using the error correction model. He used the impulse response and variance

decomposition techniques to trace the response trajectories and finally used the VAR to test the null of Granger non-causality.

United Nations Economic Commission for Africa (2008) evaluates the impact of financial sector reforms in East Africa economies. Their results reveal that macroeconomic stability is a vital factor for financial liberation and overall economic growth. Their analysis also reveals that financial repression, government imposed restriction and price distortions on financial sector could inhibit economic growth prospect. Ang (2009) study evaluates the cost and benefits associated with financial liberation and repression in India and highlights the overall effectiveness of the reform program me. He applies the co-integration estimation technique and the result shows that interest rate controls, statutory liquidity requirements and direct credit programmes positively affect the level of financial development. An increase in cash reserve requirements appears to have an adverse effect on development of the financial system. Levine et al (1999), empirically test the relationship between financial sector deepening and economic growth, using cross-country data on financial system developments. The authors found that financial sector deepening exerts a statistically significance influence on economic growth. They also observed that countries with financial legal system and those with good accounting standards tend to have better developed financial systems and growth performance.

2.7. EMPIRICAL STUDIES ON EFFECTS OF MONETARY POLICY ON ECONOMIC PERFORMANCE

This section focuses on various approaches used in the literature to determine the effects of monetary policy on economic performance in both developing and developed countries of the world. These approaches include: Macroeconomic models, have a long history in the measurement of economic performance. The oldest is the simultaneous equation macroeconomic model, sometimes associated with the names Klein (1950), Klein and Goldberger (1955). They flourished in the 1960s and 1970s during the golden age of Keynesianism, with Keynesian foundation.

Next approach is the dynamic stochastic general equilibrium (DSGE) model referred to as "The New Keynesian models" having microeconomic foundations together with rational

expectations of forward looking variables. The last approach used in literature is the vector auto regressive (VAR) models. Sim (1980) formulates a more flexible identification of the behavioural relations among economic agents within a vector auto regression (VAR) model framework. VAR models do not impose a priori structure on the dynamic relationships among economic variables. Many researchers following the lead of Sims (1980,1986) analyze the effect of monetary policy on economic performance, using vector auto regression

Consequently, the discussion of the various empirical literatures is based on the various approaches discussed above. Mwenda (1993) assesses the effects of monetary policy on one monetary policy target variable consumer's price index in Zambia. Using VAR approach and vector error correction (VECM), his result shows that a contractionary interest rate reduces consumer's price index. Christiano et al (1996) confirm Mwenda's (1993) findings; they assess VAR model with two measures of exogenous shocks to monetary policy, the orthogonalsed shocks to the federal funds rate and orthogonalsed shocks to non-borrowed reserved. Their results show that following a contractionary monetary shock, the federal funds rate rises and various measures of money fall (liquidity effect). They also show that a contractionary shock is associated with a persistent decline in real domestic output, consumer's price index and a persistence decline in employment.

Furthermore, Bernanke and Mihov (1998) also affirm the findings of Christiano et al (1996), following a contractionary monetary policy shock, domestic output and price level fall with a sluggish. Similarly, Kahn et al (2002), examine the impact of monetary policy on consumer's price index, using recursive VAR. A monetary policy shock, introduced by raising the overnight rate of banks of Israel, raises real interest rate and lowers consumer's price index. Moreover, Romer and Rome (2004) determine the effect of output in the wake of monetary policy shocks, their study estimates a monthly VAR with monetary variables and their monetary policy shock derives through their narrative method. They find that monetary policy shock, robustly, relatively rapid, and statistically significant effects on both output and inflation. In addition Christina et al (2005) in another study, develop a measure of U.S. monetary policy shocks relatively free from endogenous and anticipatory movements to determine how output behaves in wake of monetary shocks. The lagged values of the shocks series are included to capture the direct effect of the shocks on output growth. Their findings corroborate with those of Romer and Rome (2004).

Furthermore, Hsing and Hsieh (2004) assess the impact of monetary policy on economic performance of China. They use VAR model and generate impulse function and variance decomposition to determine the effect of shocks on economic performance. Their policy variables are real M2, interest rate, exchange rate and their target variables are real GDP and inflation. They find that the GDP and inflation respond negatively to a one standard deviation shock in interest rate, local currency appreciated (Chinese Yuan). Interest rate is the most important variable affecting GDP. In another related study, Hsing and Hsieh (2009) determine the impact of monetary policy on real output in China and its provinces. They find that the coastal provinces respond more to shocks than Inland provinces. Their findings show that interest rate is the most significant variable affecting their target variable GDP. This result corroborates with their earlier study with interest rates as the most significant variable, explaining the changes in GDP. Their findings confirm earlier result of [Christiano et al 1996; Bernanke and Mihov,1998; Romer and Rome,2004] where a contractionary interest rate cause a fall in GDP.

Similarly, Qin et al (2005) empirically investigated effects of monetary policy on macro economy of China. They use three monetary policy instruments; interest rate, reserve ratio and money supply and two policy targets GDP growth and consumers price levels. They carried out a simulation on their macroeconomic model. Their findings indicate GDP effect is virtually neutral in the long run when interest rate is used, but statistically significant when reserve ratio and money supply are used. This indicates that the use of interest rate as a monetary policy instruments is most effective on consumers prices index, but are least effective on the GDP growth. Money supply is the most significant variable affecting GDP and consumer's price index. Their result did not corroborate earlier results of [Christiano, et al 1996; Bernanke and Mihov, 1998; Romer and Rome, 2004], where interest rate is the most significant factor affecting domestic output and consumer's price index. Similarly, Gamber and Hakes (2005) also use macroeconomic model and two target variables GDP and consumer's price index. Their policy variables are 3 months Treasury Bills Rate, a nominal interest rate and applied simple three–equation macro model. They find domestic growth (GDP) and consumer's price index are statistically significant. Their result did not correlate that of Qin et al (2005), but overlaps those of (Christiano ,et al 1996; Bernanke and Mihov, 1998; Romer and Rome, 2004).

Christina and Eichenbaum (2005) take a step further to use a more sophisticated macroeconomic model, the dynamic general equilibrium macro model that incorporates moderate amounts of nominal rigidities that accounts for observed inflation and persistence in output. From their findings, the model generates a response in inflation and a persistent; hump shape response in output after a policy shock. In addition, the interest rate and the money growth rate move persistently in opposite directions after a monetary policy shock. Similarly, Haider and Khan (2009), also using the Dynamic Stochastic General Equilibrium model, determine the effect of monetary policy on a small open economy of Pakistan. Applying the Bayesian simulation approach, their model is based on the new Keynesian framework, characterized by nominal rigidity in prices with the consumption pattern of households. From their findings, domestic consumption in Pakistan is not significantly related to high inflation; contractionary monetary policy curbs domestic and imported inflation and output, while exchange rate appreciates significantly.

Moreover, Starr (2005) examines the real effect of monetary policy on economic performance in Russia, Ukraine, Belarus, and Kazakhstan. He estimates a reduced form VAR, using five monetary policy variables; output, prices, money supply, interest rates and exchange rates. His findings indicate that increase in interest rate is associated with a significant drop in output. In all the CIS countries, an unanticipated shock to money stock leads to higher prices. In Ukraine and Belarus, a positive shock to real exchange rate, i.e. a real depreciation, increases the price level relative to where it was supposed to be. His result on interest rate corroborates earlier result, with contractionary monetary policy, using interest rate leads to fall in domestic output and consumer's price index.

Furthermore, Uhlig (2005) estimates the effects of monetary policy, imposing sign restrictions on the impulse responses of prices, non-borrowed reserves and federal funds rate in response to a monetary policy shocks. He finds that a contractionary monetary policy shocks have no clear effect, while the effect of contractionary monetary policy shock on consumer's price index level is sluggish. In a related study, Qin et al (2005) assess the effects of money aggregate on the economy. Their study use three monetary policy, interest rate, money supply and reserve ratio. Their result shows that for control of inflation reserve ratio is the most significant

variable, while interest rate would be the preferable variable if the government wants to tighten money supply.

Besides, Sims and Zha (2006) include different variables from most other studies, the producers' price index components for crude materials and intermediate materials. After a contractionary shock all the price indices eventually fall and output declines. Their result also confirms those of Romer and Rome (2004) and Bernanke and Mihov (1998). Similarly Cortis and Kong (2007) determine the impact of monetary policy shocks on only one of the target variable on real domestic output in China. They applied the vector error correction method (VCM) and used impulse response function to trace the effects of interest rate and money supply on output. Their findings show that bank interest is the most significant factor of monetary policy a better indicator when compared to M2 as a tool for monetary policy. As against two target variables used by previous study domestic output (GDP) and consumer price index, this study used only one target variable GDP. However their result corroborates earlier results of Cortis and Kong (2007), Hsing and Hsieh (2009) with interest rate having the most significant effect on GDP.

Furthermore, Berument (2007) determines the effects of monetary policy for a highly inflationary small economy using Turkey. He used vector autoregressive (VAR) model, after a tight monetary policy shocks, positive interest rate lead to a decrease in price index, income and exchange appreciate local currency. The positive innovation of interest rate has transitory effect on output, which drops for a short period and resulted in aggregate fall in output. However, Mangani (2009) finds that exchange rate was the single most important variable affecting consumer price index. He used only one monetary policy target variable price index; his result did not confirm earlier result where interest is the most significant variable affecting price index. In a related study, Raghavan et al (2009) measured the effects of Malaysian monetary policy using two estimation techniques a vector autoregressive (VAR) and structural vector autoregressive moving average (VARMA). The authors compared the impulse responses generated by VARMA models with those generated by VARs for the pre-and post-crisis periods. In their findings VARMA impulses were more significant to those generated by VAR.

Moreover, Saizar and Chalk (2008) empirically assess the effectiveness of monetary policy on output and inflation, using two monetary policy variables; interest rate and credit on countries

that have low levels of credit. They use panel VAR in their methodology, and find that inflation appears to be unrelated to credit, while interest rate has significant effects on output and inflation; a higher interest rate reduces both output and inflation. Rafic and Mallick (2008) examine the effects of monetary policy shocks on output in the euro area economies of Germany, Italy and France. Using VAR identification, they found that monetary policy shocks are at most potent in Germany. In addition, Amarasekara (2008) utilising both recursive and structural specifications in vector autoregressive (VAR) model analyses the effects of interest rate, money supply and nominal exchange rate on real domestic growth (GDP) and inflation in Sri Lanka for the period from 1978 to 2005. A positive shock in interest rate, led to a decrease of real domestic growth and inflation while the exchange rate appreciates. When money growth and exchange rate were used as policy indicators, the impact on GDP growth contrasts with established findings.

Moreover, Barakchian and Crowe (2010), used convectional VAR method to assess the effects of monetary policy shocks on the economy of U.S. After a contractionary monetary policy shock, short term interest rates increased, resulting in aggregate fall. In the two target variables, domestic output and aggregate price index respond very slowly. His result confirms earlier result of Romer and Rome (2004); Bernanke and Mihov (1998); Saizar and Chalk (2008) with increase in interest rate output and price levels dropped. At variance with Barakchian and Crowe (2010) findings, Diego (2010) adopts structural Autoregressive VAR and his findings show increase in interest rate after a contractionary monetary policy in Argentina. The interest rate shock results in temporary increase in output, while the shock has no significant effects on price level. However the contractionary monetary policy produces an appreciation of the exchange rate, thus no evidence of exchange rate puzzle.

In another study Khan (2010) analyzed output effects of monetary policy. He examined the relationship between the growth of GDP and different monetary aggregates in 20 sub-Saharan African economies and finds that credit growth has a statistical significance with GDP growth than money growth in the countries. Mishra et al (2010) assess the effectiveness of monetary policy by investigating the dynamics of the short run and long run relationship between money supply, price and output in India for the period 1950–2009. The estimation of vector error correction model based on VAR indicates the existence of long–run bidirectional causality between money supply and output and unidirectional causality from price level to money

supply and output. Jawaid et al (2011) empirically assessed the effect of monetary policy, fiscal and trade policy on economic growth of Pakistan using annual time series data from 1981 - 2009. The policy variables are money supply, government expenditure and trade openness. In their methodology they used error correction method, and found that monetary policy is statistically significant to domestic growth and it is more effective than fiscal policy in Pakistan. Contrary trade policy is not significant to domestic growth.

Mugume (2011) examines the effectiveness of monetary policy transmission in Uganda to analyze the dynamic effects of monetary policy shocks. He uses the structural vector autoregressive (SVAR) approach to find the effects of monetary policy innovations on output proxy by GDP and inflation proxy by consumer price index. The results of the estimated impulse-response functions are overall consistent with the economic theory. Following a contractionary policy shock, the short term interest rate rises, leading to fall in output, consumer's price level, and the local currency appreciates. Moreover, shocks to M2 have no significant effect on domestic output growth and inflation and monetary policy seem to have no significant effect on domestic credit. Although domestic credit innovations significantly raise inflation, the exchange rate and credit channels seem to be ineffective. His result corroborates earlier findings of [Christiano et al 1996; Bernanke and Mihov, 1998; Romer and Rome, 2004], where interest rate is the most significant factor affecting domestic output and consumers price. Similar to the study of Qin et al (2005), YAO et al (2011) included the cash reserve ratio as one of the monetary policy instruments to investigate the dynamic and long run relationships between monetary policy and asset prices in China. Their empirical results show that monetary policy has little effect on asset prices

2.8. EMPIRICAL STUDIES ON EFFECTS OF MONETARY POLICY IN NIGERIA

To date few studies have investigated the effects of monetary policy on economic performance in Nigeria. It is not a well-researched area. Ajayi (1974) investigates the effects of monetary and fiscal policy on economic performance in Nigeria. Using OLS, he finds that monetary rather than fiscal policy exerts a great impact on economic performance in Nigeria and money supply (M2) is the most significant variable affecting domestic growth output. Similarly, Ajisafe and Folorunso (2002) find overlapping results with that of Ajayi (1974) where monetary policy, rather fiscal policy exerts a great impact on output in Nigeria and money supply (M2) has the most significant variable affecting domestic growth output. In addition, the empirical evidence of Enoma (2004) that money supply and interest rate are the most effective tools in managing capital stock and that monetary policy is more dependable than fiscal policy for macroeconomic management in Nigeria, substantiates and indeed compares favourably with the empirical evidence (Ajisafe and Folorunso, 2002).

Moreover, Folawewo and Osinubi (2006) using rational expectation and appling error correction technique, their result corroborates the findings of Ajisafe and Folorunso (2002) that money supply is the most significant factor affecting consumer price index and domestic output in Nigeria. Similarly, Oluwole and Olugbenga (2007) employ vector error correction estimation (VECM) technique to determine the impact of monetary policy on output and consumer's price index. Their empirical analysis shows that money growth (M2) is the most significant variable affecting output and consumer's price. Their result confirm the earlier results of Ajisafe and Folorunso (2002), Folawewo and Osinubi (2006). Contrary, Adebiyi (2007) analyses the effects of monetary policy on economic performance in Nigeria. His policy variables are money stock, interest rate, exchange rate, and credit to private sector. The non-policy variables are consumer price index and domestic output. He estimates Vector autoregressive model and uses impulse response and variance decomposition to capture monetary shocks. He finds that credit to private sector and exchange rates are the most significant variable affecting consumer price level and domestic output. This result does not corroborate those of Oluwole and Olugbenga (2007), where money supply is the most significant variable affecting output and consumer price index.

Furthermore, Mbutor (2007), focuses on the credit channel of monetary policy transmission mechanism of Nigeria to evaluate the effects of monetary policy actions on the domestic output of the economy. He adopted the vector auto regressive (VAR) with a contractionary monetary policy shocks, leading to a contraction in credit to the economy. However, the domestic output did not respond appropriately which shows the weak nature of the link between credit channel of monetary policy actions and the real domestic output. Similarly, Balogun (2007) finds overlapping results with Mbutor (2007); his result shows that money supply and credit to the private sector are not statistically significant. The coefficient of parameters estimates exhibit a negative sign in domestic output and exhibit a positive sign in the consumer price level. This suggests that money supply and credit to the private sector adversely affect output contrary to theoretical expectation.

Moreover, Udah (2009) assesses the effect of monetary policy on economic performance and price stabilization on the economy of Nigeria. He estimates a macroeconomic model with three stage simultaneous equations. His result shows that contractionary monetary policy through reduction in money supply has significant and undesirable effects by reducing domestic output and consumer's price index. His finding substantiates and indeed compares favorably with the empirical evidence with earlier results of Balogun (2007) and Mbutor (2007). However, this result does not corroborate with that of Adebiyi (2007) that credit and exchange rate are the most significant variables affecting domestic output and consumer's price index. But the finding of Olekah and Oyaromade (2007) substantiates the result of Adebiyi (2007) that exchange rate is a significant factor affecting consumer's price index in Nigeria.

Moreover, Olorunfemi and Dotun (2008) assess the effects of monetary policy on the economic performance of Nigeria. Their non-policy variables are inflation and domestic growth proxy for GDP. They applied the co-integration estimation technique and vector error correction model (VECM). They found a negative relationship between interest rate and domestic output, while inflation rate is positively related to interest rate. At variance with this study, Saibu and Oladeji (2008) use GARCH model to assess the effects of fiscal and monetary policy shocks on real output in Nigeria. Their empirical result showed that fiscal and monetary shocks had no significant effects on real output and money supply is not statistically significant to output. His empirical finding did not corroborate earlier findings of Oluwole and Olugbenga (2007) that money growth (M2) is the most significant variable affecting output. Olumide (2009) estimates a VAR model to determine the response of monetary policy on inflation. In his findings interest

rate differentials and purchasing power parity proxy for exchange rate, has significant influences on consumer price levels in Nigeria. His findings on exchange rate corroborate the earlier results of Olekah and Oyaromade (2007), and Adebiyi (2007) that exchange rate is a significant factor affecting consumer's price index in Nigeria. Moreover, his findings on interest rate confirm result of Olorunfemi and Dotun (2008) that inflation rate is positively related to interest rate.

Furthermore, Chuku (2009) identifies the effects of monetary policy on two monetary policy variables targets, domestic output and consumer's price index and three alternative policy instruments (money supply, Minimum Rediscount Rate and the real effective exchange rate), in Nigeria. He finds evidence that monetary policy shocks of money supply have modest effects on domestic output and consumer's price index. Similarly Oluwole and Olugbenga (2007) also found money growth (M2) as the most significant variable affecting output. In addition, Adefeso and Mobolaji (2010) adopt vector error correction estimation (VECM) technique to determine the relative effectiveness of monetary policy and fiscal policy. Their results show that the effects of monetary policy are stronger in monetary policy than fiscal policy. From the result, money stock is the most significant variable affecting output. This empirical finding confirms earlier findings of Oluwole and Olugbenga (2007), that money growth (M2) is the most significant variable affecting output and consumer price. Similarly, Okwu et al (2011) examine the effects of monetary policy innovations on stabilization of commodity prices in Nigeria. They use consumer's price index as their monetary policy target variable and broad money stock and interest rate as their monetary policy variable. Their results show that both interest rate and broad money stock have positive effects on commodity prices, but money stock has the highest significant effect. They find overlapping result with Adefeso and Mobolaji (2010).

CHAPTER THREE

3.0. STRUCTURE OF THE NIGERIAN ECONOMY

The primary purpose of this Chapter is to present an overview of Central Bank of Nigeria's monetary policy. In order to understand the economic background under which monetary policy is shaped, the study examines a brief survey of the changing structure of the Nigerian economy. First the study presents an overview of the objectives of monetary policy in Nigeria. Second the study examines monetary policy before the Structural Adjustment programme (SAP). Third, monetary policy after the Structural Adjustment Program me (SAP).Fourth, we discuss the impact of oil revenue on Nigeria economy. Fifth, we examine the current monetary policy in Nigeria.

3.1. THE MAIN OBJECTIVES OF MONETARY POLICY IN NIGERIA

The monetary policy of most central banks is based on four main pillars: (i) inflation is a monetary phenomenon; (ii) the public's expectation of future inflation is essential in the setting of current wages and prices. A consequence to this, is that there is no long-run tradeoff between unemployment and inflation; to anchor expectations, (iii) monetary policy must be dynamic and rule based (for instance, under the Taylor rule, for monetary policy to stabilize prices, the nominal interest rate must be raised by more than the rise in inflation); and (iv) the need for monetary policy to be a technical undertaking outside the control of the political authorities i.e. independence of the central bank to conduct monetary policy.

The intermediate goal of monetary policy is to influence short term interest rates in the trend of policy and allow the exchange rate to adjust in tandem. However, employing the exchange rate as an instrument of monetary policy requires a lot of discipline to succeed in the fight against inflation, especially when it is vital for the exchange rate to appreciate in order to reduce inflationary tendencies. Central banks have learnt from the Lucas critique that they may not be able to maintain consistently low real interest rates as nominal interest rates are expected to adjust upwards to accommodate expected high inflation over time. In the same vein, it is not generally possible to sustain an artificial advantage (like suppressed exchange rates) without experiencing rising wages and prices. The Central Bank of Nigeria (CBN) at inception had

pursued the approach of undervalued exchange rates to boost the country's export and to enable the country overcome its inefficiencies and create comparative advantage.

Although the CBN, like some other central banks in developing countries, has often stated growth as one of the objectives of its monetary policy, economic theory (under the long-run neutrality of money) points out that monetary policy is not designed to stimulate the growth of production capacity in the economy; rather, it is endowed with the capacity to set the long-run inflation rate. The controls of growth are therefore, located with fiscal policy through its effect on national savings via the structural budget deficit, incentive effects on work, savings and investment via the tax rate and structure and through public investment in human capital and physical infrastructure. However, the interactive effects of monetary and fiscal policy on aggregate demand affect output and employment in the short run. In practice, however, fiscal policy is dominated by the task of reducing the government deficit, thus leaving the stabilization objective almost exclusively to monetary policy.

Central banks often show a reduction in the level of unemployment as one of the objectives of monetary policy. Indeed, monetary policy does impact the level of employment in the short run. Although the objective of full employment is not statutory, the CBN indicates it as an objective of its monetary policy. By full employment is implied the natural rate of unemployment (5-6%) or the rate of full employment. To achieve full employment, the unemployment rate has to be kept as low as possible without going beyond the natural rate of unemployment, and in the process, keeping inflation on a downward track until price stability is realized. The impact of economic downturns on the level of employment makes it imperative for central banks to be concerned about the issue of employment generation since they control the instruments that influence employment in the short run. There is no conflict between the goals of price stability and employment generation given that monetary policy incidence on prices is expected in the long run. Its impact on employment is negligible in the long run, this implies that in the long run, only the price stability objective could be operative. Consequently, price stability remains the singular, unique and most authentic objective of monetary policy.

Over the years, however, the Bank's monetary policy objectives have oscillated around (Aigbokhan 1995): (i) Achievement of low inflation and maintenance of price stability; (ii) Real output growth; (iii) Reduction in the level of unemployment; (iv) Maintaining a healthy

balance of payments position; (iv) Increased savings and credit flow to the priority sectors of the economy.

3.2. OVERVIEW OF MONETARY POLICY FRAMEWORK IN NIGERIA

The approaches of monetary policy open to the CBN during the period 1959-1979 comprised both quantitative and qualitative measures. The quantitative measures deal with the quantity, volume and the price of money and credit; OMO the buying and selling of government debt instruments by the monetary authorities; difference in reserve requirements; special deposits by financial institutions; and requirement to buy some stabilization securities. The qualitative techniques of monetary policy on the other hand deal with the direction or distribution of credit. These were mostly moral suasion and selection credit controls.

During the period 1959-1991, the Bank did not employ the use of OMO as a technique of monetary policy due to the under developed nature of the money and capital markets at the time. Changes in interest rates were done basically through direct actions contained in monetary policy guidelines rather than through the forces of demand and supply. Special deposits as a technique of monetary policy were hardly used. Though there were instances when banks were mandated to make certain special deposits with the CBN, these were not for purposes of monetary management, but a requirement for achieving some other monetary policy goals such as the proceeds of indigenization.

Stabilization securities were first used in 1976, following the recommendations of the Anti-inflation Taskforce, to encourage banks to continue to accept deposits than as an instrument of monetary management. The most effective technique of monetary management in Nigeria during the review period was the credit guidelines which were first introduced in 1964. However, since 1969, the annual credit guidelines have become a permanent feature of Nigeria's monetary policy. The strategies of monetary policy was between exchange rate targeting during the immediate period preceding the introduction of a national currency for Nigeria after independence and monetary targeting, a framework implemented during the oil boom era of 1974-1976.

The major channel through which central banks affect the financial system is through their control of bank reserves. When the central bank buys or sells Treasury Bills in the open market, it does so to either reduce the level of reserves in the banking system or to take away from the stock of reserves. The central bank, however, chooses the instrument to use in controlling the level of money supply, although imprecisely, because there is no meaningful definition of money that the central bank can control with perfect precision. However, within some tolerable limits, the central bank can control any monetary aggregate, other things being equal. In the alternative, the central bank can control short term interest rates with high precision, depending on the responsiveness of short term interest rates to its anchor rate, which is the rate banks pay to borrow from the central bank, overnight. Thus, the central bank can target bank reserves, some measure of the money stock (M_2, M_3 or M_4) or it can target short-term interest rates.

Most central banks which target the aggregates, often target growth in the monetary aggregates. The thinking is that money supply, being tied to the price level in the long run, provides the economy with a nominal anchor, i.e. the assurance that the price level will not spiral up or down. Money theoretically, does give a long-run anchor on prices in a way that short term interest rates do not. Moreover, if a money targeting approach were to be effective, given the lags in monetary policy, it would be easy to swiftly receive feedback on the effects of monetary policy. This is because, shortly after the central bank changes bank reserves, we see the effect on money supply; and if this were a reliable guide to the eventual impact on the economy, it would provide a valuable preview of the direction of monetary policy.

Nevertheless, the relationship between the different measures of money supply and inflation, employment, etc has become very unclear, leading to not-too-clear indications for monetary policy and its objectives. Consequently, the CBN is considering abandoning focus on monetary targeting and adopting inflation targeting. This had become inevitable since monetary targeting has been shown not to be very effective. Another aspect of monetary policy strategy the Bank has to cope with is the timing of monetary policy i.e. lags in monetary policy. Monetary policy lags are generally long. While tight monetary policy begins to impact GDP right away, this expands out over time into many quarters.

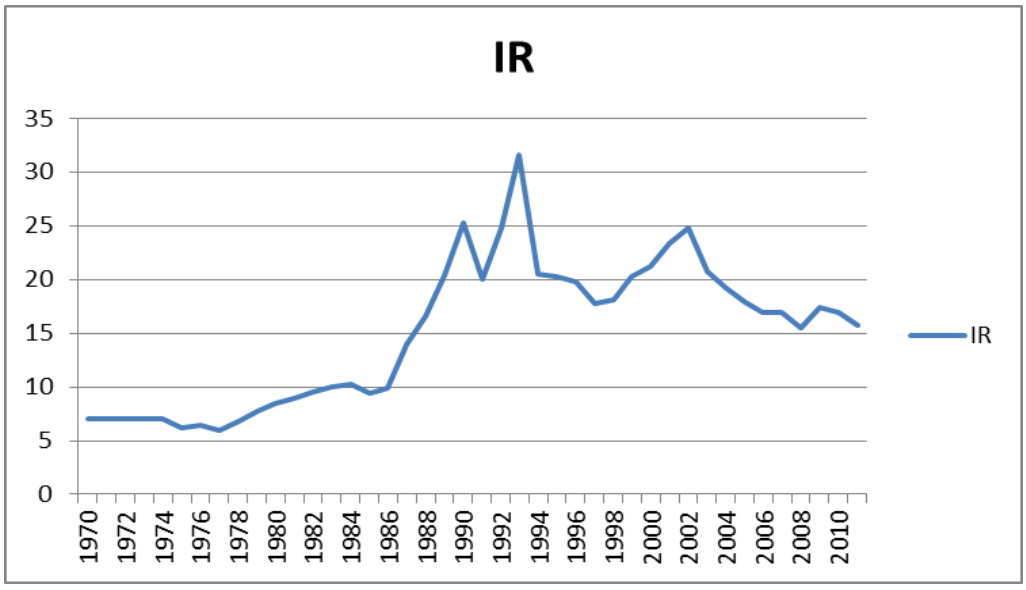
3.3. MONETARY POLICY IMPLEMENTATION BEFORE STRUCTURAL ADJUSTMENT PROGRAMME.

The implementation of monetary policy in Nigeria commences with the Formative Years (1959-1969), following the creation of the Central Bank of Nigeria (CBN) in 1959, monetary policy at the early stage was driven by the doctrine of "cheap money policy" and the use of credit control. This was achieved through the credit base via the creation of local currency, money and capital market, and keeping interest rates low for target sectors of the economy (Sanusi, 2002). At independence in 1960, the Nigerian government inherited an economy with serious infrastructural deficiencies. The banking, commerce and industrial sectors were largely controlled by expatriate firms. Thus, the key policy thrust of the emergent government was to take control of the economy. The economy was still mainly agrarian with agriculture accounting for about 64 per cent of output and employing over 73 per cent of the total labour force. Also, agricultural produce accounted for about 71 per cent of total exports, and was, thus, the major foreign exchange earner used to pay for imported manufactures (Iyoha, 2002). In contrast, the industrial sector contributed a mere 7.7 per cent, to output with the manufacturing sub-sector producing less than 4 per cent of Gross Domestic Product (GDP). However, over the period, 1960-69, the share of agriculture in total output declined, from 64 per cent to 49 per cent, following the discovery of oil towards the end of the decade. During the 1960-1965 periods, GDP growth responded positively to the economic policy of government, but became unusually negative thereafter, owing to the 1966-70 Nigerian civil wars. Consequently, the Central Bank of Nigeria embarked on the development of domestic money and capital markets, which were the main financial infrastructure on which monetary management would rely. The main financial assets introduced include Federal Government Development Stocks in 1959, Nigeria Treasury Bills and the CBN operated call money scheme in 1962.

Interest rates on those debt instruments were administratively determined while the CBN, as the underwriter, absorbed the unsubscribed portions and provided refinancing facilities. Interest rate policy was not used as an active instrument of monetary policy because it was administratively determined (this is demonstrated in figure **3.1.** From 1970 to 1979 the interest rate curve flattens out; a low fixed interest rate was maintained for more than a decade. This was the era of implementation of direct monetary control in Nigeria, with the shift to the implementation of indirect monetary control. As a result of Structural Adjustment Program me

(SAP) in 1986, all controls on interest rates were completely removed in line with government's emphasis on deregulation of the economy leading to high interest rate from 1986 to 2011 as shown in figure **3.1**

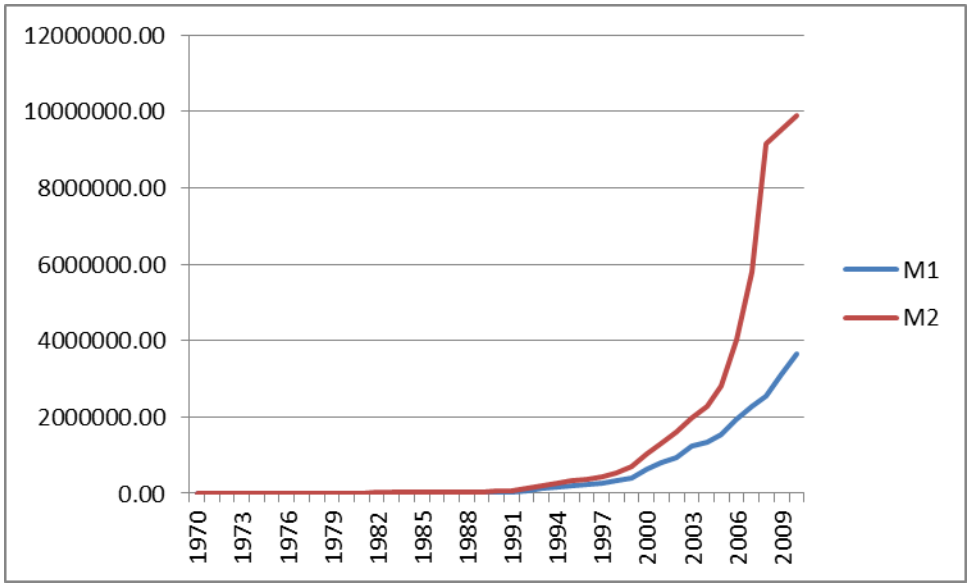
Figure 3.1 Interest Rate Spread. Percentage (Annual)



Source: Based on data compiled from IMF (2011)

Furthermore, the low interest rate during the implementation of direct monetary control provided cheap credit to the government and private sector. Cheap money policy resulted in expansionary monetary policy. For example between 1960 and 1964 money stock (M1 and M2) increased by 29.7 and 44.0 per cent, respectively. The monetary expansion was attributed to growth in bank credit to the domestic economy, which grew almost ten folds from #33 million to #306 million (CBN annual report 2007).

Figure 3.2 Money Stock M1 & M2



Source: Based on data compiled from IMF (2011)

3.4. "THE OIL BOOM ERA" (1970-1985)

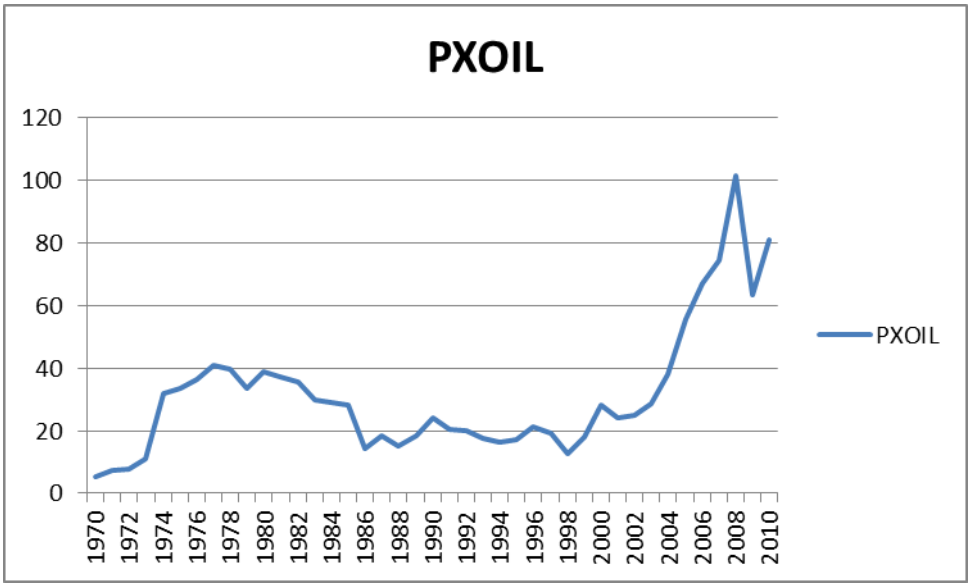
The exploitation/production of oil in commercial quantities after independence led to the neglect of agricultural sector and eroded its significance in and contribution to GDP. There was increased share of the oil sector in exports from less than 60 per cent in 1970 to over 90 per cent from 1973 (Nnanna, 2004). The growing importance of oil revenue, expanding role of the public sector, and the unsustainable dependence on the external sector, dictated economic performance in the 1970s and beyond. Owing to the significant increase in capital formation buoyed by oil income, domestic output grew rapidly, but agriculture was a drag on the economy owing to its sluggish performance. With the large increase in foreign exchange earnings from oil which were largely monetized, public sector involvement in direct economic activities dramatically increased. The enhanced government revenue notwithstanding, fiscal deficits, especially after 1974, soared.

However, the main expansionary factor was the monetization of foreign exchange receipt from crude oil exports as against the rapid growth in bank credit to government of the preceding years. The absence of mechanism for sterilizing the proceeds of excessive earnings from crude oil exports resulted in inflationary pressures, with rate reaching 33.9 per cent in 1975 compared

with 13.4 per cent of the preceding year (Aderibibge,1997). Also, the liberalization of importation resulted in massive importation of food, raw materials and other consumer's goods. This was exacerbated by the commitment of government to promote development through cheap money policy. In addition, the rapid build–up of external reserves and the pegging of exchange rate during the period helped to stabilize the external value of the local currency (Naira). The concern of the monetary authority during this period focused mainly on how to optimally channel credit to stimulate investment and output growth in Nigeria. Hence, credit was allocated to the preferred sectors of the economy at concessional interest rates.

The increasing over-dependence on the external sector threatened external sector equilibrium after the mid-1970s, as inflationary pressures mounted (see figure **3.3**. below). Industrial performance during this period, although promising, was based on the fortunes of the oil sector, while manufacturing production was supported up by over-reliance on imported raw-materials. The dominance of the public sector in economic activities was informed by the strategy to utilize the large public resources to expand infrastructural facilities, build up the country's industrial base, and undertake post-war reconstruction. With large increases in government expenditure, the financial sector experienced rapid monetary expansion in the 1970s, because these expenditures stemmed from the monetization of oil revenues. Thus towards the end of the 1970s, monetary management came under severe pressures arising mainly from the increased spending of oil money. The oil boom of the 1970s came to an abrupt end in the early 1980s, following the collapse of the international oil market.

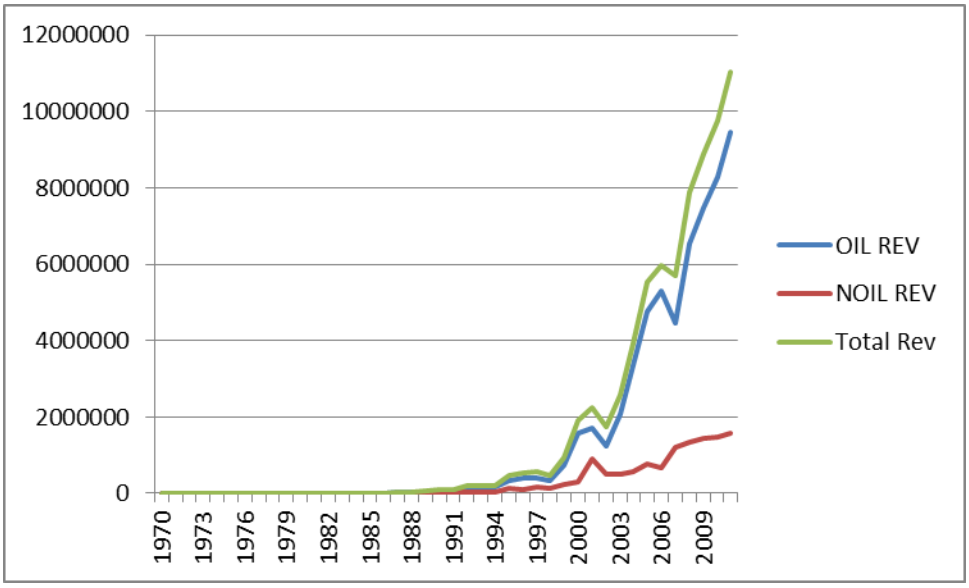
Figure 3.3 Price of Crude oil in US $ 1



Source: Data compiled from Central Bank of Nigeria (2011)

Consequently foreign exchange receipts which peaked at $24.9 billion in 1980 fell dramatically to $10.1 billion in 1983 and $5.2 billion in 1986 (CBN, 2007). The persistent drop in oil receipts created serious economic crises reflecting in declining growth rates, rising external debt burden, inflationary pressures, declining industrial capacity utilization, and rising unemployment; which led to a series of austerity measures by the Federal Government in the adoption of Structural Adjustment Program me (SAP) in July, 1986.

Figure 3.4 Federal Government Revenue 1



Source: Based on data compiled from IMF (2011)

3.5 MONETARY POLICY IMPLEMENTATION DURING & AFTER STRUCTURAL ADJUSTMENT PROGRAMME

3.5.1 The Structural Adjustment Program me (SAP) Era 1986 -1993

The effort of monetary policy during this period was to readjust prices through policy and institutional reforms after long period of distortions caused by control regimes. The general aim of SAP was to change and reorganize the production and consumption patterns of the economy, which includes the abolition of price distortions and reduction of the over-dependence on the export of diversification and motivation of the non-oil sectors. The policy measures employed to achieve the deregulation of the economy involved: implementation of a realistic exchange rate of the naira; liberalization of external trade and payments system; adoption of appropriate pricing policies in all economic sectors with greater dependence on market forces and consequent reduction in difficult administrative controls; rationalization and restructuring of public expenditure and customs tariffs.

In addition, there was pressing need to move towards the institutionalization of market-based tools of control as against former direct control and monetary regulation. The main purpose of the new policy drive was exchange rate policy reform, aimed at finding the appropriate external

value of the domestic currency. Foreign exchange controls and distributions were immediately abolished and rigorous efforts were made towards the application of Dutch auction market based exchange rate mechanism.

This was complemented by deregulation of interest rates and de-emphasizing of the use of credit allocation and control policies followed by the introduction of indirect tools of monetary management, anchored on Open Market Operation (OMO). The reform of the entire financial sector was also embarked on, the role of government in the economy was reduced considerably, paving way for increased role for the private sector.

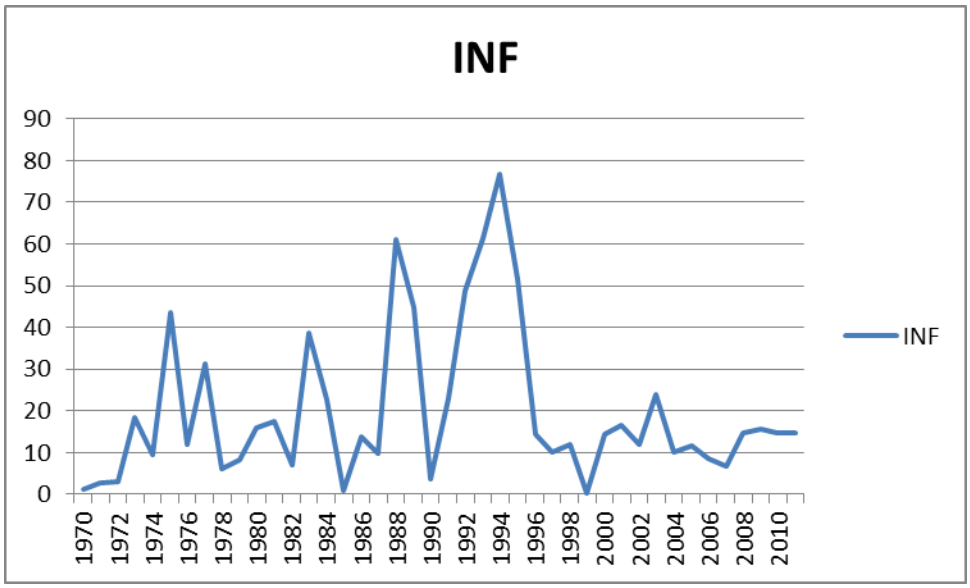
The stance of monetary policy remained tight in 1986, with growth in M2 decreasing to 3.4 per cent, while consumer's price index (CPI) which stood at 111 in 1986 when the reforms measures started, rose sharply to 293 by the end of 1990 and the CPI finally rose to 853 in 1993 (Busari, 2004) See figure **3.5** below showing the highest peak of inflation in Nigeria in 1993. However by 1987, there was widespread concern over the adverse consequences of the contractionary monetary policy, especially the restrictive budgetary standpoint on output and employment growth. Thus, a reflationary policy stance was adopted, which resulted in rapid monetary expansion, averaging about 42.0 per cent per annum during 1990 and 1994 (Aderibibge, 1997). The main source of monetary growth was expansionary fiscal operations, financed mainly by the banking system.

Moreover, the crowding out effect was demonstrated by changes in the direction of bank credit flows. For instance, the share of the private sector output of a total of approximately ~ 10.8 billion banking systems' credit to the economy in 1980 was 67 per cent while 33 per cent went to government. The allocation was reversed in 1992 when the shares of the government and private sectors were in the order of 60 and 40 per cent, respectively. Indeed, with the introduction of SAP agricultural contribution to GDP rose from 20 per cent in 1980 to 42 per cent in 1988. However, it was becoming increasingly difficult to stop government 95 per cent over-dependence on oil, which still accounted for an average of 95 per cent of total exports, and 71 per cent of government revenue during 1980-1989 (CBN 2010).

3.6. POST-SAP PERIOD (1994-2009)

The deregulation policy under SAP was to put forward its full effect during the 1990s and the period following. Although some successes had been made during SAP, the implantation of the program me brought about persistent inflation, scarcity of foreign exchange, low capacity utilization and growing unemployment, rising fiscal deficits, and excruciating poverty among the population. The inflation rate rose from 57 per cent in 1994 to 73 cent in 1995, but fell to 29 per cent in 1996 (Nnanna, 2004). It however, reduced considerably to 8.7 per cent in 1997, but rose again to over 20 per cent in 2003 (see figure **3.5).**

Figure 3.5 Post–SAP period (1994-2009) 1

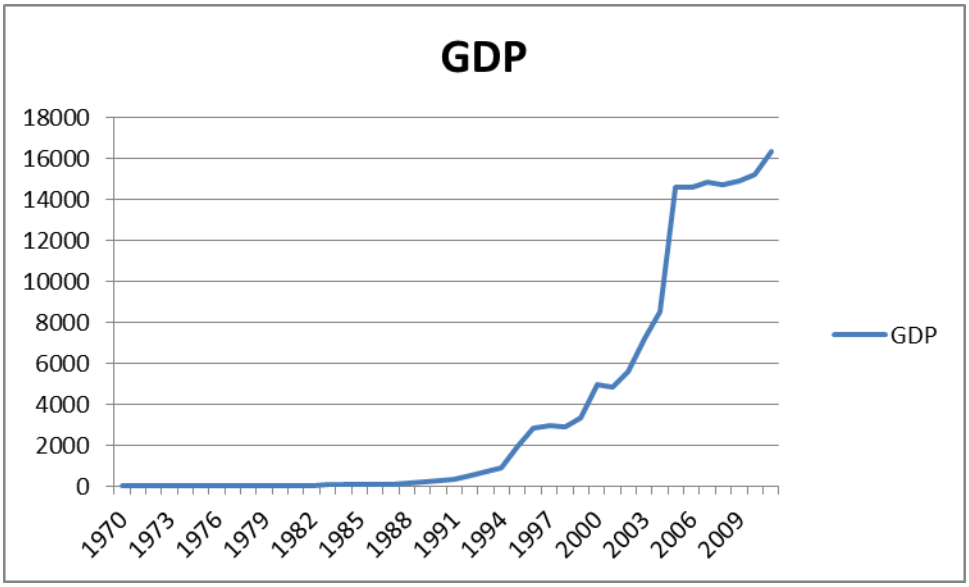


Source: Based on data compiled from IMF (2011)

Furthermore, the uncertainty brought by inflationary pressures weakened investment incentive and impaired GDP growth fell from 13 per cent in 1990 to 2.2 per cent in 1998 and 0.4 per cent in 1999 as shown in figure **3.5**. Over the 1990-1999 period, fiscal deficits averaged 6.2 per cent of GDP due to rising fiscal imbalances, operated by monetary expansion and unsustainable external debt burden estimated at N3.13 trillion by 2000 (CBN 2007). However, the contribution of agriculture to GDP appears to be recovering from 3 per cent of GDP in 1990 to 39 per cent in 1998, falling to 30 per cent in 2003/04 and, thereafter rises continuously from 2005–2011. This is reflected in the contribution of revenue in figure **3.4** above as non-oil revenue used as proxy for the contribution of agriculture. However, oil revenue still accounted for over 90 per cent of government revenue in the period 1990-2011 (see figure **3.4** above).

Consequently the tasks to monetary policy in the years ahead include: excessive monetary expansion arising from the monetization of oil revenues, oil price volatility which impacts adversely on government revenues and inflation, fiscal dominance and excess liquidity in the banking system caused by fiscal operations of government, expanding the financial market to create more instruments for the conduct of monetary policy, and establishing a viable framework for the co-ordination of fiscal and monetary policies.

Figure 3.6 GDP 1



Source: Based on data compiled from IMF (2011)

3.7. IMPACT OF OIL REVENUES IN TERMS OF "DUTCH DISEASE" ON THE NIGERIA ECONOMY.

This section discusses the impact of oil on the Nigeria economy in terms of "Dutch Disease "which Nigeria is well known for. Nigeria is an oil producing country which depends on its oil income for most of its federal revenue. Nigerian National Bureau of Statistics (2011) reports that more than 90% of Nigerian exports are crude oil and natural gas. Furthermore, about 97% of foreign revenues are from oil and gas (Technical Committee on the Niger Delta 2008).

The major exports of Nigeria had been palm oil, cocoa and ground nuts in the 1950s until the agricultural sector started to dwindle as the oil sector developed in the 1960s (Helleiner 1964).

The economy experienced a typical Dutch-disease-type structural shift and now heavily depends on oil exports. The oil industry is generally capital intensive, thus the oil sector is not generating much domestic employment. Domestic infrastructure outside the oil sector has yet to be developed. A detailed industrial analysis is still lacking, but the share of labourers working in the industrial sector is estimated to be around 10% and in services 20%. The remainder works in agriculture ("Nigeria," The World Fact book). In 2007, the poverty ratio was estimated to be over 70%, indicating that the income generated from oil, as the national wealth, has not been spread throughout the population. Nigeria's exchange rate regime was opportunistic from independence in 1960, when it was pegged to the UK pound or the US dollar, whichever was stronger and more favourable for imports, until the implementation of the Structural Adjustment Programme (SAP) in 1986 (Egwaikhide et al. 1994, Onafowora and Owoye 2008).

The huge oil revenues notwithstanding, Nigeria has accumulated foreign debt like other non-oil exporters, and it suffered prolonged economic stagnation in the 1980s. Literature on the Nigerian experience with the SAP points out problems such as poor foreign exchange management, that is, the maintenance of a fixed and overvalued exchange rate which led to the expansion of the black market, high inflation, ailing agricultural exports, a flourishing domestic service sector (Dutch disease), and a chronic budget deficit (Budina et al. 2007: Chibber 1991:Pinto 1987,1990). Of these, the budget deficit of the federal government is still a serious problem; it exceeded 10% of GDP during the stagnant 1980s, a decade in which Nigeria experienced negative GDP growth for several years.

Natural resource abundance, and specifically oil dependence has often been associated with poor growth, poverty and underdevelopment. Nigeria is considered to be a classic example of the contradiction between natural resource abundance and perverse economic development outcomes (or the paradox of plenty). It is Africa's highest oil exporter, and the world's tenth largest oil producing country. It has realised over US$ 600 billion in oil revenues since 1960, a figure greater than the resources used by the Marshall Plan in rebuilding Europe after World War II, and is currently the 8th highest net oil exporter in the world. Nigeria's economy is heavily dependent on natural resources: oil and gas constitutes 98% of total exports, 80% of government revenues and around 20% of GDP (CBN, 2010).

This adverse effect of commodity price windfalls on the output and productivity of domestic industry is widely referred to as the 'Dutch Disease'. The term was first used by The Economist in 1977 to describe the impact of booming natural gas production from the Groningen fields in the Netherlands on the non-booming tradable sector. Formal models of the 'Dutch Disease' by Corden and Neary (1982), van Wijnbergen (1984), Neary and van Wijnbergen (1986) have illustrated two important effects of commodity price windfalls, namely a resource movement effect and a spending effect. Firstly, the booming sector attracts capital and labour resources from agriculture and manufacturing, and results in an appreciation of the real exchange rate. Furthermore, booming commodity exports make imports cheaper for domestic consumers, leading to import dependence and a displacement of domestic industry.

The Dutch disease effect is just one of the manifestations of the resource curse, and other channels of causation between resource abundance and poor economic performance include the increased demands for protection and import-substituting industrialisation by powerful 'vested' interests in manufacturing industry (Krugman 1987, Auty 1994); the heightened vulnerability of economies with shrinking non-tradable sectors to exogenous price shocks (Auty 1993); irrational, exuberant government spending based on overly optimistic projections of future revenues, leading to the accumulation of debt, and economic recession (Gelb 1988); and finally, across the literature, it is argued that the increased agitation for wealth redistribution due to the structural effects of a booming minerals sector may compel the state to distribute revenues among various claimants, leading to distortionary rent-seeking with implications for efficiency and productivity growth (Gelb 1988). Rodriguez and Sachs (2000) on Venezuela, Auty and Evia (2001) on Bolivia, Auty (1994) on Mexico, Brazil and Venezuela, Mikesell (1997) on Venezuela and Peru, Fardmanesh (1991) on Algeria, Ecuador, Indonesia, Nigeria and Venezuela, Timmer (1994) on Indonesia, and Bienen (1983) on Nigeria. For the recent entries into the league of *petro-states*, see Frynas, Wood and Oliveira (2003) on the on-going structural transformation in Sao Tome and Principe. Auty (1997) provides some evidence of distortions due to the booming oil sector in Kazakhstan.

Suffice to reiterate our earlier statement that at the dawn of independence and shortly after, Nigeria was predominantly an agricultural economy. However, things changed with the discovery of Petroleum oil in the 1970's. Since the 1970's oil has not only taken the dominant

role which agriculture played in the 1960's but it has remained the single basket into which the fortunes of Nigerian economic wellbeing have been kept. Thus, the aftermath of the huge revenue from oil sector is the decline in agriculture budget, under fulfillment in the Agricultural sector in terms of government expenditure, deterioration in life in the rural areas, massive migration to the urban center, decline in food and cash crop production and the concentration of social services and power in the urban center. The subordination of agriculture by oil is what is now obvious of food and cash crops with attendant shortages vis-à-vis rapidly growing population and import substitution manufacturing industries and substantial foreign exchange expenses on food and raw materials importation.

The oil producing areas have suffered a lot in the process of oil exploration. An examination of the various decrees (concerning petroleum industry) and the development plans in the 1970s up till early part of the 1980s show that the Nigerian government policy was much concerned with the transfer of technology to the National Petroleum Company and the development of indigenous manpower. Encouraged by this indifference, the oil companies neglected the oil communities. The situation was so bad that one could be tempted to say that the discovery of oil in Nigeria was a curse to the oil producing areas. The above deplorable condition of the oil producing areas probably prompted the setting up of "oil Mineral Producing Areas Development Commission" (OMPADAC) in 1992 to see to the suffering of the oil producing communities and fashion out a development program me for the communities.

An unfortunate aspect of the oil sector is the negative correlation between the huge revenue realized from the sector and development which the country has witnessed within the period under discussion. Although this is not quantifiable, however, when considered in terms of the slow transformation of the economy from traditional to a modern and self-sustained industrial nation or in terms of the percentage of the population who have since shared the fruit of the growth that has accrued from the "oil boom" the above assertion will be deemed justified. The huge revenue which oil has fetched the nation if well managed ought to have transformed the economy into a self-sustained one, but what do we witness? The full benefits of the industry have not been realized. This is demonstrated by the minimum linkages with the rest of the economy. This linkage effect is serious in the areas of forward and fiscal linkages.

Under the fiscal linkage, is the fact that the euphoria created by the sudden substantial windfall from oil led to laxity in the tapping of revenue from other sectors especially agriculture. Agriculture which had been the mainstay of the economy became less attractive and Nigeria has become an importer of essential food items such as rice, vegetable oil, palm oil, etc. As regards forward linkage, it is quite low in the sense that only few industries which make use of petroleum as input exist in the country. Another area where development has been retarded in the economy vis-à-vis the revenue from oil is that almost everything about oil is foreign. After more than thirty five years of commercial discovery, production and exploitation of crude oil, petroleum technology and personnel problems still remain with Nigerians to a large extent. The materials used in oil well drilling and related operations ranging from steep pipes and additives are imported in spite of our abundant wealth.

In the final analysis, the revenue from oil has not been effectively used to lay a proper foundation for our industrialization; thus, what Nigeria has witnessed over three decades of oil discovery is nothing short of growth instead of development. This is because while one can easily claim to a large extent justifiably that in classical GDP terms Nigeria has growth but this wealth however, has not been translated into real increase in living standards for the majority of the people. Development in real sense of it is said to take place if and only if over time a progressively higher percentage of the population shares the fruit of economic growth that accrues to a nation. Economic growth itself is usually accompanied by structural changes. This is what has happened in Nigeria over the years with our oil money.

3.8. CURRENT MONETARY POLICY TREND - MONETARY TARGETING

The current monetary policy pursued by the CBN is the monetary policy targeting; the intermediate target for monetary targeting is base money which was necessary for the Bank to control in order to have a grip on inflation growth in the economy. Monetary targeting refers to the use of monetary aggregates such as money supply or other measures of money stock as the intermediate variable of interest that the monetary authorities target in order to impact on the ultimate policy objective to price stability. The use of monetary targeting as a framework of monetary policy means a central bank announces a certain target of the annual rate of growth of the monetary aggregate of choice, such as 10.0 percent of broad money (Bamidale 2008). The central bank is therefore accountable for achieving the target. In practice, the central bank tries

to control the base money (operating money) upon which the money stock (nominal anchor variable) is built given the multiplier principle. The base money is nothing other than liability of the central bank comprising currency in circulation plus deposit money banks and deposit with the central bank.

Monetary targeting in Nigeria as a policy of monetary management could be traced to the period from 1974 onwards, coinciding with the oil boom era when the emphasis of monetary policy shifted from demand management to reducing inflation pressures, persistent balance of payments disequilibrium and high deficits in the federal budget. The need to relax import policy to address rising inflationary pressures put increased pressure on the balance of payments. The main monetary policy objective was reduced to control of inflationary pressures through directing credit to the favoured sectors of the economy. In the period 1974-1976, supply side management policies were used to stabilize prices, while the policy of import liberalization was continued. Following the oil boom of the period, the balance of payments position improved from a deficit of N40.8 million in 1972 to a surplus of N3.102.2 million at the end of 1974. In the years following up to 1979, oil earnings plunged significantly, requiring the adoption of austerity measures at all levels of government. The attention of monetary policy became more traditional and was designed to mop up excess liquidity in the economy so as to lessen pressures on the balance of payments and moderate domestic prices by reducing excessive growth in total demand.

The CBN's monetary policy structure comprises essentially of targeting the monetary aggregates and management of the exchange rate through the retail Dutch Auction System (DAS). Consistent with its monetary targeting framework, the CBN centers on liquidity management to accomplish the objective of maintaining price and macroeconomic stability. The primary tools for liquidity management are OMO, complemented by cash reserve ratio (CRR), discount window operations, etc. The anchor for the Bank's monetary policy was the minimum rediscount rate (MRR), which was thought to anchor short term interest rates in the banking system. The use of the minimum rediscount rate (hence forth MRR) as an anchor for interest rates became increasingly unreliable over time as short term interest rates did to respond to changes in the MRR. In order to have a strong hold on the control of short term interest rates in the economy, the Bank announced a new framework for monetary policy in December 2006. The new framework uses short term interest rates as the operating target.

Consequently, the MRR which hitherto had served as a nominal anchor for short term interest rates was replaced with the monetary policy rate (MPR).

The techniques of monetary target in Nigeria commenced with the setting out the broad framework for monetary management at the beginning of the year. It defines the quantitative targets to be achieved, using the IMF financial programming framework which evaluates how the objectives of the previous year were achieved and sets out the future path for the four sectors of the economy (the rear, fiscal, external and monetary sectors). The program me was initially a short term one, usually one year, and prepared along with the Federal Government's Budget. This has been the practice even before the Structural Adjustment Program me (SAP) reforms until 2001. The monetary targets and instruments are chosen consistent with the broad monetary policy objectives. The reasons for the variance between targets and outcomes of past policy measures are explained; developments in the external environment that impacted either positively or adversely on the domestic economy are assessed and changes in the output sector examined in terms of the size of output and the rate of inflation. These formed the basis for the formulation of a realistic monetary program me to support government's fiscal policy for the year.

Initially, the yearly monetary programme is prepared on the basis of consultations with the government. After the Federal Government budget is announced, the Central Bank of Nigeria would release the yearly monetary policy and credit guidelines which detailed the levels of money supply, interest charges by the CBN (the minimum rediscount rate, now called the monetary policy rate). Other features of the guidelines are the exchange rate policy for the year and the types of goods eligible for foreign exchange allocation, interest rate charges by banks, among others. There are also policies for the banking sector on interest rates, the Minimum Rediscount Rate and the bankers tariff for the year, as well as the supervisory and surveillance requirements for the banking sector, prudential requirements and credit limits that banks are expected to meet during the year, and returns from the banks, among others. A sector of the Guidelines contains the Trade and Exchange policy provisions for accessing and utilizing the official funds in the foreign exchange market as well the limits of the commission they could earn in the inter-bank foreign exchange market. It also contains regulations on the import tariff as well as provisions on how much an individual would be entitled to as overseas traveling allowance for either personal, official or business trips.

The greatest shortcoming of monetary targeting is that its efficiency depends on a strong, predictable and reliable relationship between the goal variable (output) and the targeted monetary aggregate without which the purpose may remain vague. If the relationship between the chosen monetary aggregate and the ultimate policy objective is weak, target would not work. That many countries such as Canada, USA, United Kingdom, Australia and host of other abandon monetary targeting for other frameworks of monetary policy. The CBN, in line with this recent trend and improved efficiency of the Nigerian financial markets, has begun to develop a monetary policy framework that is geared towards the emergence of an 'Inflation Targeting' monetary policy framework in Nigeria. This gradual process which was incorporated into the monetary policy design for 2009 began with the hosting of an international seminar on Inflation Targeting in 2008. The inflation targeting framework of monetary policy is expected to commence as soon as all the necessary preparations have been completed. However, currently the Central Bank of Nigeria still adopts the monetary targeting, while working towards an explicit inflation targeting framework.

3.9. EXCHANGE RATE TARGETING

The Central Bank of Nigeria does not have an exchange rate target for the domestic currency (Naira). However, since the Naira exchange rate is one of many factors that affect inflation level and growth, the monetary authority takes the trend of the Naira exchange rate into account in the conduct of its monetary policy. The exchange rate affects inflation directly and other prices generally in a quick way through the prices of imported goods and services. The exchange rate affects inflationary pressure indirectly and usually with a long time lag through its impact on the level of economic activity. Hypothetically, a weak domestic currency entails greater demand for Nigerian goods and services, leading to increased employment of resources. The domestic currency exchange rate could also affect inflation anticipations indirectly. However, Nigeria has a commodity based mono-product economy where the transmission mechanism from exchange rate to higher exports is not that simple, because the price and volume of the major export oil is fixed by a cartel to which Nigeria is a member. All things considered, inflation anticipations are very sensitive to exchange rate changes in Nigeria.

In the previous period following the creation of the CBN, there was a strong opinion that the country did not have the capacity to run a central bank. This perception was mainly attached to the Loynes Report which had warned that "in creating a national currency, the first aim must be to make it at least as acceptable and as valued as the oil". Therefore, the early ages of monetary policy in Nigeria were committed to ensuring the appearance of a strong national currency since in the perception of the Bank, external stability of the national currency was important to the attraction of external capital to the country. Following these thoughts, the Bank maintained a strict monetary policy stance between 1959 and 1962. It insisted that all currency issues were backed by 100 per cent foreign exchange cover. Moreover, the external value of the Nigerian pound was statutorily fixed by the 1958 CBN Act at par with the British pound sterling. This period is often referred to as the exchange rate targeting phase of Nigeria's monetary policy. The 1962 CBN Act Amendment redefined the parity away from the British Pound Sterling in favour of Gold which remained fixed until 1962 when the Nigerian pound was devalued. Briefly, a gradual process of centralizing all the country's foreign exchange earnings in the Central Bank was gradually being implemented.

3.10. PHASES OF MONETARY POLICY IMPLEMENTATION

During this period, the concern of the monetary authorities was the development of strong local credit base as well as the establishment of a domestic financial infrastructure such as the money and capital markets. During this period, the first money market instrument; the Nigerian Treasury Bill (NTB) was introduced in 1960, the Lagos Stock Exchange also in 1960, bank clearing facilities in 1961 was well as the introduction of a Nigerian currency in 1959, which moved Nigeria out of the West African Currency Board System. The most active instruments used during this period were interest rates fixing and moral suasion. The rediscount rate and Treasury bill rate were revised 10 and 13 times, respectively, between April 1960 and December 1961, to encourage the commercial banks to repatriate short-term funds from London and hold them in Nigeria and build a credit base. The success of these actions brought about the decline in commercial banks' investments in the London money market and concomitant increase in their investments in Nigeria increased.

Consistent with the Second National Development Plan (1962), this monetary phase witnessed changes in interest rate and variable liquid asset policies in order to provide "cheap money" for

development. Within this period, the Bank established the Call Money Fund (July 1962), to serve as an investment outlet for the surplus short-term funds of the banks. The CBN also increased the regularity of NTB issues to weekly, while the NTB issue rates were reduced from 4.5 per cent to 4 per cent and further to 3.5 per cent in accordance with the reduction in the rediscount rate from 5.25 to 4.5 per cent and 4.0 per cent, in 1963 and 1964, respectively. The result was a significant increase in credit to the economy by the banking system.

The objective of monetary policy during the credit restraint phase was to improve the balance of payments position as the previous cheap money policy led to a drain on the country's foreign exchange reserve owing to increased demand for imports. A combination of direct credit controls, interest rate, variable liquid assets and moral suasion measures was applied. The success of the policy improved the balance of payments position from a deficit of N62.0 million to a surplus of N23.9 million. From 1966, the responsibility for bank examination was transferred from the Federal Ministry of Finance, which had carried out the function since 1960, to the CBN. The objective was to promote the enforcement of monetary policy through compliance monitoring and the enforcement of guidelines.

Characterized by social and political disturbance and the signs of continued economic recession, there was the easing of monetary policy to stimulate economic activity and enhance government borrowing. Credit ceilings were relaxed, while banks were persuaded to refrain from financing of non-essential imports in preference for more credit to the productive sectors of the economy. The major policy concern of the time was the need to increase domestic output and reduce inflation as the end of the civil war drew near. Consequently, the major monetary policy instruments employed were selective credit controls, moral suasion and a modest upward review of interest rates.

General credit ease was avoided as more credit was allocated to the preferred sectors. The result was improved domestic output, reduced pressure on the balance of payments and increased foreign reserves as government finances improved following the reduction in war expenditure. The twin ambition to expand domestic output and curtail inflation remained the major focus of monetary policy during this period. Also during the same period, government finances and foreign exchange reserves improved owing to increased oil earnings. This resulted in increased aggregate demand and money supply. The task of monetary management became

complicated with excess liquidity. Consequently, the selective credit control policy was retained, supported by interest rate and exchange rate policy in the latter part of the period.

A new Nigerian (Decimal) currency was introduced in 1973 with a new exchange rate and parity. The change in exchange rate meant severing the link of the Nigerian currency to the US dollar and allowing it to appreciate against the dollar and sterling according to the relative strength of the two. Monetary policy was also supportive of implementing the provisions of the Nigerian Enterprises Promotion Act, 1972, which empowered the Federal Government to acquire 40 per cent of the foreign owned banks, in the spirit of nationalism and taking control of the commanding heights of the economy. This was later amended in 1977 to increase the share ownership of banks by the FG to 60 per cent and the indigenization of the top management of the formerly expatriate banks. The wage increases of 1975 increased aggregate demand, while increases in government expenditure induced increased bank credit which led to an increase in money supply, thus fuelling inflationary pressures in the economy. Consequently, Stabilization Securities and the Bankers Unite Fund were introduced to mop up excess liquidity in the system.

The persistence of excess liquidity necessitated a restraint on monetary expansion as inflationary pressures built up in the economy. Consequently, the instruments of direct credit ceiling, cash reserve ratios, stabilization securities, the exclusion of deposits against letters of credit from eligible liquid assets and interest rate change were combined to address the liquidity surfeit. The Financial System Review Committee was established in 1976, while the Rural Banking Scheme was introduced in 1977 to further the achievement of the objectives of monetary policy. The policy targeted the conservation of foreign exchange reserves and the maintenance of price stability. Consequently, measures taken to reduce foreign exchange disbursements included the re-introduction of pre-shipment inspection and the imposition of pre-import deposits ranging from 10 per cent to 250 per cent to be transferred to the Bank. In addition, interest rates were raised to encourage savings and investment and reduce demand for foreign exchange.

Structural imbalances, coupled with high fiscal operations, complicated the task of monetary management, paving way for the introduction of IMF-supported structural adjustment programme in July 1986. The broad strategies included: deregulation (e.g. interest rates, external trade

and payments arrangements); adoption of market-based principles; and divestitures, privatization and liberalization (e.g. of procedures for establishing new banks and other financial institutions), amongst others. The program me was designed to put in place market structure that would anchor market driven monetary policy. The liberalization of the financial markets (interest rates, foreign exchange market, bank licensing, etc) generated high level competition in the financial system. In the process, banks developed new products and ingenious ways of courting customer patronage. Meanwhile, monetary policy was put to task to meet the ever growing needs of the financial system, especially, the demand for foreign exchange. The monetary authorities responded to this challenge with a mixture of market and administrative instruments to steer the direction of the financial system. The instruments used included: Special deposits at the CBN to cover all outstanding external payments arrears at zero interest, reduction in credit ceiling, transfer of public sector accounts from the banks to the CBN in 1989, prohibition of banks from accepting foreign guarantees/currency deposits as collaterals for domestic loans denominated in Naira, issuance of CBN Stabilization Securities, which were mandatory, non-negotiable and non-transferable, sector-specific credit allocation targets etc.

3.11. REFORMS PRIOR TO THE INTRODUCTION OF OMO

Prior to the commencement of OMO in Nigeria, additional reforms had to be introduced to accommodate the effective implementation of OMO. Some of the reforms implemented are The withdrawal of controls; Progressive reduction of the 18 sectors categorization for credit allocation to 8 in 1984 and 2 (high priority and others) in 1986; Introduction of Prudential Guidelines and Accounting Standards for bank operations in November 1990: The guidelines were designed to: ensure a uniform and more prudent approach to bank credit portfolio classification, provisioning for non-performing facilities, credit portfolio disclosure and interest accrual on non-performing assets; and ensure reliability of published accounting information; Design and Issue of the 1991 Monetary Policy Circular/Guidelines based on market approach; Setting up of an OMO Trading Desk at the CBN; Setting up of a Monetary Policy Coordinating Committee, to propose policy stance, review and adjustments; and, Upgrading of the Bank Examination Division to Departmental status in 1992. And licensing Discount Houses with effect from in 1992 to promote the availability of liquidity and to act as intermediaries in NTB trading between the CBN and operators in the inter-bank market;

Following the preceding reforms, OMO was formally introduced in Nigeria and implementation commenced on June 30, 1993, as the major tool of monetary control, to be complemented by indirect instruments such as discount window operations, reserve requirements and moral suasion. OMO involved the CBN using its discretion to sell or buy securities, particularly Nigerian Treasury Bills or other eligible securities, in the open market with a view to influencing the availability and cost of liquidity in the financial system and thus, the credit expansion ability of the deposit money banks.

Between June and May 2003, OMO was conducted weekly using appropriately tenured instruments of less than 90 days. However, as the level of liquidity in the banking system increased, issues were made bi-weekly from June 2003 until November same year when the frequency of offers became daily. The appointment of Money Market Dealers (MMDs) in December 2006 empowered the dealers to intermediate on behalf of the Bank and provide constant liquidity on the instruments used in the market and also to underwrite the unsubscribed portion of any auction at an incentive rate of 0.125 per cent above the weighted average rate. This activity significantly helped the Bank to achieve its target of withdrawal of excess liquidity in the system.

Both repo and reverse repurchase transactions that were previously performed under the discount window operations, were streamlined with OMO to ensure the effectiveness of monetary policy. This was necessitated by the fact that both the repurchase transactions and OMO had exerted the same potential of affecting the liquidity conditions in the system, depending on the nature of actions taken. As opposed to physical bids being submitted, this system provided an enhanced on-line-real-time bidding system using the Reuters Treasury Dealing System introduced in April 2007, on a bid and offer basis. It therefore, promoted efficiency and ensured effectiveness in the conduct of OMO and facilitated the achievement of targeted policy objectives.

The predominant instrument used in the market since inception was the Nigerian Treasury Bills, which became grossly inadequate owing to the surge in growth of the monetary aggregates and the demand for investible securities by the banking system that could not be met by the CBN. As a result, the Bank introduced CBN Certificates, CBN Bills and Special NTBs

in 2001, 2005 and 2006, respectively. The Nigerian Treasury Bonds were converted into tradable instruments in the secondary market by the Bank in 2003 to tackle the liquidity challenges at the time. With the take-off of RTGS on December 18, 2006 the operations of OMO have improved substantially. The determination and forecast of banking system liquidity has got better since the introduction of the RTGS, thus improving the policy environment. Besides, the interface between CBN (RTGS & T24) and banks through Temenos Internet Banking (TIB) ensured that settlements and transactions were efficiently executed both between the CBN and the banks and by the banks themselves.

This has assisted in the avoidance of undesirable credits by the CBN to banks that failed to adequately fund their clearing accounts, thereby injecting more liquidity in the system by default. With the transfer of settlement and clearing operations to the private sector, it became the responsibility of the appointed agents to settle any shortages that arose in the course of operations outside the CBN. Following the reforms introduced under Vision 2020 for improving the payments system, emphasis has shifted to movement from cash-based transactions to electronic forms of payments. As e-payment models are embraced, a large portion of systemic liquidity which was once seen by CBN with a lag would now be in the purview of the Bank real time, thereby making it easy to target excess reserves in the banking system more effectively.

3.12. COORDINATION OF MONETARY FISCAL POLICIES

The weak coordination of fiscal and monetary policies could be attributed largely to the placement of the CBN under the control of the Federal Ministry of Finance which implemented the fiscal policy. The Structural Adjustment Program me (SAP) was, subsequently introduced in July 1986 to allow for more market friendly measures that could encourage private participation and efficient allocation and use of resources. This followed the observed inadequacy of the Austerity Measures to address the economic problems (CBN, 2000). Despite the introduction of SAP, policy coordination was still not effective as fiscal policy dictated the policy direction for the economy. Consequently, inflation continued to rise, deficit financing through the CBN did not abate and balance of payments deficits and external debt continued to rise. For instance, between 1981 and 1990, there were massive injections of funds from the CBN. However, the CBN was removed from the control of the Federal Ministry of Finance and

placed under the supervision of the Presidency. Despite the change, the CBN did not have instrument independence. Fiscal policy domination continued till the early 2000s when instrument independence was granted to the CBN and policy coordination was given priority owing to various reforms that were taking place in the economy.

A major macroeconomic objective is to minimize business cycle fluctuations. This implies achieving economic stability with low rates of inflation and unemployment while external balance is maintained. To these ends, two major groups of policies, measures are required; one is related to monetary conditions and the other related to fiscal conditions. Monetary policy is employed by the central bank to control the availability and cost of credit in the economy in order to achieve macroeconomic stability. This control is exerted through changes in money supply, interest rates and other variables that affect credit in the economy. The main aim of monetary policy in ensuring economic stability is stable prices, in other words, low inflation.

Fiscal policy is employed by the ministry of finance or the treasury, through the use of taxes and government expenditure to influence aggregated level of economic activities. The key instruments used include government deficit and debt, as well as taxes and expenditure. The main focus to fiscal policy is to stimulate employment. While monetary and fiscal policies are implemented by different bodies, they are far from being independent as there is always a tradeoff between the two with regard to their effects, often entailing delicate balancing acts. An expansionary fiscal policy usually leads to expansionary monetary policy if the deficit is financed by the central bank, thereby fuelling inflation. A tight monetary policy on the other hand will lead to low inflation rate but will adequately employ resources. It is therefore, necessary to pursue a mix of the two in such a way to minimize conflict in smoothening out economic cycles and achieve economic stability and growth. Policy coordination requires that the two authorities take account of each other's objectives and actions in order to ensure stable economic growth.

Prior to the introduction of fiscal reforms in Nigeria, there were no serious attempts at coordinating monetary and fiscal policies as monetary policy was significantly driven by fiscal policy. The prevalence of fiscal indiscipline resulted in huge fiscal deficits that were financed through the banking system, thus compromising the achievement of the objectives of monetary

policy. On the other hand, fiscal policy was driven largely by oil price developments and fiscal volatilities were easily transmitted to the rest of the economy with negative implications for the real exchange rate and economic growth. Over time, oil prices impacted both revenue and expenditure, and the declines in oil prices were followed by the scaling back of public expenditures resulting in disruptions to the provision of government services.

To reduce uncertainty and establish a stable economic environment, the government introduced a set of fiscal policy rules beginning with the 2003 budget to foster transparency and accountability of fiscal operations. The central objective was to improve budgetary planning and execution. The adoption of such rule also led to the accumulation of government savings which were valuable for smoothening-out public expenditures. Under the fiscal rule, government expenditure was based on a prudent oil price benchmark. The adoption of this rule ensured that government expenditure was de-linked from oil revenue earnings, thereby limiting the transmission of external shocks into the domestic economy.

The Medium-Term Expenditure Frameworks (hence forth MTEF) and Medium-Term Sector Strategies (MTSS) were introduced to ensure that sectors spending programmes reflect government development priorities and within projected resource envelops (Okonjo-Iweala and Osafo-Kwaako, 2007). In 2007, the MTEF was formalized by the Fiscal Responsibility Act. The MTEF set out a framework for macroeconomic projections, a fiscal strategy paper, an expenditure and revenue framework and consolidated debt statement, etc. among others. In preparing the MTEF the Minister of Finance sought the input of the CBN among other stakeholders. This was expected to enhance fiscal and monetary policy coordination.

With these reforms, monetary policy became more responsive and effective in tacking inflation. Consequently, the rate of inflation was brought under control. The CBN Act 2007 also added impetus to policy coordination as it formally established the Monetary Policy Committee (MPC) charged with the responsibility for formulating monetary and credit policy. The membership of the MPC includes those appointed by the President. Also under the new Act, the Board of the CBN was enlarged to include the Accountant General of the Federation in order to facilitate the coordination of fiscal and monetary policies. Although monetization of excess crude revenue did not abate, as a result of more coordination between the monetary and fiscal authorities, the CBN was able to manage excess liquidity more effectively during this period.

A major fiscal constraint has been the unreliability of the three-year revenue and expenditure forecasts used in the medium-term expenditure and revenue frameworks. This is borne out of the unpredictability of crude oil prices and production volumes that are exogenous to the fiscal authorities. Given that the budget size is largely determined by estimates of oil revenue, the reliability on the budget as an indicator of the future direction of fiscal policy becomes doubtful, thus diminishing the relevance and essence of policy coordination. Given that expansion programmes are heavily dependent on crude oil exports, unstable revenues arising from the global oil and commodity price shocks may expand budget deficits and impair the goal of monetary policy, particularly, when the government is compelled to resort to the central bank in meeting its financing gap when the other sources of financing are grossly inadequate.

Another fiscal constraint is the growing recognition of the need to keep the monetary policy and liquidity management operations separate from debt management operations. This is required to strengthen the operational autonomy of the central bank. Moreover, central banks increasingly rely on their own papers as they offer a very flexible instrument for the short-term liquidity management as it gives them greater discretion. Central banks could alter the issuance, auction system, maturities and settlement rules. However, there would be problems of coordination when central bank paper is issued along with government treasury bill, unless there is some complementarities between the two in terms of maturity (Ali and Jayaraman: 2001).

Besides, there is no constitutional provision to back the creation of an excess crude oil account where excess revenues could be saved. The constitution provides that all revenues should be transferred to the Federation Account and shared among the three tiers of government. This has been a constraint to the monetary authority, in controlling excess supply of money. Other challenges include the lack of coordination among the tiers of government and disagreement over the broad macroeconomic objectives to be achieved. To achieve macroeconomic coordination, all the tiers of government need to enact fiscal responsibility legislations and other aspects of legal reforms such as the public procurement legislations and other adopt due process certification, public accountability and transparency in budget formulation and execution.

Given the federal structure of Nigeria, the challenge of applying fiscal rules at the sub-national level needs to be overcome for the effectiveness of reform policies. This is because the current

revenue-sharing formula allocates nearly half of the total revenue to the lower tiers of government that are also directly responsible for nearly half of consolidated government expenditure. They also process significant independence in their expenditure decisions, thereby significantly influencing the ability to design and implement appropriate public policies. It is thus important for state governments to improve budget transparency, strengthen public expenditure management and adopt the due process mechanism by formulating and implementing credible public procurement legislations if the challenges of macroeconomic coordination are to be surmounted.

In conclusion, effective coordination between the monetary and fiscal authorities in the future will depend not only on the existing institutional arrangements and the recognition of monetary policy goals for sustainable growth, but also on the commitment by government such that the public debt remains on a sustainable path in which monetary policy goals are not compromised.

3.13. CREDIT GUIDELINES

The practice of specification of credit guidelines gradually evolved from the mid-1960s. The 1966 Annual Report of the Bank stated that the primary objective of the Central Bank monetary policy in 1964-1965 was the achievement of balance of payments equilibrium. While pursuing this objective, the Bank sought to use the instruments of selective credit control to advance the development process. The monetary policy tool employed by the Bank to achieve these objectives was the "guideline" involving the placing of a ceiling on the rate of expansion of commercial bank advances during the period. The guideline adopted was non-inflationary, and so consistent with the objective of balance of payments equilibrium. The guideline was also designed to create relative credit scarcity and therefore credit rationing and reallocation in favour of preferred sectors.

The issuance of credit rationing guidelines which was a continuation of pre-war monetary management practice is perhaps the most popular instrument of monetary policy. From its inception in the pre-war period and up to 1st March, 1972 and between 1976-1979, the credit control guidelines took the form of setting the rates of change for the aggregate and components of commercial bank loans and advances. However, between April 1972 and March 1976, the use of aggregate credit ceiling was dropped in favour of the specification of a sect

oral distribution of credit. The preference for sectorial distribution of bank credit throughout the period was to stimulate the productive sectors and consequently stem inflationary pressures. The streamlining of the interest rate structure and downward inducement of the rates was also an important policy initiative. To enhance the effectiveness of the sect oral credit guidelines, a number of special deposits were imposed to reduce bank reserves and credit creating capacity.

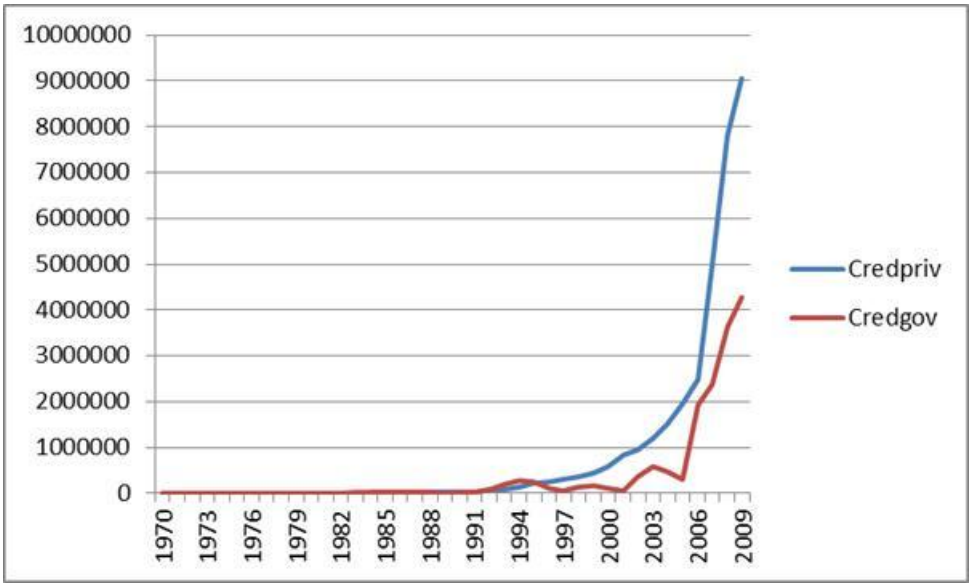
Monetary policy reform was a major element of the Structural Adjustment Program me (SAP) adopted in the mid-1986. Essentially, the economic reforms were to re-orientate economic management towards a market-based approach in-order to improve efficiency. The major objectives of monetary policy under the Program me were to enhance output growth, employment situation, and price stability and external sector equilibrium; with the underlying strategy to promote the emergence of a market-based financial sector for effective mobilization of financial savings and efficient resource allocation. The monetary authorities re-examined the existing monetary control framework dominated by the use of selective credit controls, credit ceilings, and administrative control of interest rates. Thus, in the early part of the implementation of the reforms, the authorities focused on the reform of the credit and interest rate guidelines. Consequently, in 1986, the sect oral credit guidelines were reformed to give banks greater discretion in their credit operations by reducing substantially the large number of sector-specific credit distribution targets. Also, in August 1987, all controls on interest rates were removed, although some controls were reintroduced in 1989 and 1991.

Other actions taken in 1990 and 1991 were aimed at strengthening the performance of the banking sector. Some of the policy measures adopted were increase in the minimum paid-up capital requirement for banks in 1988 and 1990; the bringing into force the risk-weighted measure of capital adequacy recommended by the Basle Committee of the Bank for international settlements, and the introduction of a set of prudential guidelines for licensed banks to complement the capital adequacy requirement and the Statement of Accounting Standards for bank and non-bank financial institutions. Under SAP, the credit guidelines were further reformed to give banks greater flexibility in their credit operations. The sector-specific credit distribution targets were compressed into four sectors in 1986 and two sectors in 1987. Under the two-sector categorization, agriculture and manufacturing enterprises were accorded the status of the priority sub-sector while the rest were grouped as “others”.

With the Bank's resolve to transit from direct controls to market-based monetary management, the credit guidelines circular assumed the role of a vehicle for conveying its policy intentions to the commercial banks. Three major developments took place in 1991/92 to facilitate the achievement of this objective. The first was the announcement by the Bank that monetary policy would shift from the system of direct to market-based approach, signaling a firm commitment after nearly five years of economic and financial reforms. The second was the promulgation of the CBN Act 1991, and the Banks and Other Financial Institutions Act 1991 (to replace the earlier Acts and their amendments); to strengthen the powers and supervisory authority of the Bank. The third was the selective lifting of credit ceilings on individual banks with effect from September 1992.

The lifting of credit ceilings was, however, initially limited to banks considered healthy by the CBN, based on their ability to meet specified statutory and prudential requirements. Following the introduction of indirect monetary management based on open market operations, the use of credit controls became inconsistent with the system. Thus direct credit controls were abolished and replaced by the monetary, credit, foreign trade and exchange policy guidelines for conveying the broad policy directives and guidelines of the Bank in the ensuing year. The last of these guidelines was issued in 2005.

Figure 3.7 Credits to the Government & Private Sector



Source: Based on data compiled from IMF (2011)

3.14. SHIFT FROM DIRECT TO MARKET BASED POLICY INSTRUMENTS

Monetary policy implementation in Nigeria has undergone two major phases: the era of direct monetary control and the current regime of indirect monetary management. The indirect approach involves the use of market instruments to effect changes in the availability and cost of credit. For a long time since the political independence the monetary authorities in Nigeria relied on the direct approach, prescribing credit ceilings and administratively fixing interest rates and attached on a fixed exchange rate regime, which was supported by an collection of trade and exchange controls (Oresotu, 2000). However, following the reforms under the Structural Adjustment Programme (SAP) of 1986 with the associated liberalization of most markets, direct controls were de-emphasized as the exchange rate was floated and trade and exchange controls liberalized. From June 1993, monetary management of bank moved away from interest rate and credit rationing, to indirect instruments of liquidity management such as open market operations and the discount window operations. However, in 1994, there was brief policy reversal to direct monetary controls. Currently, the Bank uses a mix of market based instruments, such as standing lending and deposit facilities, reserve requirements-liquidity ratio (liquid asset ratios) and cash reserve requirement, OMO and discount window; for liquidity management.

3.15. DIRECT INSTRUMENTS

The need to ensure price stability and to provide an enabling environment for economic growth and development as well as gainful employment while ensuring external sector viability, dictated the application of direct controls in the implementation of monetary policy between 1958 and 1986. This was applied in the administration of interest and exchange rate and the distribution of domestic credit as well as foreign exchange for international payments. Some of the direct monetary control instruments were the use of credit ceilings, selective credit controls, administered interest and exchange rates, liquidity ratio and cash reserve requirements, special deposits and stabilization securities. The CBN was persuaded that it was necessary to deliver credit to end-users at low interest rates to stimulate output while the exchange rate should be pegged to avoid continuous depreciation of domestic currency. The Policy also aimed at reducing imported inflation as the economy needed imports of raw materials and capital goods for industrial takeoff.

Following the oil boom in the mid and late 1970s and the subsequent fiscal expansion, there was the absence of internal balance consistent with balance of payments stability thereby making direct controls relatively ineffective. Apart from the economic problems which the monetary policy framework could not address, the interest rate regime and the non-harmonization of fiscal and monetary policies were other contributing factors which rendered the use of direct monetary controls ineffective (CBN: 1995). Banks defaulted on their prescribed credit allocation ceiling while the CBN could not meet its monetary targets. The low interest rates on government debt instrument did not sufficiently attract private sector savers and, since the CBN was required by law to take up the unsubscribed portion of government debt instruments, large amounts of high-powered money were usually injected into the economy.

Similarly, during that period, the rapid monetization of foreign exchange earnings resulted in large increases in government expenditure which led to the growth of the monetary aggregates, thereby causing macro-economic instability. The low interest rate regime also encouraged credit expansion by banks while the low rates on treasury securities discouraged patronage by the public; leading to high injection of high powered money into the economy. Against this scenario, the traditional instruments of reserve requirements, discount window operations and moral suasion were also applied, but with little effect.

The early years of monetary policy in Nigeria relied on the exchange rate as the major vehicle for monetary policy. Consequently, monetary policy was based on a fixed exchange rate, which was supported by an arsenal of trade and exchange controls. During the regime of foreign exchange controls (1959-1986), controls were applied with stringent, depending on the country's external sector position as well as the prevailing economic conditions. Consequently, import licensing and prescription of eligible transactions were employed under the exchange control regime to limit the volume of foreign exchange resources that could be used to fund non-priority items. With the liberalization of the foreign exchange regime in 1986 the use of administered exchange rate was discontinued. However, in 1994 the regime of dual exchange rate provided a window where the exchange rate was determined by the CBN. The current Wholesale Dutch Auction System (wDAS) makes the CBN a major player in the foreign exchange market.

Interest rate policy for most of the review period was administered, implying that interest rates were not market determined, but set by the CBN. In particular, interest rates were fixed within a range in which both the deposit and the lending rates were expected to be maintained by commercial banks. The level and structure of interest rates were also administratively determined by the CBN. Both deposit and lending rates were fixed in order to achieve by fiat, to enhance resource allocation, promote the orderly growth of the financial markets, contain inflation and lessen the burden of internal debt servicing on the governments. In implementing this policy, the sectors were classified into three categories; "Preferred sector" (agriculture, manufacturing, and residential housing); "Less preferred sector" (Imports and general commerce); and "Other sectors". This classification enabled the monetary authorities to direct financial resources at concessionary rates to sectors considered as priority areas.

The withdrawal and injection of deposits through the management of accounts of government agencies was used by the Bank to either reduce or increase the availability of liquidity in the system, as was the case in 1989, 1999/2000 and 2004, respectively. Currently, the Bank holds the capital accounts of the Federal Government and disburses them only when they are needed. Stabilization securities were introduced in August 1990 as a temporary instrument for liquidity management. However, it was abolished in the last quarter of 1998 owing to its failure to achieve the objective. The tenor for the stabilization securities was 90 days issued at the prevailing rate of the Nigerian Treasury Bills (NTBs) plus a small margin, and subject to roll-over at the instance of the Bank. The stabilization securities were a mandatory instrument, non-transferable, non-rediscount able and to be held to maturity.

The Central Bank may require Deposit Money Banks to hold a fraction (or a combination) of their deposit liabilities (reserves) as vault cash and or deposits with it. Fractional reserve limits the amount of loans banks can make to the domestic economy and thus limit the supply of money. Minimum cash ratios were stipulated for the banks in the mid-1970s on the basis of their total deposit liabilities; but they were not very effective since they were lower than those the banks on their own maintained with the CBN to promote industrialization and agriculture as well as to de-emphasize bank credit to the less preferred sectors of the economy, such as commerce and services. Consequently, the bank classified the various sectors and gave directives through the Monetary Policy Circular and Guidelines regarding credit ceilings and directed lending/allocation of credit to the sectors. The most preferred sectors were given

higher ceilings and allocation of credit while less credit was allocated to the least preferred sectors of the economy.

The difficulties encountered in implementing direct monetary controls led to the introduction of indirect controls in 1992. Under the system, market forces were encouraged. Open Market Operations (OMO) was introduced in 1993, complemented by reserve requirements, the discount window operations and the application of moral suasion. OMO encompasses the machinery for the supply/withdrawal of liquidity from the economy by the central bank through secondary market dealings in treasury securities as well as the issuance/purchase of central bank securities. Other indirect instruments include reserve requirements which specify the proportion of a bank's total deposit liabilities that should be kept with the central bank; and discount window operations under which the central bank performs the role of lender of last resort to the deposit money banks.

To give banks greater leverage in credit administration, the prevailing sectorial credit distribution targets were merged into four sectors in 1986, and further reduced to two in 1987. From October 1996, mandatory credit allocations were abolished. In an effort to improve the operations of the money market, an auction-based market for treasury securities was introduced in 1989. The treasury instruments were bearer bills, aimed at enhancing transferability and promoting secondary market trading.

From September 1, 1992, the CBN lifted credit ceilings on banks that met CBN specified criteria in respect of statutory minimum paid-up capital, capital adequacy ratio, cash reserve and liquidity ratio requirements, prudential guidelines, sectorial credit allocation and sound management. However, the use of stabilization securities to mop up excess liquidity in banks was intensified while three discount houses commenced operations from March 1993. The CBN introduced OMO in treasury securities with banks through discount houses on a weekly basis in June, 1993. Open market operations involve the sale/purchase of government securities to/from commercial banks and the non-bank public with a view to regulating the cost and availability of credit. It is a very flexible instrument whose use is at the instance of the central bank. OMO is performed frequently at both the primary and secondary markets, and in quantities most suitable for market development and monetary management. The primary objective of CBN's OMO operations is to minimize fluctuations in the bank liquidity with the

aim of aligning bank reserves with the Bank's reserve target and broader monetary aggregate objectives. The CBN transacts predominantly in short-term government paper 19-day treasury bills and since 2001, on its own paper.

The key feature of OMO is the buying and selling of government and other eligible securities in the open market to increase/decrease the volume of liquidity available to the financial system to influence credit expansion and the cost of credit. Consequently, when the Bank sells any securities, it withdraws from the banking system while any purchases imply an injection of liquidity. Banks subscribing to the offer, through the discount houses, draw on their reserve balance at the CBN, thereby reducing the overall liquidity of the banking system and the banks' ability to create money via credit. Since the introduction of OMO, the Bank has persistently sold to mop up systemic excess liquidity until September 18, 2008 when the motivation to increase liquidity into the system dictated the policy to purchase securities from the market (see Table **3.1**).

This was necessitated by the global financial crisis precipitated by the sub-prime problem in the US which led to credit crunch and the collapse of many financial institutions in the developed western financial systems. The institutions used in the market were mostly Nigerian Treasury Bills (NTBs) introduced in 1960, CBN Certificates (2001), CBN Bills (2005), Bonds that were held by the CBN as own-investment since they were issued by the Federal Government of Nigeria. Following the shift from direct to indirect instruments, discount window operations (DW) were also adopted to complement OMO since 1993.

Table 3.1: OMO Sales Transactions

Table 3.1. OMO Sales Transactions

	Subscription(N bn)	Sales (N bn)	Avg Rate (%)	Avg.Tenor (Days)
Jun-Dec 1993	42.1	32.8	25.79	43
1994	289.1	223.8	13.01	40
1995	178.7	157.7	n.a	48
1996	277.4	235	12.24	46
1997	141.9	101.8	10	37
1998	59.8	56.7	12.05	30
1999	181.8	167.6	17.3	36
2000	482.6	318.1	15.6	41
2001	403.3	386.9	16.9	33
2002	656.22	591.95	18.76	45
2003	924.56	794.5	14053	32
2004	1.136..30	1,099.50	13.74	35
2005	1,247.30	989.9	14.53	32
2006	2,270.20	1,808.40	8.6	135
2007	627.42	3,736.30	7.26	90
Jan-Nov 2008	34.00	1,469.37	9.15	198
Total	8,262.48	10,899.77		

Source: Central Bank of Nigeria, Statistical Bulletin (2009)

The various actions taken in the discount window included the use of repurchase agreements, Bill Discounting Outright Sales/Purchase, Overnight Sweep and Pledges. The CBN discount window facilities were established strictly in line with the "lender of last resort" role, that the Bank is expected to play. Accordingly, it has continued to provide very short term loans (overnight) to banks in need of liquidity. The facilities are collateralized by the borrowing institution's holding of government debt instruments and any other instrument approved by the CBN and subject to a maximum quota.

The Monetary Policy Rate (MPR) is the nominal anchor which influences the level and direction of other interest rates in the domestic money market. Its movements are generally intended to signal to market operators the monetary policy stance of the CBN. The interest rate charged on lending to commercial banks by the CBN is the discount or rediscount rate. By varying the discount rate, the CBN influences credit availability, as lender of last resort to commercial banks. The direct impact of varying the MPR, however, is on credit cost, much

unlike OMO which directly impacts the reserves of the DMBs. As an alternative to OMO, the CBN operates a discount window which allows for unlimited outright sale of securities or repurchase agreements. Treasury bills serve as the underlying asset for bulk of these transactions. The discount window serves as a lender of last resort function: banks can borrow reserves at a mark-up to the MPR. The various instruments under the discount window operations are:

Repurchase Agreements (Repos): are temporary purchases (repos) and sales (reverse repos) of appropriate securities by the Bank to either supply or withdraw liquidity and ensure a strong inter-bank market and curtail interest rate volatilities. Repo transactions enable the Bank to provide temporary liquidity to needy operators in the discount window on a collateralized basis to ensure the smooth operation of the inter-bank market on a continuous basis. The transactions (repos and reverse repos) are usually of between 1-7 days, executed between the Bank and any of the operators (banks and discount houses) in the discount window. From 18th September, 2008 the tenor of repos was extended to 365 days, following concerns on the impact of the global financial crisis sparked-off by the sub-prime mortgage crisis in the United States. Repos assist an operator to overcome its immediate liquidity shortages, in the process, moderating inter-bank rates. The CBN's policy rate is applied to all these transactions.

Reverse Repos: operators in the money market, with excess reserves to invest them through the discount window at an agreed interest rate. Thus, it helps to influence inter-bank interest rates from falling to unduly low levels in periods of liquidity surfeit in the banking system. In a reverse repurchase agreement, the CBN sells funds as asset against domestic currency, temporarily withdrawing liquidity, but buys the asset at a future date. Outright Sales of Nigerian Treasury Bills (NTBs): Under the outright sale of Nigerian Treasury Bills, the bank sold out substantial amounts of its NTB Holdings to banks and discount houses that had excess liquidity for investments but, could not immediately invest in the primary or open markets that were either closed, yet to open or did not satisfy them in their demands. This activity had been in operation since the discount window started in 1993. Treasury Bills Re-Discounting: This involves the Bank buying back the Nigerian treasury Bills previously sold in either the primary or secondary markets (open market and discount window) on a re-discountable basis, in order to provide liquidity to the party selling. This instrument has been in use since 1960 to provide liquidity and also give backing to the NTB as a re-discountable money market instrument.

Overnight Sweep: Introduced in 2006, overnight sweep was aimed at ensuring zero account balances at the CBN at the end of each business day, as the Bank invested the closing balances of the banks and discount houses automatically, in government securities on an overnight basis, in order to achieve certain liquidity management objectives, particularly under the Policy Support instrument which was monitored by the International Monetary Fund, to stabilize such economic conditions as price system and promote the investment climate. Pledges: In the discount window, the Bank, under Pledges, facilitated the transfer of funds between inter-bank operators for the effective operations of the financial markets, by holding the instruments used to secure the transactions until the transactions un-wound and mandate for the release of the instruments advised. The CBN Standing Facilities comprise the Standing Lending and Standing Deposit Facilities. The standing facilities were introduced on 11th December, 2006 as an improvement to the monetary policy implementation machinery. Its aim was to effectively reduce interest rate volatility in the inter-bank market and ensure a fairly stable financial market environment that aids investment decisions and engenders increased public confidence in the financial system. The facilities provide for an interest rate corridor that is applied to the standing lending and deposit facilities. All the participants in the CBN Interbank Funds Transfer System (CIFTS), otherwise known as the Real Time Gorse Settlement (RTGS) System, are eligible to access the facilities.

Fine-tuning operations or standing facilities aim to provide and absorb overnight liquidity, signal the general stance of monetary policy and bind overnight market interest rates. Fine-tuning operations are primarily executed as reverse transactions, but may also take the form of outright transactions, foreign exchange swap and collection of fixed deposit accounts. Fine-tuning operations are executed on ad hoc basis to manage the liquidity situation in the market and to steer interest rates. In particular, they aim to smooth out the effects on interest rates caused by unexpected liquidity fluctuations. The instruments and procedures applied in the conduct of fine-tuning operations are adapted to the types of transactions and the specific objectives pursued in performing the operations. Fine-tuning operations are normally executed through quick tenders or bilateral procedures. For effectiveness, a limited number of banks are selected to participate in fine-tuning operations. Two standing facilities, the lending and deposit rates are available.

The Standing Lending Facility: Provide access to liquidity for participants in the RTGS, on an overnight basis, to assist them in evening out their short positions in the inter-bank market and ensure the continued smooth operation of the market. The standing deposit facility: On the other hand, provides an investment outlet for the surplus reserves of operators in the RTGS, thereby increasing the inventive for resource mobilization. The CBN Standing Facilities (Lending and Deposit Facilities) which constituted the hub for the new monetary policy framework were designed to achieve inter-bank rate stability by influencing the short-term money market rates. They, therefore, provide the financial valves for absorbing surplus funds and injecting overnight funds on last-resort basis. Furthermore, the lending and deposit facilities provide the rate corridor within which market players with suitable securities are expected to trade. The facilities became operational on December 11, 2006 with the Monetary Policy Rate of 10.00 per cent which was reviewed downward by 200 basis points, i.e. from 10.0 per cent, to 8.0 per cent in June, 2007 while the width of the interest rate corridor was reduced from +/- 250 basis points.

Standing facilities may be applied to steer market interest rates towards the central bank rate and in the process prevent interest rate volatility. Operationally, at the end of each trading day, bank deficits are financed at the lending rate which is the upper boundary set by the CBN on presentation of eligible collateral(s). This puts a cap on the rates such banks would be prepared to pay during the day for overnight facilities in the inter-bank market. Banks with surpluses have their positive balances remunerated at the deposit rate which is the lower boundary of the interest corridor by the CBN. A participating bank only accepts a rate in the market for its surplus at that rate or any rate higher than the lower boundary. It cannot possibly obtain a rate higher than the upper boundary since its counterparties in the market would not be prepared to offer any rate higher than the last resort which is the upper boundary available. The spread between the lower and upper boundaries (deposit and lending rates) provides some cost incentives for banks to deal among themselves rather than with the CBN.

Through its regulatory powers, the CBN exerts direct control over bank liquidity by imposing statutory reserve requirements (RR). Reserve requirement is the percentage of banks' liabilities held as reserves at the central bank. It insures a bank's individual liquidity against any run and helps monetary control since it serves as a built-in stabilizer. Reserve requirements also contribute to generating income for the central bank and can be used to create or enlarge a

structural liquidity deficit. The averaging facility minimized the urgent need for discounting OMO instrument as it provided a buffer for evening-out short-term transitory liquidity shocks without the related short term interest rate volatility. The current trend in central banking is to keep the RR low and in some cases, even zero. RR may be remunerated in order to minimize the high cost on the bank.

The CBN complements its OMO operations with specified reserve requirements. In this connection, the reserve requirements are instruments for liquidity management and for prudential regulation. The reserve requirements are the Cash Reserve Ratio (CRR) and the Liquidity Ratio (LR). While the CRR represents a proportion of the total demand, savings and time deposits which banks are expected to keep as deposits with the CBN, the Liquidity Ratio refers to the proportion of banks' liquid assets to their total position liabilities. Reserve requirements can be appealing monetary tools since they are administratively easy to implement and monitor; they are reliable and, hence, enhance the predictability of demand for bank reserves.

3.16. REGIMES OF EXCHANGE RATE MANAGEMENT IN NIGERIA

In Nigeria, exchange rate management techniques over the years have ranged from fixed, guided deregulation to freely floating. The fixed exchange regimes in Nigeria correspond with the era of exchange controls, which was backed by the Exchange Control Act of 1962. Economic considerations formed the basis for the adoption of the fixed exchange regime from independence until the deregulation of 1986. Under SAP, the exchange rate strategy was to float the naira and establish an institutional framework for its trading in a market-determined manner. Accordingly, a market determined exchange rate was established under the framework of the Second Tier Foreign Exchange Market (SFEM) to achieve the exchange rate policy objectives (Anifowose, 1997). The essence of the dual exchange rate system was to avoid a deliberate undue depreciation of the naira but to allow for a gradual depreciation to occur in the SFEM while at the same time the central bank continued a downward adjustment of first tier and official (to accommodate the pre-SFEM transaction) rate until the two rates converged to produce a realistic exchange.

The hybrid of exchange rate management in Nigeria can be grouped into three, namely, the fixed, dual and floating regimes. Fixed regimes guarantee stability in decision making process, but they may lead to inefficiency and suboptimal resource allocation, with dire economic consequences. Floating regimes could be volatile and unsustainable if the economic fundamentals are not right, and especially, when fiscal and monetary operations are not well synchronized and there is fiscal dominance. The various exchange rate regimes adopted over the years in Nigeria are discussed as follows:

Before 1986, as a result of the prevailing trade practices in vogue, which also informed the fixed regime adopted in the determination of the exchange rate of the Naira, the currency was perceived to have been over-valued. This was attributed to the main problems of Nigeria's external sector in those years, a factor which made the country more dependent on import of goods. Thus, the country was unable to attain the main objectives of its policy during this period. In order to create a realistic value of the Naira, the approach of the Second-tier Foreign Exchange Market was adopted in 1986 under the Structural Adjustment Program me (Anifowose, 1997). The policy was intended to reverse the structural distortions in the economy by introducing a flexible or floating exchange rate regime. From 1986 to date, the flexible exchange rate mechanism which started with dual exchange rate system has undergone several modifications which include the unified exchange rate system, the completely deregulated system, the fixed exchange rate system and back again to the dual exchange rate system.

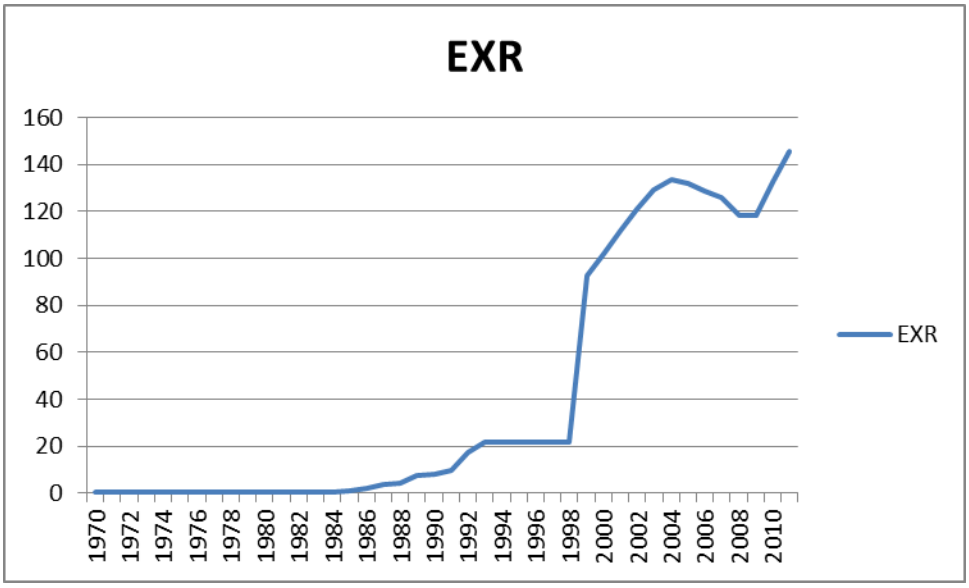
During the period of exchange control (1962-1986) ad hoc administrative measures were applied. For instance, between 1959 and 1967, the country's exchange rate maintained parity with the pound sterling until the devaluation of the sterling by 10 per cent in November 1967. Thereafter, the currency was allowed to move independently of sterling, to include the US dollar in the basket of currencies for determining the value of the Naira. Following the change of the Nigerian pound to Naira in 1973, fixed exchange rates were established for both the pound sterling and the US dollar at 0.5833 and US$ 1.5200 to N1.00, respectively (Busari 2007). During the era of administrative control of exchange control before the introduction of SAP in 1986 the exchange rate curve flattens out indication fixed exchange control, while it started increasing from 1986 when the parity rate was determined by the market forces (see figure **3.7).** Furthermore, the naira was deliberately overvalued progressively, as an anti-

inflation measure. This encouraged reliance on imports and capital flight which eventually led to the depletion of external reserves.

After August, 1971 when the US abandoned her obligation to convert the US dollar into gold (the demonetization of gold), as the currencies of the world were re-aligned, the value of the Naira was then adjusted in relation to the pound sterling's or US dollar's performance against a basket of currencies. The basket of currencies included the Deutsche mark. Swiss franc, French franc, Dutch guilder, Japanese yen and Canadian dollar. A basket method of calculating the exchange rate was introduced in 1978. The seven currencies mentioned above were designated with different trade weights based on the relative shares of the countries whose currencies were included in Nigeria's imports. However, the weights of the pound sterling and the US dollar were relatively higher than others reflecting the importance of the two currencies in Nigeria's external payments.

To minimize the perennial problem of high incidence of arbitrage in the Naira exchange rate quotation, it was agreed in 1985 that a one currency intervention system be adopted. Under this system, the Naira exchange rate was quoted against a single intervention currency, the US dollar. Although the system helped to wipe out the incidence of arbitrage that prevailed during the period before its adoption, it had the disadvantage of tying the Naira to the fortunes of the dollar, i.e. to float or sink with the dollar in the international foreign exchange market. The system used to determine the value of other currencies in terms of the Naira was to maintain the US$/N rate of a point and deriving the cross rates of other currencies against the Naira through such a quotation, i.e. the other currency rates taking a cue from such quoted US$/N.

Figure 3.8 Exchange Rate



Source: Based on data compiled from IMF (2011)

CHAPTER FOUR

4.0 METHODOLOGY

The previous chapter discussed the structure of Nigerian economy. As already mentioned, the effects of monetary policy depend on the structure of the economy. The objective of this chapter is first, to provide the link between the monetary policy and economic performance; this is done by linking the theoretical framework of my study to the model specification. From the theoretical framework, the conceptual framework for the study is formulated. Furthermore, three hypotheses are formulated from the theoretical framework for three macroeconomic objectives (dependent variables), namely gross domestic product (GDP), consumer's price index (CPI) and balance of payments (BOP). Furthermore, three models (linear functions) are specified along with the hypotheses, the linear equations are specifically used only for the estimation of the coefficients of long and short run equations. In addition, the study introduced structural breaks and breakpoints to the data. The structural break was applied to only two sub-period for the CPI and BOP models from 1970Q1–1986Q4 before the Structural adjustment programme in Nigeria, and from 1987Q1–2011Q4 period of Structural adjustment programme in Nigeria. The study also estimates the period 1970Q1–2011Q4, without a structural break for the GDP model having been confirmed in a structural break test.

The Procedure of Estimation is divided into two broad processes. The first estimation is based on the interpretation of the coefficients of the variables of the specified models of the three linear functions. In the first procedure, the study splits the data into two periods from 1970Q1–1986Q4 and from 1987Q1–2011Q4 to capture the structural break for the three models. Next, is the transformation of all variables to real except interest rate already in percentage, and the logs of all the variables were taken. Also, the study determines the lag criteria for the three models i.e. model 1 (GDP), model 2 (CPI) and model 3 (Balance of payments). In addition, the study test for stationarity of all variables and determines the co-integrating equations for the three models (GDP, CPI and BOP). Finally, the study estimates the long run and short run.

The second broad process, analyses the results of the structural VAR are interpreted as linear combinations of exogenous shocks rather than identifying the autoregressive coefficients [Sims (1981), (1986), Bernanke (1986) Shapiro and Watson (1988) and Mugume (2009)]. The

standard practice in VAR analysis is to report result from impulse response, variance decompositions and Granger causality test. This is attributed to the complicated dynamics in the VAR. These statistics are more informative than the estimated VAR regression coefficients or R-square statistics (Mordi 2008). The interpretation of the results follows mainly from the path of the impulse response functions generated from the recursive-orthogonalized estimated residuals of the SVARs.

4.1 THEORETICAL FRAMEWORK

One way of understanding how monetary policy affects the economy is through the various channels of monetary transmission mechanism. These transmission mechanisms include interest rate effects, real effective exchange rate effects, asset price effects, and credit channel (Mishkin, 1995). This study therefore adopts the Neo-classical monetary transmission mechanism as the theoretical basis to justify the empirical work. The theory shows channels through which monetary policy affects aggregate spending and real output [Iyoha (2002), Ajayi (2007)]. Specifically, it refers to the channels through which monetary impulses such as interest rate, credit, real effective exchange rate and real money supply move from the monetary sector to affect real variables in the national economy such as domestic output, consumers price level, employment and balance of payment.

Over the last three decades, there have been remarkable changes in the way financial markets operate. In addition, the conduct of monetary policy has also changed in spectacular ways, with an increased focus on achieving price stability. Additionally, research in monetary economics has stimulated new thinking on how monetary policy can affect the economy, leading to further evolution in our understanding of the monetary transmission mechanism. All of these developments suggest that there is a strong possibility that there have been changes in the monetary transmission mechanism.

The traditional channels of monetary transmission mechanism are built upon the core models of investment, consumption, and international trade behavior developed during the mid-20th century Mishkin et al (2010): The Neo-classical models of investment of Jorgenson (1963) and Tobin (1969), Ando and Modigliani (1963), and Friedman (1957), and the international IS/LM-type models of Mundel (1963) and Fleming (1962). For investment, the key channels are the

direct interest rate channel operating through the user cost of capital and the closely related Tobin's q channel.

In the interest-rate channels, of the Neo-classical model of investment channel of monetary transmission that has been surrounded in macroeconomic models, involves the impact of interest rates on the cost of capital and hence on business and household investment spending. Standard Neo-classical models of investment demonstrate that the user cost of capital is a key determinant of the demand for capital, whether it is investment goods, residential housing or consumer durables (the classic reference is Jorgenson (1963).With the monetary policy instrument being a short-term interest rate, makes clear that the monetary transmission mechanism involves the link between short and long term interest rates through some version of the expectations hypothesis of the term structure.

When there is an increase in monetary policy short-term interest rates, the long-term interest rates will also tend to increase because they are linked to future short-term rates; consequently the user cost of capital rises and the demand for the capital asset falls. The decline in the demand for the capital asset leads to lower spending on investment in these assets and so causes aggregate spending and demand to decline (Tobin's q). The investment decisions of firms and households can also be considered in the framework of James Tobin (1969). For business investment, Tobin (1969) defined q as the market value of firms divided by the replacement cost of capital. When q is high, the market price of firms is high relative to the replacement cost of capital, and new plant and equipment capital is cheap relative to the market value of firms. Next is the money supply channel.

For money supply channel, where money supply represents an expansionary monetary policy by increase in money supply given the demand for money which is sensitive to interest rate will result in a fall in interest rates which in turn reduces the cost of borrowing leading to increase of investment, thereby causing an increase in aggregate demand and an increase in output. Christiano and Eichenbaum (2005) study confirm this theory, their empirical result show that increase in money supply leads to a drop in the interest rate and a rise in domestic output and employment. If nominal interest rate is so low during deflationary period, an expansionary policy which increases money supply can increase the expected price level and expected

inflation causing the nominal interest rate to fall, even when nominal interest rate is so low at zero point stimulating spending through the interest rate channel.

In addition, real effective exchange rates channel of monetary transmission mechanism captures the international effect of domestic monetary policy on net exports through exchange rate (Taylor, 1983). Assuming flexible real exchange rate, when the domestic nominal interest rates fall, domestic foreign deposits become less attractive relative to deposits dominated in foreign currencies. This further leads to a fall in the value of domestic deposit relative to other currency deposits, which is a depreciation of foreign deposit. The lower value of domestic currency makes the domestic products to be cheaper than foreign products because of the depreciation of the domestic currency, causing net export to increase.

Furthermore, in the bank-based Channels there are two distinct bank-based transmission channels. In both, banks play a special role in the transmission process because bank loans are imperfect substitutes for other funding sources. The first is the traditional bank lending channel. According to this view, banks play a special role in the financial system because they are especially well suited to solve asymmetric information problems in credit markets. Because of banks' special role, certain borrowers will not have access to credit markets unless they borrow from banks. As long as there is no perfect substitutability of retail bank deposits with other sources of funds, the bank lending channel operates as follows. Expansionary monetary policy, which increases bank reserves and bank deposits, increases the quantity of bank loans available. Because many borrowers are dependent on bank loans to finance their activities, this increase in loans will cause investment and consumer spending to rise. An important implication of the bank lending channel is that monetary policy will have a greater effect on expenditure by smaller firms, which are more dependent on bank loans, than it will on large firms, which can get funds directly through stock and bond markets (and not only through banks.). Though the bank lending channel has been supported in empirical work (e.g. Gertler and Gilchrist, 1993, 1994, Kashyap and Stein, 1995, Peek and Rosengren, 1997).Next is the balance sheet channel.

Like the bank lending channel, the balance sheet channel arises from the presence of asymmetric information problems in credit markets. When an agent's net worth falls, adverse selection and moral hazard problems increase in credit markets. Lower net worth means that

the agent has less collateral, thereby increasing adverse selection and increasing the incentive to boost risk-taking, thus exacerbating the moral hazard problem. As a result, lenders will be more reluctant to make loans (either by demanding higher risk premier or curtailing the quantity lent), leading to a decline in spending and aggregate demand.

Moreover, monetary policy affects firms' balance sheets in several ways. Contractionary monetary policy causes adverse selection and moral hazard problems which lead to a decline in lending, spending and aggregate demand (Mishkin et al (2010). Furthermore, the link of credit to macro-economic performance is demonstrated in Rieflier-Burgers hypothesis on credit view (Brunner and Meltzer 1964). The hypothesis states that the volume of bank borrowing is not determined by interest rates, but determined by changes in balance sheet items. Bank credit to the private sector channel operates as follows: Expansionary monetary policy, increased bank deposits and reserves, and increases the quantity of bank credit to the private sector available. Because many borrowers are dependent on bank loans to finance their activities, increase in loans will cause investment and consumer spending to rise. An important implication of the bank credit to the private sector channel is that monetary policy will have a greater effect on expenditure by smaller firms, which are more dependent on bank loans, than it will on large firms. The theories discussed here are conceptualized into a framework in next section.

4.2. CONCEPTUAL FRAMEWORK AND HYPOTHESES

The aim of this section is to present a conceptual frame on how monetary policies affect macroeconomic performance in Nigeria. The conceptual framework is the link between monetary policy and macroeconomic performance; it is based on financial liberation theory, the theory of demand for money, monetary approach to balance of payment and some empirical works. The hypotheses of the study are drawn from the conceptual framework. The non-policy variable or target variables for the study include domestic growth proxy by GDP, consumer price index (CPI) and balance of payments (BOP). The policy variables are real money supply, nominal interest rate, real effective exchange rate, domestic credit. Based on the predictions of theoretical discussion above, the conceptual framework is presented to show the effects of monetary policy and economic performance.

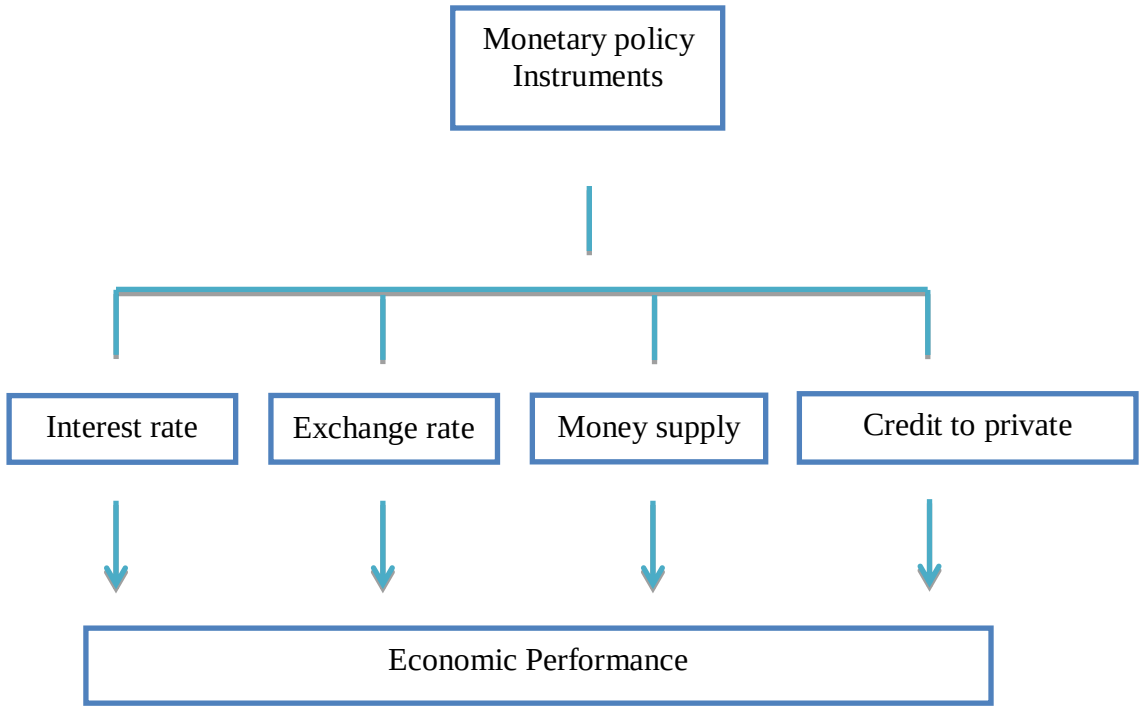
The conceptual framework depicts schematically an eclectic overview of monetary policy transmission, showing the major channels that have been distinguished in the theoretical literature. The indicators for measurement of macroeconomic performance are based on the macroeconomic and monetary policy objectives which are domestic growth proxy by GDP, consumer price index used as proxy for inflation, balance of payments equilibrium and employment. However, the study dropped employment because of absence of data. Therefore the variables representing macroeconomic performance in this study are domestic growth proxy by GDP, consumer's price index used as proxy for inflation, balance of payments equilibrium.

The conceptual framework presents the discussion of the first proxy for measuring economic performance, domestic output (GDP) and its policies variables here. The first channel is the interest rate channel. For example a decrease in nominal short–term interest rate causes a fall in the real long-term interest rate (Loayza and Hebbel, 2000). Interest rate (IR) is expected to have a negative sign with GDP indicating that as interest rate increases, GDP will decrease. Next is the real effective exchange rate channel. The real effective exchange rate channel is an important element in conventional open-economy macroeconomic models, although it is often neglected in the closed-economy models. Therefore, an increase in the nominal interest rate, relative to foreign rates, will lead to a stronger currency and a reduction in both net exports and in the overall level of aggregate demand. The real effective exchange rate is expected to have a negative sign with RGDP indicating that as real effective exchange rate decrease, RGDP is expected to increase.

In addition real domestic credit is positively related to RGDP indicating that increase in real domestic credit would lead to increase in RGDP. Similarly, real money supply is positively related to RGDP, an increase in real money supply is expected to lead to increased RGDP. The relationship between RGDP and real money supply is given credence by the quantity theory of money. From the quantity theory of money demand, increase in real money supply also increases the supply of investible fund in the economy, and therefore increases the real output of goods and services (Enoma, 2004). Given this condition, a rise in real money supply will lead to a fall in the market rate of interest, thus inducing an increase in investment demand, which will eventually result in expansion of real domestic growth (RGDP).

Figure 4.1 Conceptual Framework

Figure 4: Conceptual framework



The process begins with the transmission of monetary policy instruments, through any of several channels via the official financial markets to affect macroeconomic performance. Additionally, the conceptual framework presents the discussion of the second proxy for measuring macroeconomic performance consumer's price index (CPI) and its policies variables here. Interest rate (IR) is expected to have a positive relationship with CPI indicating that as interest rate increases CPI will increase. The quantity theory of money also gives credence to the monetary transmission theory, thus the quantity theory of money says that an increase in money supply with given money demand will produce increased consumers price levels. Real effective exchange rate is expected to have a negative sign with CPI indicating that as real effective exchange decreases, CPI is expected to increase. Moreover, real domestic credit is positively related to CPI indicating that as real domestic credit increases CPI will also increase. Furthermore, real money supply is positively related to CPI. An increase in real money supply is expected to lead to increase in price level. This is based on the quantity theory of money which says increase in money supply will lead to increase in price level.

Finally, the conceptual framework presents the third proxy of macroeconomic performance. Balance of payments equilibrium is presented here. Real Money supply is positively related to the BOP, increase in real money supply leads to decrease in interest rate and decrease in real effective exchange rate. The decrease in real effective exchange is followed by increase in net export, real domestic output and favorable balance of payments. Real domestic credit is positively related to balance of payments. An increase in real domestic credit raises real money supply relative to demand, so the balance of payments must go into deficit to reduce the real money supply. A large balance of payments deficit may be as a result of excessive credit to the private sector creation. Based on the predictions of theoretical discussion above, three hypotheses are formulated to empirically assess the effect of monetary policy on macroeconomic performance of Nigeria.

Hypothesis 1 (H1): Money supply has positive effect on domestic output (GDP) in Nigeria.

There is a positive relationship between real money supply and growth of real domestic output, proxy by RGDP. Increase in real money supply leads to a fall in interest rates which in turn reduce the cost of borrowing leading to increase of investment thereby causing an increase in aggregate demand and an increase in real domestic output. The relationship between RGDP and real money supply is given credence by the quantity theory of money demand. From the quantity theory of money demand, increase in real money supply also increases the supply of investible fund in the economy and therefore increase the real output of goods and services. Christiano and Eichenbaum (2005) study reaffirm this theory, their empirical result show that increase in real money supply leads to drop in nominal interest rate and rise in real domestic output and employment. Furthermore, real domestic credit is positively related to real domestic output. This is based on Rieflier–Burgers hypothesis on credit view (Brunner and Meltzer 1964). The hypothesis states that the volume of bank credit is not determined by interest rates, but determined by changes in balance sheet items. Therefore expansionary monetary policy increases bank deposits and reserves, and increases the quantity of bank domestic credit. Moreover, nominal interest rate (IR) is expected to have a negative sign with RGDP indicating that as interest rate increases, RGDP will decrease. Consequent upon hypothesis 1, Model 1 is specified, the model is used only for the analysis linear equation result based on the coefficients of the variables.

From the hypothesis the study proceeds to presentation of model specification of the functional form. The justification is to estimate and analyse the functional form of the coefficients of the variables. The first section estimation is based on the interpretation of the coefficients of the variables of the estimated long and short run of my models to determine the effects of monetary policy. In the second section, the analyses of the results are based on the residual of the structural VAR model. Results of SVAR are interpreted as linear combinations of exogenous shocks rather than identifying the autoregressive coefficients [Sims (1980), (1986), Mugume (2009), Bernanke (1986) and Shapiro and Watson (1988)]. The study proceeds to presentation of model specification of the functional form.

4.3 MODEL SPECIFICATION FOR FUNCTIONAL EQUATIONS

Model 1: GDP Model

$$RGDP = f(IR, REXR, RM2, RDCRED,) \quad (4.5)$$

Where, RGDP = real gross domestic product (proxy for domestic output) using 1990 constant basic prices, IR = nominal interest rate, REXR = Real effective exchange rate, RDCRED = real domestic credit, RM2 = real money supply.

The above functional form equation **(4.5)** can be stated in operational form as well as reflect the structural break. Following studies by Chow (1960), Klein (1965) Lee and Park (2000) we specify the structural break model.

If we slit our data into two sub periods, then we have

Time period 1970Q1 – 1986Q4 (The era before structural adjustment)

$$RGDP = b_0 + b_1 IR + b_2 REXR + b_3 RDCRED + b_4 RM2 + \mu \quad (4.6)$$

Transform equation (**4.6**) in Log-log form. b_0 is the constant factor, b_1,b_2,b_3 and b_4 are the coefficients of RGDP variables before the break.

$$LNRGDP = b_0 + b_1 IR + b_2 LNREXR + b_3 LNRDCRED + b_4 LNRM2 + \mu \quad (4.7)$$

Based on economic theory, the expected sign or presumptive sign of the parameter estimates are : $b_1 .< 0$, $b_2 .< 0$, $b_3 > 0$, $b_4 > 0$

Time period 1987Q1 – 2011Q4 (The era after structural adjustment)

$$RGDP = b'_0 + b'_1 IR + b'_2 REXR + b'_3 RDCRED + b'_4 RM2 + \mu \quad (4.8)$$

Transform equation (**4.8**) into Log-log form. $b'_{0,}$ is the constant factor, b'_1, b'_2, b'_3, b'_4 are the coefficients of RGDP variables after the break.

$$LNRGDP = b'_0 + b'_1 IR + b'_2 LNREXR + b'_3 LNRDCRED + b'_4 LNRM2 + \mu \quad (4.9)$$

The hypothesis to be tested after the structural break is, whether the coefficient of the variables after the break is equal to the coefficient of the variables before the break.

$b_1 = b'_1$ and $b_2 = b'_2$ and $b_3 = b'_3$ and $b_4 = b'_4$

However, the stability test done with the CUSUM does not specify each hypothesis i.e coefficient $b_1 = b'_1$ such as the Chow break test, but the CUSUM test is a general test based on the residual of the coefficients

Hypothesis 2 (H1): Interest has negative effects on consumer price index (CPI) in Nigeria

The hypothesis presents the discussion of the second proxy for measuring macroeconomic performance consumer's price index (CPI) and its policy variables here. Interest rate has negative effects on consumer price index (CPI). Interest rate (IR) is expected to have a positive sign with CPI indicating that as interest rate increases, CPI will increase. The quantity theory of money also gives credence to the monetary transmission theory, thus the quantity theory of money says that an increase in real money supply with given money demand will produce increase in consumers price levels. Furthermore, real effective exchange rate is expected to have a negative sign with CPI indicating that as real effective exchange rate decreases, CPI is expected to increase. In addition, real domestic credit is positively related to CPI indicating that increase in real domestic credit would lead to increase in CPI. Similarly real money supply is positively related to CPI, an increase in real money supply, is expected to lead to increase in price level. Consequent upon hypothesis 2, Model 2 is specified, the functional relationship is given as:

Model 2: CPI Model

$$CPI = f(IR, REXR, RM2, RDCRED) \quad (4.10)$$

Where, CPI = consumer's price index (proxy for inflation), IR = nominal interest rate, REXR = real effective exchange rate, RDCRED = real domestic credit, RM2 = real broad money supply. If we slit our data into two sub periods, then we have:

Time period 1970Q1 – 1986Q4 (The era before structural adjustment)

Equation (**4.10**) is transformed into linear form. K_0 is the constant factor, K_1, K_2, K_3 and K_4

are the coefficients of CPI variables before the break.

$$CPI = K_0 + K_1 IR + K_2 REXR + K_3 RDCRED + K_4 RM2 + \mu \quad (4.11)$$

Equation in log form

$$LNCPI = K_0 + K_1 IR + K_2 LNREXR + K_3 LNRDCRED + K_4 LNRM2 + e \quad (4.12)$$

The expected sign or presumptive sign of the parameter estimates based on economic theory, are : $K_1 .< 0$, $K_2 .< 0$, $K_3 > 0$, $K_4 > 0$

Time period 1987Q1 – 2011Q4 (The era of structural adjustment)

Equation **(4.10)** is transformed into linear form. k'_0 is the constant factor, k'_1 ,k'_2 ,k'_3 k'_4 are the coefficients of CPI variables after the break.

$$LNCPI = K'_0 + K'_1 IR + K'_2 REXR + K'_3 RDCRED + K'_4 RM2 + \mu \quad (4.13)$$

Equation in log form

$$LNCPI = K'_0 + K'_1 IR + K'_2 LNREXR + K'_3 LNRDCRED + K'_4 LNRM2 + \mu \quad (4.14)$$

After the break the study test the hypothesis that the coefficient of the variables before the break is the same with the coefficient of variables after the break

$k_1 = k'_1$ and $k_2 = k'_2$ and $k_3 = k'_3$ and $k_4 = k'_4$

However, the stability test done with the CUSUM does not specify each hypothesis i.e coefficient $b_1 = b'_1$ such as the Chow break test, but the CUSUM test is a general test based on the residual of the coefficients

Hypothesis 3 (H3): Domestic credit is positively related to balance of payment

Real domestic credit is positively related to balance of payment. An increase in real domestic credit raises real money supply relative to demand, so the balance of payments must go into deficit to reduce the real money supply. This is based on the monetary approach to the balance of payments (Frenkel and Johnson, 1976; Lanciaux, 1990). A large balance of payments deficit may be the result of excessive real domestic credit creation. Because output and thus money demand falls, the monetary approach also predicts that a balance of payments deficit will result from a fall in export demand. Following hypothesis 3, Model 3 is specified, the balance of payments (BOP) functional relationship is given as:

Model 3: BOP Model

$$BOP = f(IR, REXR, RM2, RDCRED) \quad (4.15)$$

Where, BOP = balance of payment, IR = nominal interest rate, REXR = real effective exchange rate, RDCRED = real domestic credit, RM2 = real broad money supply.

If we split the data into two sub periods, then we have:

Time period 1970Q1 – 1986Q4 (The era before structural adjustment)

Equation 4.15 is transform into linear form. π_0 is the constant factor,

π_1, π_2, π_3 and π_4, are the coefficients of BOP variables before the structural break.

$$BOP = \pi_0 + \pi_1 IR + \pi_2 REXR + \pi_3 RDCRED + \pi_4 RM2 + v \quad (4.16)$$

Equation in linear – log form.

$$BOP = \pi_0 + \pi_1 IR + \pi_2 LNREXR + \pi_3 LNRDCRED + \pi_4 LNRM2 + v \quad (4.17)$$

The expected sign or presumptive sign of the parameter estimates are:

$\pi_3 > 0$ is the real domestic credit, is positively related to balance of payments. An increase in real domestic credit raises real money supplies relative to demand, so the balance of payments must go into deficit to reduce the real money supply. A large balance of payments deficit may be as a result of excessive credit to the private sector creation.

Time period 1987Q1 – 2011Q4 (The era after structural adjustment)

$$BOP = \pi'_0 + \pi'_1 IR + \pi'_2 REXR + \pi'_3 RDCRED + \pi'_4 RM2 + v \quad (4.18)$$

Equation in linear–log form. π'_0 is the constant factor,

π'_1, π'_2, π'_3 and π'_4 are the coefficients of BOP variables after the structural break

$$BOP = \pi'_0 + \pi'_1 IR + \pi'_2 LNREXR + \pi'_3 LNRDCRED + \pi'_4 LNRM2 + v \quad (4.19)$$

After the break the study test the hypothesis that the coefficients of the BOP variables after the break is the same with the coefficient of variables after the break.

$\pi_1 = \pi'_1$ and $\pi_2 = \pi'_2$ and $\pi_3 = \pi'_3$ and $\pi_4 = \pi'_4$

However, the stability test done with the CUSUM does not specify each hypothesis i.e coefficient $b_1 = b'_1$ such as the Chow break test, but the CUSUM test is a general test based on the residual of the coefficients

The expected sign or presumptive sign of the parameter estimates are:

$\pi_3 > 0$ is the real domestic credit, is positively related to balance of payments. An increase in real domestic credit raises real money supply relative to demand, so the balance of payments

must go into deficit to reduce the money supply. A large balance of payments deficit may be as a result of excessive credit to the private sector creation.

4.3.1: Model Specification for SVAR/ Justification for the use of SVAR

The study also employs the Structural Vector Auto-regression (SVAR). SVAR is a solid conduit between economic theory and multivariate time-series regression analysis in order to determine the time path and hence the dynamic response of variables to various disturbances or shocks that occur within the economy.

The justification for the use of SVAR is that, SVAR estimation provides reliability in the response of policy targets to monetary policy shocks. It is therefore employed to track such monetary policy innovations on the performance of the overall economy and hence, for forecasting and policy analysis. Also, SVAR has the ability to clearly describe the interactions and interrelationships between economic variables in the model and while maintaining theoretical coherence [Serven and Solimano (1991)] SVAR econometric models otherwise known as identified vector auto regression has the advantage of identifying the system errors which are interpreted as linear combinations of exogenous shocks rather than identifying the autoregressive coefficients[Sims (1981), (1986), Bernanke (1986) and Shapiro and Watson (1988) Mugume (2009).

Economists have employed a variety of techniques to solve the simultaneity problem, but none is entirely satisfactory. Perhaps the most common approach, and one employed by several papers, is to use a vector auto regression (VAR) model to eliminate interest rate changes of systematic responses to economic activity and to focus instead on the response to exogenous monetary policy "shocks." Typically, this is done by exploiting the presumed lag between policy and its effects on real activity, which is apparent from the chart. (Since financial markets respond immediately to policy, a non-recursive structure is more appropriate for modeling asset prices.). However, critics of the VAR approach argue that the shocks really represent either model specification errors or changes in the overall policy regime. In addition, the VARs' focus on shocks makes it hard to use them to analyze changes in the systematic element of monetary policy. Nevertheless, the method remains popular because it offers a straightforward solution to the simultaneity problem and appears to yield a reasonable characterization of the economy's response to monetary policy (Mosser and Kutter 2002).

The theoretical issues regarding the applicability of the SVAR model include the VAR lag order determination (lengths of the lags), deterministic components and data transformation. These issues are theoretically related to the variables that are captured in the SVAR model as the vector of endogenous variables, appropriate identification of the monetary policy and the orthogonalization procedure required segregating the exogenous economic policy shocks from the endogenous effects. In this gaze, the specification of the z^{th} endogenous vector follows a p^{th} order autoregressive VAR process which is given as:

$$Z_t = \beta + A_1 Z_{t-1} + A_2 Z_{t-2} + ... + A_p Z_{t-p} + \in_t \qquad \textbf{(4.20)}$$

The perturbation arising from the model is with the distribution function $\in_t \sim N[0, \Omega]$. Z_t is the $[K \times 1]$ vector of endogenous variables at time t. there are pk^2 parameters in the A matrices. Employing the lag operator L, equation is re-specified as:

$$A[L] Z_t = \beta + \in_t \qquad \textbf{(4.21)}$$

Where $A[L] = A_0 L^0 - A_1 L^1 - ... - A_p L^p$

The roots of $[A(L)]$ lie outside the unit circle and the degree of stationarity is determined on the basis that $[A_0 = 1]$. The restriction that $[A_0 = 1]$ implies that there are no current endogenous variables in the SVAR model. By methodology, equations in the SVAR model are related through the off-diagonal elements in the error covariance matrix Ω which is consistently estimated as:

$$\Omega = 1/T \left(\sum_{t=1}^{T} \in_t \in_t^{'} \right) \qquad \textbf{(4.22)}$$

where $\sum = E\left[\in_t \in_t^{'} \right] = B^{-1} M \Omega M' B^{-1}$

$\in_t$ is the $[K \times 1]$ vector of OLS residuals

In view of policy inference, the impulse response functions and the variance decomposition are the useful tools for evaluating the effects of policy shock in SVAR estimation. In consideration that Z is k-dimensional vector series generated by

$$Z_t = G_1 Z_{t-1} + ... + G_p Z_{t-p} + \in_t \qquad \textbf{(4.23)}$$

$$= \theta(A) \in_t = \sum_{i=0}^{\infty} \theta_i \in_{t-1}$$

$$I = \left[I - G_1 A - G_2 A - ... - G_p A^p \right] \theta(A)$$

Where $\theta_{jk,i}$ is the moving average (MA) coefficient that measures the impulse-response, that is, it captures the response of variable j to a unit impulse in k variable that previously occurred at the i^{th} period. Given that the matrix $\sum$ is non-diagonal, that is, positive definite matrix, it is impossible to shock one variable with other variables fixed. This indeed necessitated a transformation, the Cholseky decomposition (Sims, 1980). Thus, if P represents a lower triangular matrix, equation can be rewritten as:

$$Z_t = \sum_{i=0}^{\infty} \Phi_i s_{t-1} \qquad \textbf{(4.24)}$$

$$\left[\Phi_i = \theta_i P, s_t = P^{-1} \in_t, E\left(s_t s_t^{'}\right) = 1, \sum = PP^{'} \right]$$

4.4. REDUCED-FORM VAR

Here three VAR reduced form specifications are presented to enable us specify the SVAR, SVAR model exhibits the features of a reduced-form statistical model of the data generating process [Mugume, (2009)]. The starting point of SVAR analysis is the reduced form of VAR Gottschhalk (2001).

Figure 4.2: Reduced VAR 1

$$\begin{bmatrix} LnRGDP \\ IR \\ LnREXER \\ LnM2 \\ LnRDCRED \end{bmatrix} = \begin{bmatrix} \Psi_1 \\ \Psi_2 \\ \Psi_3 \\ \Psi_4 \\ \Psi_5 \end{bmatrix} + \sum_{i=1}^{k} \begin{bmatrix} \alpha_{11} & \alpha_{12} & \alpha_{13} & \alpha_{14}\alpha_{15} \\ \alpha_{21} & \alpha_{22} & \alpha_{23} & \alpha_{24}\alpha_{25} \\ \alpha_{31} & \alpha_{32} & \alpha_{33} & \alpha_{34}\alpha_{35} \\ \alpha_{41} & \alpha_{42} & \alpha_{43} & \alpha_{44}\alpha_{45} \\ \alpha_{51} & \alpha_{52} & \alpha_{53} & \alpha_{54}\alpha_{55} \end{bmatrix} \begin{bmatrix} LnRGDP_{t-1} \\ IR_{t-1} \\ LnREXER_{t-1} \\ LnM2_{t-1} \\ LnRDCRED \end{bmatrix} + \begin{bmatrix} \mu_{1t} \\ \mu_{2t} \\ \mu_{3t} \\ \mu_{4t} \\ \mu_{5t} \end{bmatrix}$$

$$\begin{bmatrix} LnCPI \\ IR \\ LnREXER \\ LnM2 \\ LnRDCRED \end{bmatrix} = \begin{bmatrix} \infty_1 \\ \infty_2 \\ \infty_3 \\ \infty_4 \\ \infty_5 \end{bmatrix} + \sum_{i=1}^{k} \begin{bmatrix} \beta_{11} & \beta_{12} & \beta_{13} & \beta_{14}\beta_{15} \\ \beta_{21} & \beta_{22} & \beta_{23} & \beta_{24}\beta_{25} \\ \beta_{31} & \beta_{32} & \beta_{33} & \beta_{34}\beta_{35} \\ \beta_{41} & \beta_{42} & \beta_{43} & \beta_{44}\beta_{45} \\ \beta_{51} & \beta_{52} & \beta_{53} & \beta_{54}\beta_{55} \end{bmatrix} \begin{bmatrix} LnCPI_{t-1} \\ IR_{t-1} \\ LnREXER_{t-1} \\ LnM2_{t-1} \\ LnRCDRED \end{bmatrix} + \begin{bmatrix} e_{1t} \\ e_{2t} \\ e_{3t} \\ e_{4t} \\ e_{5t} \end{bmatrix}$$

$$\begin{bmatrix} BOP \\ IR \\ LnREXER \\ LnM2 \\ LnRDCRED \end{bmatrix} = \begin{bmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \\ \eta_4 \\ \eta_5 \end{bmatrix} + \sum_{i=1}^{k} \begin{bmatrix} \gamma_{11} & \gamma_{12} & \gamma_{13} & \gamma_{14}\gamma_{15} \\ \gamma_{21} & \gamma_{22} & \gamma_{23} & \gamma_{24}\gamma_{25} \\ \gamma_{31} & \gamma_{32} & \gamma_{33} & \gamma_{34}\gamma_{35} \\ \gamma_{41} & \gamma_{42} & \gamma_{43} & \gamma_{44}\gamma_{45} \\ \gamma_{51} & \gamma_{52} & \gamma_{53} & \gamma_{54}\gamma_{55} \end{bmatrix} \begin{bmatrix} BOP_{t-1} \\ IR_{t-1} \\ LnREXER_{t-1} \\ LnM2_{t-1} \\ LnRDCRED \end{bmatrix} + \begin{bmatrix} v_{1t} \\ v_{2t} \\ v_{3t} \\ v_{4t} \\ v_{5t} \end{bmatrix}$$

The variables LnRGDP, IR, LnRM2, LnREXR, LnRDCRED, LnCPI, BOP, variables are real economic growth (growth of real domestic output),nominal interest rate, real money supply,real domestic credit, real effective exchange rate, consumer price level, and balance of payments. Where the column vector on the left hand side of each equations denotes the vector of our policy and non-policy variables, the optimal lag order of the VAR specification is k, the intercepts are $\Psi's$, $\infty's$ and $\eta's$, that is, vectors of constants, $\alpha's$, $\beta's$ and $\gamma's$ are the coefficients of the variables of model 1, 2 and 3 respectively that is, the matrix of coefficients on the variables lagged *j* periods. $\mu's$, $e's$ and $v's$ are the VAR errors, that is, vectors of serially uncorrelated disturbances that have zero mean, unit-variance and zero-co-variance matrix. Following Granger (1986), we re-specified the general VAR model in an error correction representation:

Figure 4.2 VAR Model in Error Correction Representation

$$[1-L]\begin{bmatrix} LnRGDP \\ IR \\ LnREXER \\ LnRM2 \\ LnRCDRED \end{bmatrix} = \begin{bmatrix} \Psi_1 \\ \Psi_2 \\ \Psi_3 \\ \Psi_4 \\ \Psi_5 \end{bmatrix} + \sum_{i=1}^{k}[1-L]\begin{bmatrix} \alpha_{11} & \alpha_{12} & \alpha_{13} & \alpha_{14}\alpha_{15} \\ \alpha_{21} & \alpha_{22} & \alpha_{23} & \alpha_{24}\alpha_{25} \\ \alpha_{31} & \alpha_{32} & \alpha_{33} & \alpha_{34}\alpha_{35} \\ \alpha_{41} & \alpha_{42} & \alpha_{43} & \alpha_{44}\alpha_{45} \\ \alpha_{51} & \alpha_{52} & \alpha_{53} & \alpha_{54}\alpha_{55} \end{bmatrix}\begin{bmatrix} LnRGDP_{t-1} \\ IR_{t-1} \\ LnREXER_{t-1} \\ LnRM2_{t-1} \\ LnRDCRED_{t-1} \end{bmatrix} + [ECT_{t-1}]\begin{bmatrix} \tau_{1t} \\ \tau_{2t} \\ \tau_{3t} \\ \tau_{4t} \\ \tau_{5t} \end{bmatrix} + \begin{bmatrix} \mu_{1t} \\ \mu_{2t} \\ \mu_{3t} \\ \mu_{4t} \\ \mu_{5t} \end{bmatrix}$$

$$[1-L]\begin{bmatrix} LnCPI \\ IR \\ LnREXER \\ LnRM2 \\ LnRDCRED \end{bmatrix} = \begin{bmatrix} \infty_1 \\ \infty_2 \\ \infty_3 \\ \infty_4 \\ \infty_5 \end{bmatrix} + \sum_{i=1}^{k}[1-L]\begin{bmatrix} \beta_{11} & \beta_{12} & \beta_{13} & \beta_{14}\beta_{15} \\ \beta_{21} & \beta_{22} & \beta_{23} & \beta_{24}\beta_{25} \\ \beta_{31} & \beta_{32} & \beta_{33} & \beta_{34}\beta_{35} \\ \beta_{41} & \beta_{42} & \beta_{43} & \beta_{44}\beta_{45} \\ \beta_{51} & \beta_{52} & \beta_{53} & \beta_{54}\beta_{55} \end{bmatrix}\begin{bmatrix} LnCPI_{t-1} \\ IR_{t-1} \\ LnREXER_{t-1} \\ LnRM2_{t-1} \\ LnRDRCED_{t-1} \end{bmatrix} + [ECT_{t-1}]\begin{bmatrix} \zeta_{1t} \\ \zeta_{2t} \\ \zeta_{3t} \\ \zeta_{4t} \\ \zeta_{5t} \end{bmatrix} + \begin{bmatrix} e_{1t} \\ e_{2t} \\ e_{3t} \\ e_{4t} \\ e_{5t} \end{bmatrix}$$

$$[1-L]\begin{bmatrix} BOP \\ IR \\ LnREXER \\ LnRM2 \\ LnRDCRED \end{bmatrix} = \begin{bmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \\ \eta_4 \\ \eta_5 \end{bmatrix} + \sum_{i=1}^{k}[1-L]\begin{bmatrix} \gamma_{11} & \gamma_{12} & \gamma_{13} & \gamma_{14}\gamma_{15} \\ \gamma_{21} & \gamma_{22} & \gamma_{23} & \gamma_{24}\gamma_{25} \\ \gamma_{31} & \gamma_{32} & \gamma_{33} & \gamma_{34}\gamma_{35} \\ \gamma_{41} & \gamma_{42} & \gamma_{43} & \gamma_{44}\gamma_{45} \\ \gamma_{51} & \gamma_{52} & \gamma_{53} & \gamma_{54}\gamma_{55} \end{bmatrix}\begin{bmatrix} BOP_{t-1} \\ IR_{t-1} \\ LnREXER_{t-1} \\ LnRM2_{t-1} \\ LnRDRCED_{t-1} \end{bmatrix} + [ECT_{t-1}]\begin{bmatrix} \Im_{1t} \\ \Im_{2t} \\ \Im_{3t} \\ \Im_{4t} \\ \Im_{5t} \end{bmatrix} + \begin{bmatrix} v_{1t} \\ v_{2t} \\ v_{3t} \\ v_{4t} \\ v_{5t} \end{bmatrix}$$

The crucial issue in estimation of structural model is always the identification of the empirical model. Within the VAR framework two approaches are proposed to resolve the identification problem. The first is to put in diagonals the variance–covariance matrixes of the VAR system using a triangular orthogonalise [Orthogonal means that the transformed model contains disturbances that are contemporaneously uncorrelated.] process. This is done by estimating the reduced form VAR model, followed by computing the Cholesky factorization of the model covariance matrix and this is referred to as the recursive VAR modeling procedure, can resolve the contemporaneous correlation problem while ensuring that shock to the VAR can be identified as shocks on the reduced form VAR (endogenous variable) [Lukepohl,(2005)]. [Note the purpose of estimating the reduce form VAR is to solve the identification problem] [Also note that the Cholesky factorization is referred to as recursive VAR. Apart from resolving the problem of contemporaneous correlation, recursive structure of the VAR has to do with variable ordering.

4.5. MODEL IDENTIFICATION

The imposition of a recursive structure of the VAR has to do with variable ordering. We order the policy variables in the SVAR after the non-policy variables.

4.5.1. Recursive VAR Identification

The impulse response function and the variance decomposition are rendered empirically useful only when the SVAR model is identified in the sense of exhibiting structural orthogonal innovations and meaningful economic interpretation. This identification[4] process is thus equivalent to the process of recovering structural parameters from a reduced form estimable equation. In the VAR parlance, the reduced form estimable equation can be given as:

$$Z_t = A_1 Z_{t-1} + A_2 Z_{t-2} + ... + A_p Z_{t-p} + \in_t \qquad \textbf{(4.25)}$$

A structural representation of **(4.25)** can be expressed as

$$A_0 Z_t = A_1 Z_{t-1} + A_2 Z_{t-2} + ... + A_p Z_{t-p} + B\upsilon_t \qquad \textbf{(4.26)}$$

There is thus, an obvious relationship between the reduced from and the structural equations. Structurally, this can be expressed as in Breitung (2005):

$$Z_t = A_0^{-1} A_1 Z_{t-1} + A_0^{-1} A_2 Z_{t-2} + ... + A_0^{-1} A_p Z_{t-p} + A_0^{-1}\upsilon_t \qquad \textbf{(4.27)}$$

Where,

$$\theta_1 = A_0^{-1} A_1$$
$$\theta_2 = A_0^{-1} A_2$$
$$... = ...$$
$$\theta_p = A_0^{-1} A_p$$
$$\sum\nolimits_{\in} = A_0^{-1} \sum\nolimits_{\upsilon} A_0^{-1}$$

In effect, there are more parameters in the structural estimable model than in the reduced-form.

In which case, the same number of restrictions or constraints is imposed in order to achieve

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[4]The identification problem arises because, the econometrician need to recover the structural parameters or innovation from the reduced-form equation. In the reduced-form model, there are $\left[n^2 p + n(n+1)/2\right]$ number of parameters to be estimated and these correspond to the matrices $\left[\theta_1, \theta_2, ..., \theta_p, \sum\nolimits_{\in}\right]$ and are the number of elements in the endogenous vector. In the structural model, the number of parameters to be estimated is given by $\left[n^2 (p+1) + n(n+1)/2\right]$ corresponding to the matrices $\left[G_1, G_2, ..., G_p, \sum\nolimits_{\upsilon}\right]$

identification. The imposition of a recursive structure of the VAR has to do with variable ordering. We order the policy variables in the SVAR after the non-policy variables with output coming first, based on the assumption that it adjusts most slowly. This ordering technique recognizes that of Starr (2005) and it is a deviation from the usual ordering used for developed economies where prices are assumed to be most sluggish, and hence, entering first. However, reversing this order is likely to be more appropriate for Nigeria where prices are relatively flexible and the rigidity of production techniques makes output more inelastic. Within the policy related block, we ordered the variables for model **1** as RGDP, followed by the nominal interest rate, real effective exchange rate, real money stock, and domestic credit. For model **2,** the variable ordering is CPI, interest rate, real effective exchange rate, real money stock, and real domestic credit. For model **3**; we have BOP, short-term rate of interest, real effective exchange rate, real money stock, and real domestic credit. The variable ordering is thus a reflection of expected degrees of endogeneity within the policy related block. For the three specifications; the variable ordering is given as:

Figure 4.3 Variable Ordering

$$Z_t = \begin{bmatrix} LnRGDP \\ IR \\ LnREXR \\ LnRM2 \\ LnRDCRED \end{bmatrix}, \; Z_t = \begin{bmatrix} LnCPI \\ IR \\ LnREXR \\ LnRM2 \\ LnRDCRED \end{bmatrix} \text{ and } Z_t = \begin{bmatrix} BOP \\ IR \\ LnREXR \\ LnRM2 \\ LnRDCRED \end{bmatrix}$$

Orthogonal means that the transformed model contains disturbances that are contemporaneously uncorrelated. The intuition behind the assumption is a reflection of a long-standing view that many macroeconomic variables do not respond instantaneously to policy shocks (Friedman 1968). By intuition, identifying restriction indicates that the nominal interest rate (IR) has no instantaneous effects on real domestic output (RGDP); real effective exchange rate (REXR) has no instantaneous effect on nominal interest rate, real money stock (RM2) exhibits no instantaneous effect on the real effective exchange rate and real domestic credit does not instantaneously impact real money stock.

In other words, the relationship between the reduced-form errors and the structural disturbance is given by:

$$AZ_t = C(L)Yt_{-1} + Be_t \qquad \textbf{(4.28)}$$

This is a general representation where Z_t is a vector of endogenous variables, and e_t is a vector of structural disturbance. The disturbance term captures any exogenous factors in the model. The square n x n matrix A, where n is the number of variables, describes the contemporaneous relations among the variables. The square n x n matrix B allows some shocks to affect directly more than one endogenous variable in the system. Matrix B contains the structural form parameter of the model. CL is a matrix finite–order polynomial. At the empirical level, the starting point of VAR analysis is the estimation of the reduced form of the underlying structural model

$$Z_t = A^{-1} \quad C \quad (L)_{t-1} + V_t \qquad \textbf{(4.29)}$$

Where V_t denotes the VAR residual vector. The relation between the VAR residuals in V_t and the structural disturbance in e_t is therefore,

$$Av_t = Be_t \qquad \textbf{(4.30)}$$

If we write $Av_t = Be_t$ we essentially decompose the structural error (e_t) into components caused by the unexplained contemporary reduced form shock(V_t). Since we want to highlight contemporary relations, we must impose K(K +1) / 2 restrictions on the A and B matrices, to be able to exactly identify the system. The ordering of the k variables has been discussed above. Identification restrictions are imposed since the number of parameters to be estimated in the reduced form is smaller than that of the structural form. We estimate the AB-model of Amisano and Giannini (1997). In this case, the model for innovations can be written as Avt =Bet.

The overall number of elements in the structural form matrices A and B is $\mathbf{2K^2}$. We therefore impose $\mathbf{2K^2 - K\,(K+1)/2}$ further restrictions to identify the full model. The AB-model in the form Avt =Bεt is written in the case of Nigeria as:

Figure 4.4 Structural VAR Model

$$A = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ s_{21} & 1 & 0 & 0 & 0 \\ s_{31} & s_{32} & 1 & s_{34} & s_{35} \\ s_{41} & s_{42} & s_{43} & 1 & s_{45} \\ s_{51} & s_{52} & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} v_t^{LnRGDP} \\ v_t^{IR} \\ v_t^{LnREXR} \\ v_t^{LnRM\,2} \\ v_t^{LnRDCRE} \end{bmatrix} B = \begin{bmatrix} b_{11} & 0 & 0 & 0 & 0 \\ 0 & b_{22} & 0 & 0 & 0 \\ 0 & 0 & b_{33} & 0 & 0 \\ 0 & 0 & 0 & b_{44} & 0 \\ 0 & 0 & 0 & 0 & b_{55} \end{bmatrix} \begin{bmatrix} e_t^{LnRGDP} \\ e_t^{IR} \\ e_t^{LnREXR} \\ e_t^{LnRM\,2} \\ e_t^{LnRDCRE} \end{bmatrix}$$

The usual assumption is that the central monetary authority cannot respond instantaneously to developments in the real economy. This assumption thus imposes a recursive restriction on the reduced-form disturbance. Assuming that Central Bank of Nigeria (CBN) are operating systematically using some form of policy rule, the SVAR approach concentrates on deviations from this rule. According to Simatele (2004), such deviations may result from changing the systematic component of monetary policy or from exogenous shocks. These deviations can be used as a basis for observing the response of the economy to unexpected monetary shocks. Thus, the VAR modeling approach is capable of tracking dynamic adjustments to a given policy stance and subsequent deviations from same due either to some changes in cyclical or systematic component of macroeconomic policy variables or to exogenous shocks.

What is conventionally revealing is the fact that the Cholseky decomposition imposes a recursive causal structure from the top variables to the bottom variables and not vice-versa to transform the system innovations into contemporaneously uncorrelated shocks. Thus, following Lutkepohl (2005), for a K-dimensional stationary SVAR (p), the useful theoretical remark is that:

$$\theta_{jk,i} = 0,\ \forall j \neq k, i = 1,2,\ldots,\ \ \theta_{jk,i} = 0,\ \forall i = 1,\ldots, p\left(K-1\right) \qquad \textbf{(4.31)}$$

In effect, the identifying restriction implies that if the first $\left[pK-p\right]$ response of variable j to an impulse in variable k is zero, then all the following responses are zero. Also, variable k does not cause variable j if $\theta_{jk,i} = 0, i = 1,2,\ldots$

4.5.2. Non-Recursive Structural VAR Identification

The study utilizes the non-recursive structural VAR identification status. The non-recursive identification relaxes the restrictions of the recursive identification [Sims and Zha (2006) and Kim and Roubini (2000)]. This is in contrast to the recursive identification scheme which assumes no contemporaneous correlation between the growth rate of output, inflation and payment balances. Specifically, our identification restriction is captured in the following form:

Figure 4.5 Non-Recursive Structural VAR

$$\begin{bmatrix} \upsilon_t^{LnRGDP} \\ \upsilon_t^{IR} \\ \upsilon_t^{LnREXR} \\ \upsilon_t^{LnRM2} \\ \upsilon_t^{LnRDCRE} \end{bmatrix} = \begin{bmatrix} \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ s_{21} & 1 & 0 & 0 & 0 \\ s_{31} & s_{32} & 1 & s_{34} & s_{35} \\ s_{41} & s_{42} & s_{43} & 1 & s_{45} \\ s_{51} & s_{52} & s_{53} & s_{54} & 1 \end{bmatrix} \end{bmatrix} \begin{bmatrix} \in_t^{LnGDP} \\ \in_t^{IR} \\ \in_t^{LnREXR} \\ \in_t^{LnRM2} \\ \in_t^{LnRDCRE} \end{bmatrix}$$

The RGDP equation represents slow response of real domestic output growth with respect to shocks to the nominal interest rate, real effective exchange rate, real money stock and real domestic credit. The interest rate equation is basically, the monetary policy reaction function, which responds contemporaneously to real effective exchange rate, real domestic credit and real money stock (and hence demand for money) at equilibrium. As it were, the nominal interest rate would not respond instantaneously to contemporaneous real domestic output growth due to lag effect associated with output. The real effective exchange rate equation implies that the real effective exchange rate responds instantaneously to all other variables in the model. At equilibrium, the money stock equation can be likened to and interpreted as a short-run money demand function where the demand for money responds contemporaneously to shocks in domestic output (income), nominal interest rate, real effective exchange rate and real domestic credit. The real domestic credit equation indicates that real domestic credit responds instantaneously to all other variables in the model.

Explicitly, our identifying restriction implies that monetary policy innovations are determined based on knowledge of contemporary and past values of the non-policy variables whereas, the non-policy variables respond to changes in the policy variables with a lag and not vice-versa. Empirically, rather than identifying the autoregressive coefficients, the strength of the SVAR derives from the fact that identification is based on the errors of the system, which are interpreted as linear combinations of exogenous shocks (Mugume, 2011). This approach has the advantage of providing a basis for characterizing the relationship between the policy variables and the non-policy variables. This restriction helps to identify and interpret the relationship between the residuals of the SVAR model and the underlying innovations in monetary policy variables. Precise identification of innovations is useful for the estimated SVAR in order to generate reliable impulse response functions that explain the time-dynamic

effects of monetary shocks on the non-policy variables. We estimate the structural vector autoregressive models by including two accepted measures of monetary policy (real money supply and nominal interest rate). Hence, we used five variables, four policy related variables and one non-policy variable in models **1, 2** and **3** respectively. Real growth of domestic output, consumer price level and balance of payments position are the non-policy variables. The policy variables include real money supply (RM2), the nominal interest rate (IR), real effective exchange rate (REXR) and real domestic credit.

4.6. THE CO-INTEGRATING VAR MODEL: VECM

The co-integration of the structural VAR model is often represented by vector error correction model (VECM), a representation of equation (**4.27**) following Starr (2005):

$$\Delta Z_t = \gamma - \Pi z_{t-1} + \sum_{f=1}^{k-1} \Gamma_f \Delta Z_{t-f} + \Pi \Delta w_t + U_t, t = 1, 2, ..., T \qquad \textbf{(4.32)}$$

Where $\Pi = I_v - \sum_{f=1}^{k} \Phi_f, \Gamma_f = -\sum_{j=f+1}^{k} \Phi_j$ for $f = 1, ...k-1$ and Δ is a $[p \times h]$ matrix of unknown coefficients. The relationship between SVAR parameters and that of the co-integrating vector error correction can thus be specified as:

$$\Phi_1 = I_p - \Pi + \Gamma_1, \Phi_f = \Gamma_{f-1} - \Gamma_{f-1}, \text{ for } f = 2, ...k-1, \Phi_k = -\Gamma_{k-1} \qquad \textbf{(4.33)}$$

The co-integrating restrictions can be formally specified as:

$$\Pi = \alpha \beta' \qquad \textbf{(4.35)}$$

Where α and β are matrices of full rank r, that is, rank $[\Pi] = r$. Thus, Π is the impact matrix, α is the vector of adjustment coefficients, β is the vector of co-integrating relations and both are *p x r* matrices, Z_t is a px1 vector of stochastic variables, in our case Z_t = [RGDP, IR, RM2, REXR, CPI, BOP, RDCRE,]. If a linear combination of these variables exists, that is, stationary then these variables are said to be co-integrated. Given that the error correction representation is a function of the co-integrating relations the long-run co-integrating relations between the variables of the VAR model are determined at foremost and then estimate equation (4.35) for possible short-run dynamics between these variables of the model. With co-integrating relationship, the error correction model produces consistent impulse response functions and optimal predictions. IRF estimates based upon ECM are consistent. Thus, the computation of an impulse response function for a co-integrated SVAR system takes the stages:

determination of the co-integration rank by LR test, estimating the ECM model, converting the ECM back to VAR model and using the resulting VAR model to perform the IRF.

To observe the effects of monetary policy innovations in Nigeria, we adopt the Structural Vector Auto regression (SVAR) approach with a recursively orthogonalized identifying restriction to take care of the underlying assumptions we make. Following Sims (1980), Christiano *et al.* (1999) and Starr (2005) approach we estimate a reduced form SVAR and identify monetary policy innovations through variable specification. The usual assumption is that the central monetary authority cannot respond instantaneously to developments in the real economy. This assumption imposes a recursive restriction on the reduced form disturbance. This restriction helps to identify and interpret the relationship between the residuals of the SVAR model and the underlying innovations in monetary policy variables.

The impulse response functions are utilized as essential tools in causal empirical analysis and policy effectiveness and hence to describe the time-dynamic effects of monetary innovations on the non-policy variables. This process is usually referred to as the Choleski decomposition. Specifically, our assumption implies that monetary policy innovations are determined based on knowledge of current and past values of the non-policy variables, whereas, the non-policy variables respond to changes in the policy variables with a lag and not vice-versa. About the most influential monetary policy variable, we estimate the SVAR model including three popular measures of monetary policy. Hence, we used five variables in the model, three policy related variables and two non-policy variables. Real money supply (RM2 aggregate), the minimum rediscount rate (measured by the nominal interest rate), real domestic credit and the real effective exchange rate are the policy variables. While output measured by real GDP and prices measured by the consumer price index (CPI) are the non-policy variables. We order the policy variables in the SVAR after the non-policy variables with output coming first, based on the assumption that it adjusts most sluggishly. This ordering technique is a deviation from the usual ordering used for developed economies where prices are assumed to be most sluggish, and hence, entering first [Starr (2005)]. Nevertheless, reversing this order is likely to be more appropriate for Nigeria where prices are relatively flexible and the rigidity of production techniques makes output more inelastic.

4.7 STABILITY TESTS

Central Bank of Nigeria commenced an extensive financial system and monetary policy reforms in 1986. These reforms were based on the financial liberation theory by McKinnon and Shaw (1973) as part of a Structural Adjustment Programme (SAP) introduced by the World Bank in the early 1980s based on Washington Consensus. Consequent on the reforms this study carried out stability test to determine the structural break (structural parameter change) in our model. A structural change is said to have taken place when a change is observed in the regression parameters of the estimable model. Any structural break is (by definition) accompanied by the change in relevant model coefficients (Page, 1954). Such changes can engender a permanent shift in the level or slope (or both) of the series. Structural changes do result from shocks or events that significantly affect a regressor. Since the parameters of econometric models form the basis of optimal decision rules and these in turn integrate knowledge about policy decisions, changes in policies are likely to induce changes in the parameters of the relationships (Lucas, 1976). Studies by Chow (1960), Klein (1965), Cooley and Prescott (1976), Wichern, Miller and Hsu (1976), Picard (1985), Zivot and Andrews (1992), Lee and Park (2001) have all emphasized the importance of parameter stability in empirical studies. This is because ignoring structural changes in an empirical study can lead to false conclusion in the statistical fitness and hence in policy evaluation. An assessment of possible instability of coefficient estimates is therefore relevant in our study in view of its policy significance.

Econometric methods for testing for structural break of the estimated coefficients of a model are numerous. The study applied Page (1954) and Brown, Durbin and Evans (1975) two stability tests based on cumulative sum of recursive residuals (CUSUM) and cumulative sum of the squares of recursive residuals (CUSUMSQ) against the upper and lower bounds of the 95 per cent confidence interval at each point. CUSUM AND CUSUM SQ are stability test to check if there was a structural break with the introduction of structural adjustment programme in Nigeria in 1986.

The CUSUM test was introduced by Brown et al. (1975) for the study of structural change and the original test statistic was constructed based on cumulated sums of recursive residuals. Ploberger and Kramer (1992) extended the CUSUM test to OLS residuals. Nowadays, these

tests are widely used in econometrics and statistics, and have become especially popular because they draw attention to structural change and breakpoints in the data. It is important to note that the CUSUM SQ test has power against a wide range of departures from the constant variance assumption as shown in Ploberger (1989).

There have recently been developments in improving various procedures to allow for general form of heteroskedasticity via non-parametrically estimated variance profiles. Therefore this study equally used the CUSUM and CUSUM SQ to test for structural break. The structural break was applied to only two sub-periods from 1970Q1–1986Q4 before the Structural adjustment program me in Nigeria and from 1987Q1–2011Q4 periods of Structural adjustment programme in Nigeria. The study also estimates the period 1970Q–2011Q4 without a structural break for model 1(GDP) because the structural break test shows that there was no structural break. Reason for the structural break, Central Bank of Nigeria commenced an extensive financial system and monetary policy reforms in 1986. These reforms were based on the financial liberation theory by McKinnon and Shaw (1973) as part of a structural adjustment programme introduced by the World Bank in the early 1980s based on Washington Consensus. The structural break tests therefore established whether the structural reforms of 1986 in Nigeria brought a structural change.

To test whether a structural break must have taken place, we test for the model stability under the null hypothesis that the vector of coefficient $\mathbf{b_1}$ is the same in every period as against the alternative $\mathbf{b'_1}$ that it is not.

$$Z_t = h\beta_t = U_t A_0^{-1} \upsilon$$

$$U_t \sim N(0, \upsilon_t I_t), t = 1, 2, ..., T$$

To test whether a structural parameter change must have taken place, we test for model stability under the null hypothesis that the vector of coefficient $\mathbf{b_1=b'_1}$ is the same in every period as against the alternative that is not. Thus, the hypotheses are specified as:

Ho : $b_1=b'_1$ and $b_2=b'_2$ and $b_3=b'_3$ and $b_4=b'_4$

H_1 : $b_1 \neq b'_1$ and $b_2 \neq b'_2$ and $b_3 \neq b'_3$ and $b_4 \neq b'_4$

However, the stability test done with the CUSUM does not specify each hypothesis i.e coefficient $b_1=b'_1$ such as the Chow break test, but the CUSUM test is a general test based on the residual of the coefficients

CUSUM AND CUSUM SQ test was proposed by Brown et al. (1975). The tests are applied on the residuals of all variables of VECM model. If the plot of the CUSUM statistics stays within the critical bound of 95 per cent level of significance the null hypothesis is that all coefficients in the error correction model cannot be rejected. If any of the lines crosses, the null hypothesis of coefficient constancy at 95 per cent level of significance will be rejected. A CUSUM-SQ test is based on the square recursive residuals, and a similar procedure is used to carry out this test.

However, CUSUM and CUSUMQ tests have some weaknesses. For instance, if there is serial correlation problem between the data of the model, the explanatory power of model stability of CUSUM test is insufficient (Andrew, 1993; Yashchin, 1993). Therefore, if the model, allowing structural break, involves a constant term, CUSUM test produces more robust results.

The CUSUM of squares test is more appropriate if you want to detect changes in the variance (rather than the conditional mean). For both problems (breaks in the mean / breaks in the variance) there are other tests which are usually more appropriate than the CUSUM or CUSUM of squares test .But depending on the model and hypothesis you want to test, another technique than CUSUM of squares might be more appropriate and also available in structural change. The limitation of CUSUM and CUSUM SQ tests is the inconvenience of having asymptotically a low level of coefficients instability but not at the entire vector of coefficients. To solve this problem, Ploberger, Krämer and Kontrus (1989) suggested that the parameters test should be based on the fluctuation test rather than the recursive residuals. A similar study was suggested by Sen (1980) for the case of simple regression model and by Ploberger (1983) for the case of fluctuation test.

CHAPTER FIVE

5.0. DATA: SOURCE AND DESCRIPTION OF VARIABLES

The fourth chapter provides the link between the monetary policy and macroeconomic performance. This chapter discusses the sources of the time series data and description of the variables, the procedure followed in derivation of some of the variables as discussed, for example the data are obtained in nominal form and have to be converted to real. Equally discussed in this chapter is the measurement of economic performance and the indicators used for the measurement of effects of monetary policy. Finally this chapter also discusses problems encountered and descriptive statistics.

5.1. DESCRIPTIVE STATISTICS

The data is quarterly collected and it covers a period from 1970Q1–2011Q4 with 168 observations. Table 5.1 displays the descriptive statistics of the variables of monetary policy targets, gross domestic product (GDP), balance of payments (BOP) and consumer's price index (CPI) and the monetary policy tools or instruments, interest rate, exchange rate, money supply, and domestic credit. The table also shows the mean value, and the standard deviation, which can be used for measurement of variability; it also shows the maximum and the minimum value for each variable. The standard deviation shows the spread of observations around the mean value.

Table 5.1: Summary of Descriptive Statistics

	LNRGDP	LNRBOP	LNCPI	IR	REXR	LNRM2	LNRDCREI	LNRCRR
Mean	9.870854	-6.25018	1.757195	15.06196	1.633127	9.730652	9.323309	0.010048
Median	9.759838	-5.83997	1.393739	16.51	1.482911	9.635294	9.496575	-0.38828
Maximum	13.09192	-4.02368	5.205324	34.87	4.761907	11.13842	10.1512	4.407341
Minimum	8.996982	-9.8377	-1.89712	6	0.479736	8.579031	4.255087	-4.42285
Std. Dev.	0.58419	1.562382	2.349412	6.715136	0.948692	0.61695	0.738906	2.622526
Skewness	2.073649	-0.61755	-0.00951	0.267142	1.037629	0.606049	-2.86108	0.100076
Kurtosis	11.73227	2.337807	1.495267	2.265287	3.674666	3.395172	17.64074	1.838566
Jarque-Be	650.2738	13.74775	15.85208	5.776837	33.33311	11.37738	1719.364	9.722934
Probabilit	0	0.001034	0.000361	0.055664	0	0.003384	0	0.007739
Sum	1648.433	-1050.03	295.2088	2530.41	274.3653	1634.749	1556.993	1.687984
Sum Sq. D	56.65208	407.653	921.7964	7530.541	150.3028	63.56477	90.63293	1148.566
Observati	167	168	168	168	168	168	167	168

The quarterly data spans over the sample period, 1970Q1-2011Q4. The rationale for using quarterly data series is having sufficient degree of freedom. All variables are in logs except interest rate because it is in percentage and seasonally adjusted. The data were sourced mainly from the International Financial Statistics (IFS) of the International Monetary Fund (IMF).

5.2: THE DIFFERENCE BETWEEN NOMINAL AND REAL VARIABLES.

A nominal value is an economic value expressed in monetary terms (that is, in units of a currency). By contrast, a real value is a value that has been adjusted from a nominal value to remove the effects of general price level. It is a measure of purchasing power of any price changes over time. Real values are a measure of purchasing power of any price changes over time. Similarly, for aggregate measures of output, such as gross domestic product (GDP), the nominal amount reflects production quantities and prices in that time period, whereas the differences between real amounts in different time periods reflect only changes in quantities. A series of real values over time, such as for real GDP, measures quantities over time expressed in prices of one year, called the base year (or more generally the base period). Real values in different years then express values of the bundles as if prices had been constant for all the years, with any differences due to differences in underlying quantities.

Since interest rates are measured as percentages rather than in terms of units of some currency, real interest rates are measured as the difference between nominal interest rate and the rate of inflation. The expected nominal interest rate as of the starting time of a loan is the nominal interest rate minus the inflation rate expected over the term of the loan. The realised interest rate is computed by subtracting the actual inflation rate that ends up prevailing during the life of the loan from the nominal interest rate, and reflects what actually happened during the life of the loan. The real interest rate is the nominal rate of return adjusted for inflation. For example, the difference between the nominal interest rate and the real interest rate is the inflation rate. Price indices are tools used to measure price changes for a specific subset of goods and services. Broad price indices, such as the consumer price index (CPI) or the GDP deflator are often used to measure inflation throughout the entire economy. Real values (such as real wages or real gross domestic product) can be derived by dividing the relevant nominal value (e.g., nominal wage rate or nominal GDP) by the appropriate price index.

CPI represents consumer price index in urban/rural areas; the consumer price index is designed to measure changes in the level of retail prices paid by consumers. It is obtained from International Monetary Fund and International Financial Statistics (IFS) from 1970q1-2011q4 (units; index number). The CPI is used in transforming the data from nominal to real. Nwaobi (2002) reports that the CPI provides a reasonable first-order approximation to the true price deflator because in an open economy like Nigeria, GDP deflator is not appropriate since it is constructed as a value-added which excludes import, but the CPI takes care of that problem by including import and excluding export. The short-term interest rate already is in percentage. The short-term interest rate which is measured in percentage is the prime lending rate charged by commercial banks on first-class advances. Exports and imports data were measured in national currency on billion scales. The real exchange rate data is the monthly average official exchange rate of the naira in relation to the American dollar.

IR represents prime lending rate charged by commercial banks on first–class advances 1970Q1-2011Q4. It is available and obtained from International Financial Statistics CD Rom. The study utilized short term nominal interest rate. In addition, most central banks around the world today including the Federal Reserve in US use short term nominal interest rate. DCRED represent domestic credit. It is available and obtained from International Financial Statistics CD Rom (2011). Motivation of choice of variable domestic credit is based on monetary approach to

balance of payments which demonstrate the importance of credit in balance of payments and the transmission mechanism which also demonstrates effects of credit on output and consumer's price index

GDP represents gross domestic product, proxy for domestic growth output. Real GDP is the GDP at various base years. Constant Basic prices equals GDP at (various base years) market prices less indirect taxes net subsides. Partially available in International Financial Statistics CD Rom (2011). Therefore GDP data is obtained from Statistical Bulletin Central Bank of Nigeria from 1970Q1 to 2008Q4. Data from 2009-2011 were absent; to obtain the remaining years we extrapolate by using annual growth rate to compute the missing value. We obtain growth rate for 2009 and 2010 from World Bank indicators. The growth rate is 7.0 and 8.7 respectively.

REXR represents real effective exchange rate, Monthly Average Official Exchange Rate of the Naira Vis-a-Vis the United States Dollar (Units: US Dollars) (Scale: Millions). It is obtained from International Monetary Fund and International Financial Statistics (IFS) from 1970q1-2011q4. This information is presented in the data below. M2 represents broad money supply, M1 plus time, savings, and foreign currency deposits of resident sectors other than the central government. The motivation for using M2 is based on the monetarists' argument that there is stable relationship between the intermediate target M2 on one hand and output, inflation, unemployment, and other relevant economic variables on the other; and government is able to control M2. In addition economists use M2 when looking to quantify the amount of money in circulation and try to explain the different economic monetary conditions. M2 is key economic indicator used to forecast inflation. M2 is used as an intermediate target, but the growth rate of M2 can deviate significantly from its target without causing high inflation.

BOP represents balance of payments, the study focuses on overall balance. The balance of payments is in equilibrium when the sum of reserve inflow equals sum of outflow. For the overall balance, the current account, capital account and the official settlement (also known as change in reserves) balance must sum up to zero, the official settlements is the inverse of the overall balance. Economists referred to the overall balance as the best measure of the balance of payments (Howard & Mamingi, 2002). This is in line with the objective of monetary

authority of Nigeria to maintain healthy balance of payment position, where import of goods and services should be equal to export of goods and services.

5.3: JUSTIFICATION AND CRITERIA USED IN SELECTING THE VARIABLES OF THE MODELS

The choices of the use of variables in this study are based on the monetary policy instruments which include: interest rate, exchange rate, asset price, and credit (see Aigbokhan, 1995; and Fifty Years of Central Banking in Nigeria Hand Book, 1959-2009 draft.) The choices of the use of variables are also based on the channels of monetary transmission mechanism. Mishkin (1995) opine that one way of understanding how monetary policy affects the economy is through the various channels of monetary transmission mechanism. These transmission mechanisms include interest rate effects, exchange rate effects, asset price effects, and credit channel. Macroeconomic aggregates such as output, employment and prices are, in turn, affected by the stance of monetary policy through a number of ways including interest rate or money: credit; wealth or portfolio; and exchange rate channels (Akhtar, 1997; CBN, 1995). The objectives of monetary policy are achieved by central bank through the use of a number of instruments of monetary policy. The policy tools under the control of the central bank are not, however, directly linked to the policy objectives. Consequently, the usual practice is that intermediate targets such as money supply, interest rates and bank credit are employed to achieve monetary policy objectives

Table 5.2 Variable definitions and data 0.1

Variable Name	Definition	Data Source
Domestic output(GDP)	Real GDP Expressed inconstant units of local currency.GDP at 1990 constant Basic Prices equals GDP at 1990 Market Prices less indirect taxes net of subsidies'	Central Bank of Nigeria Statistical Bulletin.50years special Anniversary Edition1959-2009.
Consumer's Price Index (CPI)	Consumer's Price Index (CPI) represents consumer's price index in urban/rural areas, the consumer's price index are designed to measure changes in the level of retail prices paid by consumers	International Financial Statistics quarterly data 1956-2011. It is available and obtained from International Financial Statistics CD Rom (2011).
Balance of Payments (BOP)	The study focus on overall balance. We reserve inflow equals sum of outflow. For the overall balance, the current account, capital account and the official settlement (also known as change in reserves) balance must sum up to zero.	International Financial Statistics quarterly data 1956-2011. It is available and obtained from International Financial Statistics CD Rom (2011).

Interest Rate (IR)	IR represents prime lending rate charged by commercial banks on first –class advances	International Financial Statistics monthly data from CD Rom 2011. Imputed quarters(average of three months per quarter)
Money Supply (RM2)	M1plustime,savings,andforeing currency deposits of resident sectors other than the central government	International Financial Statistics quarterly data 1956-2011. It is available and obtained from International Financial Statistics CD Rom(2011).
Real Exchange rate (REXR)	Real effective exchange rate: unit of local currency per US dollar, adjusting for differential rates of inflation (Units: US Dollars) (Scale: Millions).	International Financial Statistics monthly data from CD Rom 2011. Imputed quarters(average of three months per quarter)
Real Domestic credit(RDCRE)	represent credit from the commercial Banks to the private sector	International Financial Statistics quarterly data 1956-2011. It is available and obtained from International Financial Statistics CD Rom (2011).

5.4. MEASUREMENT EFFECTS AND PROBLEMS ENCOUNTERED

For the measurement of the effects of monetary policy, several channels have been highlighted in literature based on monetary transmission mechanism, (Mishkin,1995; Kuttner and Possen, 2000); Broadly, these indicators for measuring the effects of monetary policy include direct interest rate, which influences investment decision, domestic credit, exchange rate, which affects the relative prices of domestic and foreign goods, indirect effects of asset prices such as prices of bonds, equities and treasury bills. The measurements of economic performance are based on monetary policy targets such as growth rate (GDP), inflation, unemployment, balance of payments etc. Moesen and Cherchye (1998) posit that there is a common interest in measuring and comparing the economic performance of nations. Accordingly, macroeconomic measure should capture the relevant information about the overall economic performance of a nation in one single statistics; real gross domestic product (GDP) offers such a statistic. In this study the policy target variables used in measuring economic performance are domestic growth rate (GDP), consumer price index (CPI), a proxy for inflation and balance of payments.

Measuring the macroeconomic performance of Indonesia, the Bank of Indonesia (2004) disaggregated the gross domestic product into various components. In a similar view, Ekpo and Umoh (2009) used the following economic indicators in Nigeria, namely GDP of the industry and manufacturing sectors, GDP of the agricultural sector, inflation and employment. Cecchetti (2008) argues that effectiveness depends on that analysis which examines how close monetary policy is to the "optimal" monetary policy that entirely offsets shocks to aggregate demand and

minimizing a weighted average of inflation and output volatility. In line with Cecchetti's view, Saizar and Chalk (2008) evaluate the effects of monetary policy, arguing that it is first necessary to adopt a metric by which to measure what "effects" actually means. The authors therefore argue that one approach is to look at how far away monetary policy is from minimizing fluctuations in inflation and output. In this study the variables used for the measurement of economic performance are gross domestic output proxy by GDP, consumer price index proxy for inflation, balance of payments.

Hendry (1991) says to merit empirical modeling; data must measure the variables of interest with reasonable accuracy. Given the long historical period of study here, there are likely to be errors of measurement, both numerical and conceptual, in most of these time series data. One of the major problems with the collection of data in this study is the availability and reliability of appropriate time series data. The annual time series data in most cases are not usually up to date, not reliable and inconsistent in Nigeria. One of the objectives of the study was to use employment as target variable (policy target variable) of monetary policy. Data on employment are not available in IFC data, Statistical Bulletin of Central Bank of Nigeria and, the Federal Office of Statistics in Nigeria. Another problem is the non-availability of quarterly data. It is more appropriate to use quarterly data in monetary policy, but quarterly data are not available in data source of Nigeria. Evidence in this, [Obadan, and Iyoha, (1996)] report that the scarcity of quarterly data meant that existing econometric models for Nigeria have been estimated with annual data, yet quarterly data seems to be better for econometric model especially in monetary policy. Besides with annual data my observations were only 46, inadequate to give sufficient degree of freedom.

The problem of scarcity of quarterly data was resolved by subscribing for data from the International Financial Statistics (IFC) from 1957–2011 in a CDROM. Unfortunately, the data are inadequate because some of the variables are monthly, some quarterly and others annual data. To make the data uniform for estimation I converted the monthly data to quarterly by average of three months per quarter. One of the variables GDP was neither in monthly or quarterly. Therefore GDP data is obtained from Statistical Bulletin Central Bank of Nigeria from 1970Q1 to 2008Q4. Data from 2009-2011 were absent; to obtain the remaining years we extrapolated by using annual growth rate to compute the missing value. We obtained growth

rate for 2009 and 2010 from World Bank indicators. The growth rate is 7.0 and 8.7 respectively.

With my quarterly data my observation has increased from 46 to 166 observations which have given me sufficient degree of freedom. In addition, the approaches of differencing lead to loss of valuable long-run information in the data (Madalla, 1992). This study addresses this issue based on the theory of co-integration, by introducing an error correction (EC) term[4]. The error correction term lagged one period i.e. (ECM_{t-1}) integrates short-run dynamics in the long run economic growth model. The data for some of the variables for the studies failed the time series property test and are not utilized in the study. For example unit root test for real GDP and CPI using Augmented Dickey Fuller are not statistically significant, because the data for the variables are all positive. As a rule during differencing all data must be negative, however the logs of the nominal GDP and CPI, including their real value and the logs of their real value are statistically significant. Similarly the real value of interest rate (RIR) is not statistically significant, because the data for the variables is positive. Consequent upon this we dropped the real interest rate and utilized the nominal interest rate (IR) as the only alternative. Despite these difficulties, it is worth modeling the available data for meaningful result.

Table **5.2** summarized the descriptive statistics for real gross domestic output (RGDP), interest rate (IR), real exchange rate (REXR), real money supply (RM2), credit to the private sector (PRICV), consumer's price index (CPI), balance of payments (BOP) for quarterly time series, data for the period 1970 Q1and 2011Q4 with 166 observations.

[4] The ECM is incorporated to account for the disequilibrium between the long-run and short run. The adjustment factor is the ECM that adjust the disequilibrium between the long-run and short –run.

CHAPTER SIX

6.0. EMPIRICAL ANALYSIS OF RESULTS

Chapter five discussed the sources of the time series data and description of the variables, used in this study. Equally discussed is the measurement of macroeconomic performance and the indicators used for the measurement of the effects of monetary policy. The objective of this chapter is to empirically assess the effects of monetary policy on macroeconomic performance. The empirical work is highly influenced by the financial liberation theory which brought about structural adjustment programme in Nigeria. Consequent upon this, the empirical data is split into two sub periods to take account of the period of financial liberalization in Nigeria.

The Procedure of Estimation is divided into two broad sections. The first section was based on the interpretation of the coefficients of the variables of the specified models of the three linear functions. In the first procedure, we split the data into two sub periods from 1970Q1–1986Q4 (this is the era before the structural adjustment programme) and from 1987Q1–2011Q4 (this is the era after the structural adjustment programme), to enable us capture the structural breaks. The second procedure is the transformation of all variables to real except interest rate which is already in percentage. Thirdly, we take the logs of all the variables. Fourthly, we determine the lags criteria for the three models i.e. model 1 (GDP), model 2 (CPI) and model 3 (Balance of payments). Fifthly, we test for stationarity of all variables. Sixthly, we determine co-integrating equations for the three models (GDP, CPI and BOP). In the seventh stage, we estimate the long run and short run equations, of the three models. Finally we carry out the diagnostic test on the three models.

In the second section, the analysis of the results are based on the residual of the structural VAR model which is interpreted as linear combinations of exogenous shocks rather than identifying the autoregressive coefficients [Sims (1981), (1986), Bernanke (1986) Shapiro and Watson (1988) and Mugume (2009)]. The standard practice in VAR analysis is to report the result of impulse response, variance decompositions and Granger causality test. This is attributed to the complicated dynamics in the VAR. These statistics are more informative than are the estimated VAR regression coefficients or R-square statistics (Mordi 2008). The interpretation of the

results follows mainly from the path of the impulse response functions generated from the recursive-orthogonalized estimated residuals of the SVARs.

6.1. VAR ORDER: LAG SELECTION, STATIONARITY.

Appendix **E1** reports the lag length selection for model **1.** The Johansen co-integration technique requires us to specify the lag order and the deterministic trend assumption for the VAR. The lag order for the VAR is chosen using the information criteria approach. Only an appropriate lag selection will be able to identify the true dynamics of a model [Bahmani – Oskooee and Sungwon (2002)]. For model **1,** the VAR Lag order selection criteria are Schwarz Bayesian criterion (SBIC), Akaike information criterion (AIC), Hanna-Quinn Information Criterion (HQIC), Final Predictor Error (FPE) and Likelihood Ratio (LR). Lag order 5 are simultaneously generated by LR, FPE, AIC, HQIC and SBIC respectively.

Model **1** is estimated using the stochastic trend assumption at lag order **5.** For model **2** (CPI) and model **3** (BOP) the VAR Lag order selection criteria are Schwarz Bayesian criterion (SBIC), Akaike information criterion (AIC), Hanna-Quinn Information Criterion (HQIC), Final Predictor Error (FPE) and Likelihood ratio (LR). For model **2**, AIC, HQIC, FPE and LR indicate the use of **5** lags, only SBIC indicates the use of **4** lags (see appendix **F.1)**. For model **3**, lags order **6** are simultaneously generated by LR, FPE, AIC, HQIC and SBIC (see appendix **G.1)**. Model **1** and model **3** are estimated using the stochastic trend assumption at lags order **5** and **6** respectively. The unit root test for model **1,** model **2** and model **3** results based on the augmented Dickey-Fuller (ADF) are presented in Appendix **B**. According to the results, none of the variables in the study could gain stationarity at levels given that the ADF test statistic(s) is less than the critical value. Thus, all variables became stationary after first differencing.

6.2 CO-INTEGRATION TEST RESULTS

To empirically ascertain the true co-integrating vectors, this study adopts the Arestis and Demetriades (1997) normalization procedure of normalizing each of the vectors of the endogenous variable in order to obtain a clear evidence of error correction. The normalization requires a set of restrictions that rule out all but one element that need to be pinned down by the identifying restrictions (Gottschalk 2001). Normalization is obtained by imposing linear restrictions on the matrix that contains the parameters of interest. There is no way to obtain

estimates of the structural parameters of interest without some identifying restrictions (normalization). In the discussion of the general normalization, it was shown that normalization boils down to restricting the elements in the matrix, *so* that a unique structural model can be retrieved from the data set. When normalization (restriction) is not imposed on the model, interpretation does not have any economic meaning.

Furthermore, impulse response function and the variance decomposition are rendered empirically useful only when the SVAR model is identified in the sense of exhibiting structural orthogonal innovations and meaningful economic interpretation. This identification process is thus equivalent to the process of recovering structural parameters from a reduced form of estimable equation. In effect, there are more parameters in the structural estimable model than in the reduced-form, in which case the same number of restrictions or constraints is imposed in order to achieve normalization. This restriction helps to identify and interpret the relationship between the residuals of the SVAR model and the underlying innovations in monetary policy variables. Precise identification of innovations is useful for the estimated SVAR in order to generate reliable impulse response functions that explain the time-dynamic effects of monetary shocks on the non-policy variables without restriction.

6.3. CO-INTEGRATING VECTOR WITHOUT STRUCTURAL BREAK FOR GDP MODEL 1970Q1–2011Q4

The result of structural break for model 1(GDP) shows that there is no structural break therefore, the study proceeds to estimate the entire period from 1970Q1-2011Q4 of no structural break. Table **6.1** reports the co-integration test results for model **1** without structural break. Trace tests indicate 1 co-integrating relationship or vector at the 5% level of significance. To determine co-integrating test, we compare the trace statistics to the critical value in order to determine the number of co-integrating equations. If the trace statistics is greater than the critical value there is co-integrating equation. For example at rank 1 the trace statistics is 72.5497 greater than the critical value 70.4900. Thus, the trace statistics value test indicates 1 co-integrating relationship or vector at the 5% level of significance. Thus, the VECM is estimated based on 1 co-integrating vectors.

Table 6.1: Co-integrating Vector without Structural Break for GDP Model 1970 - 2011

```
 Co-integration with unrestricted intercepts and no trends in the VAR
Co-integration LR Test Based on Trace of the Stochastic Matrix
************************************************************************
 163 observations from 1971Q2 to 2011Q4. Order of VAR = 5.
 List of variables included in the co-integrating vector:
 LNRGDP          LNRM2           LNRDCRED        LNREXR          IR
 List of eigenvalues in descending order:
.16703     .13990    .081364    .024115   .0023553
************************************************************************
 Null    Alternative    Statistic     95% Critical Value   90%Critical Value
 r = 0      r>= 1        72.5497           70.4900                66.2300
 r<= 1      r>= 2        42.7611           48.8800                45.7000
 r<= 2      r>= 3        18.1962           31.5400                28.7800
 r<= 3      r>= 4         4.3632           17.8600                15.7500
 r<= 4      r = 5          .38437           8.0700                 6.5000
    Conclusion r = 1
```

6.4. LONG RUN ESTIMATE FOR GDP MODEL WITHOUT STRUCTURAL BREAK

The long run results are presented in Table **6.2.** Thus, a unit increase in real domestic credit induces increase in real domestic output in the long-run up to the tune of .31930. Nominal interest rate is negatively related to real GDP. This is in line with my hypothesis 1 and a priori expectation which states that interest rate is negatively related to real GDP. A unit increase of nominal interest rate induces a decrease in real GDP in the long run to -.0090556. The response of real GDP to interest rate, based on the economic theory is statistically significant. The result corroborates with those of Okwu et al (2011) for Nigeria, Mugume (2011) for Uganda, Barachian and Crowe (2010) U.S., with increase in interest rate resulting in fall in GDP. This result did not corroborate those of Mbutu (2007) for the Nigerian economy, Eichenbaum (1992) for the US economy, Sims (1992) for OECD countries, Christiano, Eichenbaum and Evans (2002) for the US economy, and Rafiq and Mallick (2008) for the German economy which states that increase in interest rate leads to increase in GDP.

Moreover, the results show a positive relationship between real money supply (M2) and real gross domestic output (RGDP). This is in line with my hypothesis 1 and my a priori expectation. Thus, a one-percentage point increase in the real money supply induces increase in real GDP in the long-run up to 1.0248. The growth of real money supply is proportionate to the growth of domestic growth; a unit growth increase in real money supply also leads to a unit growth in real domestic growth. The proportionate growth of real money supply can be based on the quantity theory of money by Fisher which states that money stock velocity of circulation (v) is equal to price level of transactions per period of time. The theory assumes that when the velocity of circulation and number of transactions are held constant, increase in money stock leads directly and proportionately to increase in price level.

The quantity theory of money has been criticised on empirical ground that prices vary directly and proportionately. It is argued that price level sometimes rises as money stock falls, and falls when it rises. However, when prices and money stock move in the same direction it is usually not proportional. Although, the theory has been criticised it holds in some occasions. This result corroborates with Chuku (2009) in Nigeria, who finds that increase in real money supply leads to increase in RGDP. My result is not consistent with those found in Christiano et al (2002) and Ghosh (1996) for Ukraine, a developing economy. In addition, the positive coefficient of the real effective exchange rate is an indication that real exchange rate depreciation leads to increase in real domestic output.This result is in line with my a priori expectation. A unit increase in real effective exchange rate leads to an increase in real GDP, in the long run to 1.1586. The significance of each long run parameters in the co-integrating vectors was further determined using Wald coefficient restriction test by placing a zero restrictions on each of the variables.

Table 6.2: Long Run Result without Structural Break for GDP Model 1970Q1 – 2011Q4

```
Estimated Co-integrated Vectors in Johansen Estimation (Normalized in Brackets)
Co-integration with unrestricted intercepts and no trends in the VAR
*****************************************************************
 163 observations from 1971Q2 to 2011Q4.Order of VAR = 5,chosen r =1.
 List of variables included in the co-integrating vector:
 LNRGDP          IR          LNRM2           LNRDCRED        LNREXR
*****************************************************************
                  Vector  1
 LNRGDP               .15198
                  (  -1.0000)
  IR                  .0013763
                  (-.0090556)
  LNRM2               -.15575
                  (   1.0248)
  LNRDCRED            -.048528
                  (   .31930)
  LNREXR              -.17608
                  (   1.1586)
 *****************************************************************
```

LNRGDP = -.0090556 IR + 1.0248 LNRM2 + .31930 LNRDCRED + 1.1586 LNREXR

6.5. SHORT RUN DYNAMICS: VEC FOR GDP MODEL WITHOUT A BREAK 1970Q1-2011Q4

The Vector Error Correction (VEC) estimate for the RGDP model without structural break is shown in **Table 6. 3**. In model **1**, the domestic rate of interest is only statistically significant at lag 4 with a negative sign and with a p-value of .000. Nominal interest rate at lags 1 and 3 equally has negative sign in line with the study a priori expectation, but are not statistically significant as shown from the p – value.

Money supply failed the test of significance with a negative sign at lags 2 and 3 contrary to the a priori sign of the study. However, real money supply at lag one has a positive sign in line with the hypothesis, but not statistically significant with a p-value of .010. From the regression, the variables that seem to have significant short-run relationship with the real GDP, are nominal interest rate, real effective exchange rate and real domestic credit. The goodness-of-fit statistics are robust and highly plausible (see Appendix **D1**).

The coefficients of error correction terms for model **1** had the right sign and are significant at 1% levels. The error correction models produces better short-run forecasts and hence provides the short-run dynamics essential to obtain a long-run equilibrium. The diagnostic test obtained from the regression is quite impressive. For example the R square and adjusted R is 42 per cent and 34 per cent for model **1**. The F-statistics is significant in the conventional level. Durbin–Watson statistics shows an absence of auto correlation in the model. However, the comments of the short run do not tell us much about the effects of monetary policy on the GDP, because they are only an adjustment mechanism towards equilibrium.

The diagnostic tests results as reported in Appendix **D3** for the regression reject the alternative of non-normality, heteroskedaticity and serially correlated VAR residuals. Furthermore, the rejection of the alternative of non-normality test is also presented graphically [Appendix **D3.1.** Appendix **D3.2 and** Appendix **D3.3].** The empirical distribution of the data (the histogram) is a bell shape and resembles the normal distribution. In effect, the VAR residuals are well behaved and hence obey the Gaussian distribution and the null hypothesis of multivariate normal VAR residual with Cholesky orthogonalization, is accepted as against the alternative. This has been ascertained under the Jarque-Bera statistic(s). The plot of the inverse roots of the characteristics AR polynomial shows that the estimated VAR is stable and above all stationary given that all the roots have modulus that are less than unity and also these roots lie inside the unit circle (see Appendix **A**).

Table 6.3: Short Run Result without Structural Break for GDP Model 1970Q1- 2011Q4

ECM for variable LNRGDP estimated by OLS based on co-integrating VAR(5)

Dependent variable is dLNRGDP

163 observations used for estimation from 1971Q2 to 2011Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
Intercept	-.072600	.048685	-1.4912[.138]
dLNRGDP1	-.27123	.084350	-3.2155[.002]
dLNRM21	.55434	.21226	2.6117[.010]
dLNRDCRED1	-.0077305	.085403	-.090518[.928]
dLNREXR1	.041150	.054042	.76144[.448]
dIR1	-.0031031	.0050500	-.61447[.540]
dLNRGDP2	-.19464	.087838	-2.2159[.028]
dLNRM22	-.12191	.23410	-.52075[.603]
dLNRDCRED2	-.098309	.083084	-1.1832[.239]
dLNREXR2	.027659	.054932	.50351[.615]
dIR2	.3340E-3	.0048689	.068590[.945]
dLNRGDP3	-.069662	.085235	-.81730[.415]
dLNRM23	-.23555	.23917	-.98486[.326]
dLNRDCRED3	.090974	.082681	1.1003[.273]
dLNREXR3	.0065292	.054934	.11886[.906]
dIR3	-.8320E-3	.0048646	-.17104[.864]
dLNRGDP4	.26773	.085065	3.1474[.002]
dLNRM24	-.40260	.20880	-1.9281[.056]
dLNRDCRED4	-.013209	.078046	-.16925[.866]
dLNREXR4	.11605	.056668	2.0478[.042]
dIR4	-.024244	.0047788	-5.0733[.000]
ecm1(-1)	-.18126	.094475	-1.9186[.057]

R-Squared	.42165		
R-Bar-Squared	.33551		
S.E. of Regression	.094475	F-stat. F(21, 141)	4.8950[.000]
Mean of Dependent Variable	.0099119	S.D. of Dependent Variable	.11590
DW-statistic	1.9403	System Log-likelihood	460.1841

6.5.1: Stability Test Result for Structural Break

The study test for each equation in the model on the basis of cumulative sum of residual (CUSUM) and cumulative sum of squares of residuals (CUSUMSQ) test. CUSUM and CUSUM SQ are stability tests to check if there was a structural change following the introduction of the structural adjustment programme in Nigeria in 1986. CUSUM and CUSUM SQ test were proposed by Brown et al. (1975). The tests are applied on the residuals of all variables of VECM model. If the plot of the CUSUM statistics stays within the critical bound of 95% level of significance the null hypothesis is that all coefficients in the error correction model cannot be rejected. If any of the lines crosses, the null hypothesis of coefficient constancy at 95% level of significance will be rejected. That is the equation parameters are considered unstable (structural break presence), if the whole sum of recursive error gets outside the two critical lines of both tests (Irefin and Yaaba 2011).

These two tests, the cumulative sum of residuals (CUSUM) and cumulative sum of squares of residuals (CUSUMSQ) are applied to examine the stability of the long-run coefficient together with short run dynamics (Pesaran, and Pesaran, 1997). The CUSUM test is based on the cumulative sum of the equation error in the regression. On the other hand, the CUSUM-SQ instead uses recursive double errors, which are the CUSUM-SQ test based on the square recursive residuals. When the mean is stable, it indicates that there is no structural break (Abdullahi and Bakari, 2011). Evidently, stability is easily inferred for the period under analysis. The stability inference which is made evident under the graphical interpretation of the CUSUM and CUSUMSQ graphs holds on the basis of the fact that the cumulative sum of the residuals and the cumulative sum of the squares of residual falls within the area between the two critical bounds as presented by the critically dotted lines at the 5% significance level.

This study used the CUSUM and CUSUM SQ, to test for structural change. The structural break; is applied to two sub-periods from 1970Q1–1986Q4, before the structural adjustment programme in Nigeria and from 1987Q1–2011Q4, after the structural adjustment programme in Nigeria. The study also estimates the period 1970Q1– 2011Q4, for the GDP model and the result shows that there was no structural break for the GDP model.

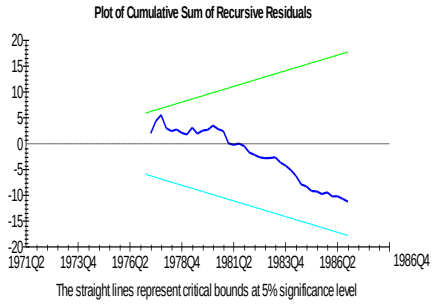
6.6: CUSUM AND CUSUMSQ PLOTS FOR GDP MODEL

The result of the CUSUM and CUSUM-SQ test for the GDP is presented in figure 1 below. The test for the entire period 1970Q1–2011Q4 shows that the parameters of the analysed equation are stable given that recursive errors lie within the two critical lines of both tests. This means that the structural adjustment programme introduced in 1987 did not bring changes[5] to the domestic growth (GDP) of the Nigerian economy. Although the coefficient of the credit has increased dramatically and the coefficient of the real effective exchange rate has become negative after the reform, their impact was minimal, as the parameters of the analysed equation are stable given that recursive errors lie within the two critical lines of both tests. Therefore we cannot reject the null hypothesis meaning that there is no significant structural change for model 1 (GDP).

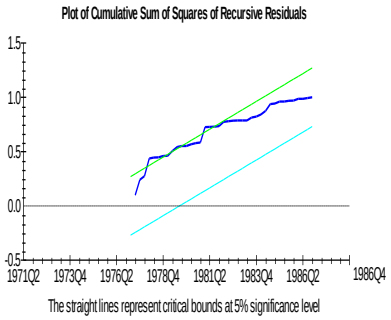
[5] A structural change is said to have taken place when a change is observed in the regression parameters of the estimable model. Any structural break is (by definition) accompanied by the change in relevant model coefficients (Page, 1954)

Figure 6.1:CUSUM AND CUSUMSQ for GDP Model

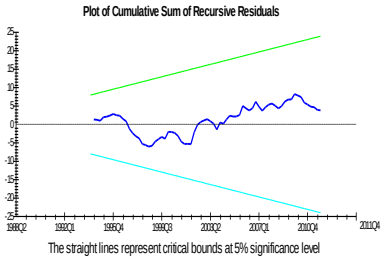
Model 1 GDP Before structural Break for Cusum



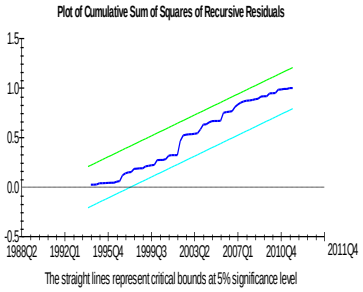
Model 1 GDP Before structural Break for Cusumsq



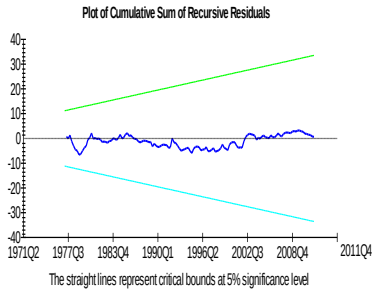
Model 1 GDP After structural Break for Cusum



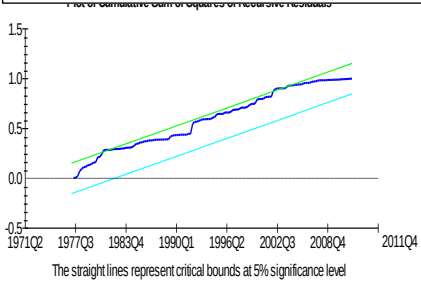
Model 1 GDP After structural Break for Cususq



Model 1 GDO CUSUM 1970-2011



Model 1 GDP Cusuq 1970-2011



6.6. CO-INTEGRATING VECTOR BEFORE STRUCTURAL BREAK FOR CPI MODEL 1970Q1-1986Q4

The CPI structural break test shows that there was structural break, and the result is accepted. From the graph in figure 6.2 before the break (1970Q1-1986Q4) CUSUM and CUSUMSQ were stable. After the break (1987Q1-2011Q4) CUSUM and CUSUMSQ became unstable. This indicates that a structural change has taken place in the regression parameters of the estimable model. The study therefore proceeds to estimate the two sub period's 1970Q1-1986Q4 and 1987Q1-2011Q4. Table **6.4** reports the co-integration test results before the structural break for model 2. The Maximal Eigen value statistics tests indicate 2 co-integrating relationship or vectors at the 5% level of significance. To determine the co-integrating test, we compare the Maximal Eigen value statistics to the critical value to determine the number of co-integrating equations. If the Maximal Eigen value statistics is greater than the critical value there is co- integrating equation. For example at rank 1 the trace statistics is 49.9816 greater than the critical value 33.6400. Thus, the trace statistics value tests indicate 2 co-integrating relationship or vectors at the 5% level of significance. Thus, the VECM is estimated using 2 co-integrating vectors.

Table 6.4: Co-integrating Vector for CPI Model before Structural Break 1970-1986Q4

Co-integration with unrestricted intercepts and no trends in the VAR

Co-integration LR Test Based on Maximal Eigenvalue of the Stochastic Matrix

****

63 observations from 1971Q2 to 1986Q4. Order of VAR = 5.

List of variables included in the co-integrating vector:

LNCPI LNRDCRED LNREXR LNRM2 IR

List of eigenvalues in descending order:

.54768 .45763 .23542 .13440 .015447

****

Null	Alternative	Statistic	95% Critical Value	90% Critical Value	
r = 0	r = 1	49.9816	33.6400	31.0200	
r<= 1	r = 2	38.5439	27.4200	24.9900	
r<= 2	r = 3	16.9114	21.1200	19.0200	
r<= 3	r = 4	9.0932	14.8800	12.9800	
r<= 4	r = 5	.98078	8.0700	6.5000	**Conclusion r = 2**

****

6.7. CO-INTEGRATING VECTOR AFTER STRUCTURAL BREAK FOR CPI MODEL 1987Q1-2011Q4

Table **6.5** is a report of the co-integrating vector results after the structural break for model 2 representing consumer's price index. The Maximal Eigen value test show that there are 2 co-integrating relationships or vectors at the 5% level of significance. To determine the co-integrating test, we compare the Maximal Eigen value statistics to the critical value to determine the number of co-integrating equations. If the Maximal Eigen value statistics is greater than the critical value; there is co-integrating equation. For example at rank 1 the Maximal Eigen value statistics is 45.5015 greater than the critical value 33.6400. Also at rank 2 the Maximal Eigen value statistics is greater than the critical value. Thus, the Maximal Eigen value statistics test indicates 2 co-integrating relationship or vectors at the 5% level of significance. Thus, the VECM is estimated using 2 co-integrating vectors.

Table 6.5: Co-integrating Vector for CPI Model after Structural Break

Cointegration with unrestricted intercepts and no trends in the VAR

Cointegration LR Test Based on Maximal Eigenvalue of the Stochastic Matrix

****

95 observations from 1988Q2 to 2011Q4. Order of VAR = 5.

List of variables included in the cointegrating vector:

LNRGDP LNREXR LNRM2 LNRDCRED IR

List of eigenvalues in descending order:

.38057 .25465 .14876 .10628 .0010550

****

Null	Alternative	Statistic	95% Critical Value	90% Critical Value	
r = 0	r = 1	45.5015	33.6400	31.0200	
r<= 1	r = 2	27.9210	27.4200	24.9900	
r<= 2	r = 3	15.3008	21.1200	19.0200	**Conclusion r = 2**
r<= 3	r = 4	10.6748	14.8800	12.9800	
r<= 4	r = 5	.10028	8.0700	6.5000	

6.8. LONG RUN ESTIMATE FOR CPI MODEL BEFORE STRUCTURAL BREAK 1970Q1-2011Q4

Table 6.6 shows the long run results of the effect of monetary policy on consumer's price index before the structural break in Nigeria. The long-run elasticity of the price level with respect to real domestic credit shows that a unit increase in real domestic credit induces a decrease in consumers' price level in the long-run by -.58457. This is not in line with my a

priori hypothesis which says that real domestic credit is positively related to CPI. Furthermore, nominal interest rate, and real broad money supply have a positive sign. Thus, a unit increase in nominal interest rate, and the real broad money supply induce increases in consumer price level in the long-run by .034898 and 2.7988 respectively. This is in line with my a priori sign of hypothesis 2 where increase in real broad money supply and interest rate led to increase in consumers price levels. The results show the response of CPI to the real effective exchange rate, it is strong and rather appreciative. A unit increase of real effective exchange rate leads to an increase in consumers' price level by .57565.

Table 6.6: Long Run Estimate for CPI Mod

Table 6.6: Long Run Estimate for CPI Model before Structural Break

Estimated Co-integrated Vectors in Johansen Estimation (Normalized in Brackets)

****

63 observations from 1971Q2 to 1986Q4. Order of VAR = 5, chosen r =2.

LNCPI LNREXR LNRM2 LNRDCRED IR

****

	Vector 1	Vector 2
LNCPI	-.31736	.84414
	(-1.0000)	(-1.0000)
LNREXR	-.18269	1.5838
	(.57565)	(-1.8762)
LNRM2	.88821	.71593
	(2.7988)	(-.84812)
LNRDCRED	-.44740	.49346
	(-1.4098)	(-.58457)
IR	.011075	.025779
	(.034898)	(-.030539)

****

LNCPI = .034898 ***IR*** +2.7988 ***LNRM2*** -.58457 ***LNRDCRED*** + .57565 ***LNREXR***

6.9. LONG RUN ESTIMATE FOR CPI MODEL AFTER STRUCTURAL BREAK 1987Q1-2011Q4

Table 6.7 represents the long run result for the effect of monetary policy on CPI after structural break in Nigeria. The long-run elasticity of the price level with respect to real domestic credit shows that a unit increase in real domestic credit induces increase in consumer price level in the long-run by .21643. Real domestic credit passed the test of significance with a positive sign; this is in line with my a priori hypothesis which says that real domestic credit is positively related to CPI. Furthermore, nominal interest rate, and real broad money supply have positive sign. Thus, a unit increase in nominal interest rate and the real broad money supply induce increases in consumers' price level in the long-run by 1.5111 and 5.1341 respectively. This is in line with my a priori sign of hypothesis 2 where increase in real broad money supply leads to increase in CPI. Similarly, a unit increase in real effective exchange rate leads to an increase in consumers' price level by 5.9865.

Table 6.7: Long Run Estimate for CPI Model after Structural Break

```
Estimated Cointegrated Vectors in Johansen Estimation (Normalized in Brackets)
     Cointegration with unrestricted intercepts and no trends in the VAR
*******************************************************************************
 95 observations from 1988Q2 to 2011Q4. Order of VAR = 5, chosen r =1.
 List of variables included in the cointegrating vector:
 LNCPI        LNREXR        LNRM2         RDCRED        IR
*******************************************************************************
             Vector  1
 LNCPI         .039196
             (  -1.0000)

 LNREXR     .23465
             (  5.9865)

 LNRM2      -.20124
             (   5.1341)

 RDCRED    -.84835
             ( .21643)

 IR              -.059228
             (   1.5111)

*******************************************************************************
```

6.10. SHORT RUN ESTIMATE FOR CPI MODEL BEFORE STRUCTURAL BREAK 1970Q1-1986Q4

The vector error correction regression estimate of the short-run dynamic specifications for the policy target CPI model 2 before the structural break is shown in **Table 6.8.** In model **2,** real broad money supply are positively sign at lags 1 and 4, but not statistically significant. This is in line with my a priori expectation which says that increase in real broad money supply will lead to increase in price levels. Real effective exchange rates has lag 3 as the only significant variable with a positive sign, but not statistically significant. Nominal interest rate at lags 1 and 2 has a negative sign. This is in line with my a priori sign, where interest rate is negatively related to consumers price level (CPI). However the short run does not tell us much about the effects of monetary policy on macroeconomic performance because they are adjustment

mechanism towards the long run equilibrium. The usefulness of the error correction models produces better short-run forecasts and hence provides the short-run dynamics essential to obtain long-run equilibrium.

Table 6.8 Short Run Result for CPI model before Structural Break

ECM for variable LNCPI estimated by OLS based on co-integrating VAR(5)
Dependent variable is Dlncpi
63 observations used for estimation from 1971Q2 to 1986Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
Intercept	-1.5217	.43453	-3.5018[.001]
dLNCPI1	.24771	.26404	.93818[.354]
dLNREXR1	-.33090	.12776	-2.5899[.013]
dLNRM21	.22880	.20772	1.1015[.077]
dLNRDCRED1	-.6034E-3	.046401	-.013004[.990]
dIR1	-.012071	.0084725	-1.4247[.162]
dLNCPI2	-.30054	.29977	-1.0026[.322]
dLNREXR2	-.16404	.15947	-1.0286[.310]
dLNRM22	-.083341	.24336	-.34245[.734]
dLNRDCRED2	-.049454	.043726	-1.1310[.265]
dIR2	-.0036585	.0095809	-.38185[.705]
dLNCPI3	.11876	.34868	.34059[.735]
dLNREXR3	.019877	.15106	.13158[.896]
dLNRM23	-.061510	.30617	-.20090[.842]
dLNRDCRE	-.045360	.035180	-1.2893[.205]
dIR3	.0018869	.0093710	.20135[.841]
dLNCPI4	.53129	.34179	1.5544[.128]
dLNREXR4	-.087394	.16709	-.52303[.604]
dLNRM24	.58490	.27787	2.1050[.042]
dLNRDCRED4	-.054215	.037847	-1.4325[.160]
dIR4	.8717E-3	.0078004	.11175[.912]
ecm1(-1)	.3180E-3	.035546	.0089473[.993]
ecm2(-1)	.13285	.035546	3.7376[.001]

R-Squared	.47711	R-Bar-Squared	.28953
S.E. of Regression	.035546	F-stat. F(22, 40)	1.6590[.081]
DW-statistic	2.0850	System Log-likelihood	412.8342

6.11. SHORT RUN RESULT FOR CPI MODEL AFTER STRUCTURAL BREAK 1987Q2 TO 2011Q4

The vector error correction regression estimates of the short-run dynamic specifications for the policy target CPI model 2, after the structural break is shown in **Table 6.9.** In model **2,** real broad money supply is positively sign at lags 1 and 4. This is in line with my a priori expectation which says that increase in real broad money supply will lead to increase in price levels, but is not statistically significant. Real domestic credit is positively sign at lags 1,2 and 4 indicating that increase in real domestic credit leads to increase in price level and real effective exchange rates are statistically not significant; they failed the test of significance with a negative sign. However, as mentioned earlier, the short run does not tell us much about the effects of monetary policy on macroeconomic performance because they are adjustment mechanism towards the long run equilibrium.

The coefficient of error correction terms for model 2 after the structural break had the right sign and is significant at 1% levels. The usefulness of the error correction models produces better short-run forecasts and hence provides the short-run dynamics essential to obtain long-run equilibrium. The diagnostic test obtained from the regression is quite impressive. Before the structural break the R square and adjusted R was 47 per cent 28 per cent respectively. After the break there was a dramatic increase in the R square and adjusted R to 68 per cent and 59 per cent for model 2. The F-statistics is significant in the conventional level. Durbin–Watson statistics shows an absence of auto correlation in the model.

Table 6.9 Short Run Result for CPI Mode 1 after Structural Break

ECM for variable LNCPI estimated by OLS based on co integrating VAR(5)

****

Dependent variable is dLNCPI

95 observations used for estimation from 1988Q2 to 2011Q4

****

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
Intercept	.20649	.10685	1.9325[.057]
dLNCPI1	.87311	.22612	3.8613[.000]
dLNREXR1	-.036112	.026530	-1.3612[.178]
dLNRM21	.33751	.22228	1.5184[.133]
dRDCRED1	.8179E-5	.5595E-5	1.4617[.148]
dIR1	.4679E-3	.0023093	.20262[.840]
dLNCPI2	-.32252	.28433	-1.1343[.260]
dLNREXR2	-.049131	.026125	-1.8806[.064]
dLNRM22	-.030656	.28573	-.10729[.915]
dRDCRED2	.6075E-5	.6756E-5	.89920[.372]
dIR2	-.0026402	.0021079	-1.2525[.214]
dLNCPI3	-.26217	.28041	-.93495[.353]
dLNREXR3	-.019256	.024857	-.77466[.441]
dLNRM23	-.44156	.28483	-1.5503[.125]
dRDCRED3	-.5668E-5	.6614E-5	-.85692[.394]
dIR3	.2251E-5	.0020011	.0011248[1.00]
dLNCPI4	.94913	.22176	4.2800[.000]
dLNREXR4	-.022103	.024576	-.89937[.371]
dLNRM24	.52860	.22278	2.3727[.020]
dRDCRED4	.1355E-4	.5777E-5	2.3455[.022]
dIR4	-.0026493	.0019501	-1.3585[.178]
ecm1(-1)	.071594	.034574	2.0708[.042]

****

R-Squared .68041 R-Bar-Squared .58847

S.E. of Regression .034574 F-stat. F(21, 73) 7.4007[.000]

DW-statistic 1.9999 System Log-likelihood -407.9859

6.11.1 Summary Results of CPI Model before & after Structural Break

Table **6.9.1** shows the summary results of the coefficients of CPI model. From the results the coefficient of real broad money supply has increased dramatically, after the structural break and the coefficient of the real domestic credit has become positive after the reform. There was also a significant change in the coefficient of nominal interest rate. This means that the structural reform in Nigeria brought changes, in real broad money supply, real domestic credit and real effective exchange rate, and also brought about change in consumers' price index

Table 6.9.1: CPI Model showing the Summary Results of Variables before & after SAP

Non Policy variable	**Policy variables Before Structural Break 1970Q1-1986Q4**	**Policy variables After Structural Break 1987Q1-2011Q4**
LNCPI	-1.0000	-1.0000
LNREXR	.57565	5.9865
LNRM2	.2.7988	5.1314
LNRDCRED	-.58457	.21643
IR	.034898	1.5111

6.12. STABILITY TEST RESULT FOR STRUCTURAL BREAK FOR CPI MODEL

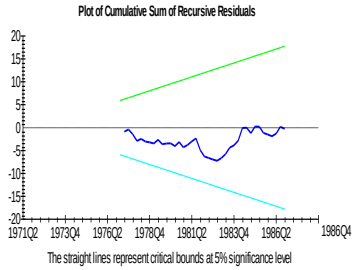
6.13. CUSUM AND CUSUMSQ PLOTS FOR CPI MODEL REGRESSIONS

The cumulative sum of residuals (CUSUM) and cumulative sum of squares of residuals (CUSUMSQ), are applied to examine the stability of the long-run coefficient together with short run dynamics. The results of CUSUM and CUSUM-SQ, for model 2 are presented in figure 6.2 below. The stability inference, which is made evident under the graphical interpretation of the CUSUM and CUSUM-SQ graphs, before structural break from 1970Q1-1986Q4, hold on the basis that the analysed equations are stable given that the recursive errors lie within the two critical lines of both tests, which indicates no evidence of any significant instability. However, after the structural break CUSUM-SQ plot of figure 6.2, 1987Q1-

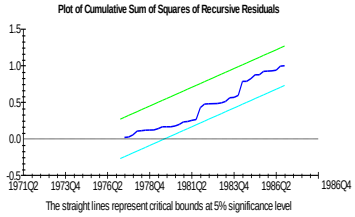
2011Q4, slightly crosses the critical bound indicating instability for CPI (inflation). The reason could be attributed to the reform which brought about devaluation specifically meant to encourage export and discourage import. The devaluation made import of goods to be very expensive, which resulted in inflation. After the structural adjustment programme from 1987Q1- 2011Q4, shows that the parameters of the analysed equation were not stable, given that the recursive errors cut across the critical lines for both tests. This means that the structural adjustment programme introduced in 1987, increased inflation in the Nigerian economy. Therefore we reject the null hypothesis meaning that there was a structural break.

Figure 6.2:CUSUM AND CUSUMSQ for CPI Model

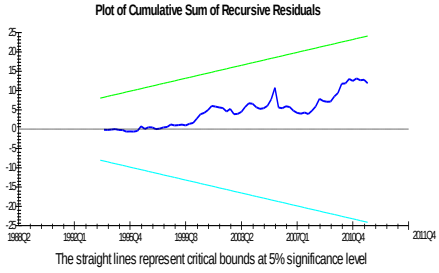
Model 2 CPI before Structural Break For Cusum



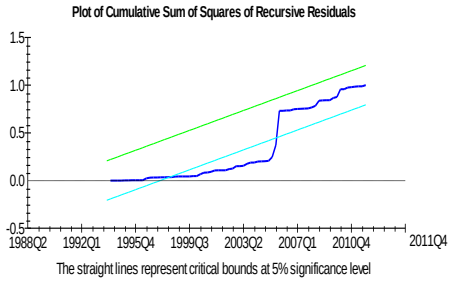
Model 2 CPI before Structural Break For Cususq



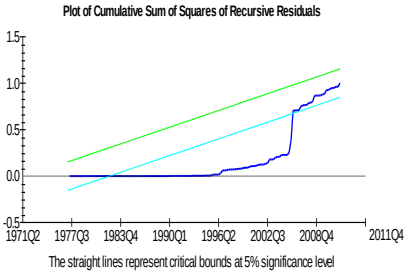
Model 2 CPI after Structural Break For Cusum



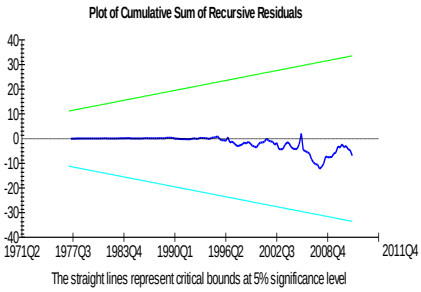
Model 2 CPI after Structural Break For Cusumsq



Model 2 CPI Cusum from1970- 2011



Model 2 CPI Cususq from1970- 2011



6.14. CO-INTEGRATION TEST FOR BOP MODEL BEFORE STRUCTURAL BREAK 1970Q1-1986Q4

The BOP structural break test shows that there is structural break, the result is accepted. From the graph in figure 6.3 before the break (1970Q1-1986Q4), CUSUM and CUSUMSQ were stable. After the break (1987Q1-2011Q4), CUSUM and CUSUMSQ became unstable. This indicates that a structural change has taken place in the regression parameters of the estimable model. The study therefore proceeds to estimate the two sub period's 1970Q1-1986Q4 and 1987Q1-2011Q4.

Table **6.10** reports the co-integration test results before the structural break for the BOP model. The Maximal Eigen value tests indicate 1 co-integrating relationship or vectors at the 5% level of significance. To determine co-integrating test, we compare the Maximal Eigen value statistics to the critical value to determine the number of co-integrating equations. If the Maximal Eigen value statistics is greater than the critical value; there is co- integrating equation. For example at rank 1 the Maximal Eigen value test is 61.90 greater than the critical value 33.64. Thus, the Maximal Eigen value tests indicate 1 co-integrating relationship or vector, at the 5% level of significance. Thus, the VECM is estimated using 1 co-integrating vectors.

Table 6.10: Co-integrating Vector for BOP model before Structural Break

Cointegration with unrestricted intercepts and no trends in the VAR
Cointegration LR Test Based on Maximal Eigenvalue of the Stochastic Matrix

****

62 observations from 1971Q3 to 1986Q4. Order of VAR = 6.
BOP LNREXR LNRM2 LNRDCRED IR
List of eigenvalues in descending order:
.63154 .30729 .21000 .13160 .073220

****

Null	Alternative	Statistic	95% Critical Value	90% Critical Value
r = 0	r = 1	61.9030	33.6400	31.0200
r<= 1	r = 2	22.7627	27.4200	24.9900
r<= 2	r = 3	14.6149	21.1200	19.0200
r<= 3	r = 4	8.7486	14.8800	12.9800
r<= 4	r = 5	4.7144	8.0700	6.5000

Conclusion r = 1

6.15. CO-INTEGRATION TEST FOR BOP MODEL AFTER STRUCTURAL BREAK1986Q1-2011Q4

Table **6.11** reports the co-integration test results after structural break for BOP model. The Trace tests indicate 3 co-integrating relationship or vectors at the 5% level of significance. Thus, the VECM is estimated using 3 co-integrating vectors.

Table 6.11: Co-integrating Vector for BOP Model after Structural Break

Co-integration with unrestricted intercepts and no trends in the VAR
Co-integration LR Test Based on Trace of the Stochastic Matrix

94 observations from 1988Q3 to 2011Q4. Order of VAR = 6.
List of variables included in the co-integrating vector:
BOP LNREXR LNRM2 LNRDCRED IR
List of eigenvalues in descending order:
.29529 .20556 .18962 .12303 .036515

Null	Alternative	Statistic	95% Critical Value	90%Critical Value	
r = 0	r>= 1	90.1303	70.4900	66.2300	
r<= 1	r>= 2	57.2329	48.8800	45.7000	
r<= 2	r>= 3	35.6016	31.5400	28.7800	
r<= 3	r>= 4	15.8376	17.8600	15.7500	
r<= 4	r = 5	3.4966	8.0700	6.5000	Conclusion r = 3

6.16. LONG RUN RESULT FOR BOP MODEL BEFORE STRUCTURAL BREAK 1970Q1-1986Q4

Table **6.12:** shows the long run result for model 3 before structural break. A unit increase in real domestic credit, led to an increase of BOP by 421.07 units and a unit point increase in real broad money supply induce increases in balance of payment in the long-run to 170.48 units. Nominal interest rate is positively related to BOP, this is against my hypothesis and a priori expectation which states that interest rate is negatively related to BOP. A unit increase of nominal interest rate, induces an increase in BOP in the long run to 67.08 units.

Table 6.12: Long Run Estimate for BOP Model before Structural Break

Estimated Cointegrated Vectors in Johansen Estimation (Normalized in Brackets)
Cointegration with unrestricted intercepts and no trends in the VAR

62 observations from 1971Q3 to 1986Q4. Order of VAR = 6, chosen r =2.
List of variables included in the co-integrating vector:
BOP LNREXR LNRM2 LNRDCRED IR

	Vector 1	Vector 2
BOP	-.0024912	.0015456
	(-1.0000)	(-1.0000)
LNREXR	.66010	.17464
	(264.9732)	(-112.9882)
LNRM2	.42472	.59778
	(170.4882)	(-386.7552)
LNRDCRED	1.0490	-.13791
	(421.0734)	(89.2279)
IR	.16710	-.26574
	(67.0759)	(171.9291)

***BOP* =** 67.08 **IR +** 170.49**LNRM2 +**421.07 **LNRDCRED** 264.97**LNREXR**

6.17. LONG RUN FOR BOP MODEL AFTER STRUCTURAL BREAK 1987Q1-2011Q4

Table **6.13** shows the long run result for BOP model, after structural break. A unit increase in real domestic credit, led to an increase of BOP by 358.57 units and a unit point increase in real broad money induces increases in balance of payment in the long-run up to of 2270.2 units. A unit increase in nominal interest rate induces BOP to reduce by -120.45 units. Nominal interest rate is negatively related to BOP, this is in line with my hypothesis and a priori expectation which states that interest rate is negatively related to BOP.

Table. 6.13: Long Run Result for BOP Mod after Structural Break

```
 Co-integrated Vectors in Johansen Estimation (Normalized in Brackets)
 Co-integration with unrestricted intercepts and no trends in the VAR
*********************************************************************************
 94 observations from 1988Q3 to 2011Q4. Order of VAR = 6, chosen r =3.
 List of variables included in the co-integrating vector:
 BOP         LNREXR       LNRM2        LNRDCRED      IR
*********************************************************************************
           Vector 1     Vector 2     Vector 3
 BOP      .6393E-4     -.1587E-3     -.8030E-4
          ( -1.0000)   ( -1.0000)   ( -1.0000)

 LNREXR    -.16519      -.042423       .24243
          (  2584.0)   (-267.2825)   (  3019.2)

 LNRM2      .13249       .36032       -.15762
          ( -2072.4)   (  2270.2)   ( -1962.9)

 LNRDCRED -.10269       .056912       -.68569
          (  1606.4)   ( 358.5730)   ( -8539.3)

 IR          .064802      -.019117     -.0032785
          ( -1013.7)   (-120.4468)   ( -40.8294)

*********************************************************************************
```

***BOP* =** -120.45 **IR +** 2270.2 **LNRM2 +** 358.57 **LNRDCRED** + 2584.0**LNREXR**

6.18. SHORT RESULT FOR BOP MODEL BEFORE STRUCTURAL BREAK 1970Q1-1986Q4

The short-run result for the BOP model before structural break is shown in **Table 6.14.** The result shows that nominal interest rate in all the lags are found to be statistically insignificant, but are all negatively sign. This is in line with my a priori expectation where nominal interest rate is negatively related to balance of payment (BOP). Real money supply at lags 1, 2, 4 and 5 are positively related to BOP. Furthermore, real domestic credit failed the statistical significance test, but at lag 2 and lag 5 real domestic credit, is positively sign in line with my hypothesis. The coefficient of error correction terms for BOP model, before the structural break had the right sign

and is significant at 1% levels. The diagnostic test obtained from the regression is quite impressive, for example the R square and adjusted R is 89 per cent and 81 per cent respectively for model 3 before the structural break. The F-statistics is significant in the conventional level. Durbin–Watson statistics shows absence of auto correlation in the model. However, the comments of the short run do not tell us much about the effects of monetary policy on the BOP, because they are only adjustment mechanism towards equilibrium.

6.19. SHORT RESULT FOR BOP MODEL AFTER STRUCTURAL BREAK 1987Q1-2011Q4

The short-run result for the BOP model after structural break is shown in **Table 6.15.** In BOP model, only real effective exchange rate at lag 3 shows a positive sign in line with my a priori sign which says that increase in real effective exchange rate leads to increase in BOP. Real effective exchange rate at lags 1, 2, 4 and 5 has negative sign which is against my a priori sign. The real domestic rates of interest in all the lags are found to be statistically insignificant, but are all negatively sign; this is in line with my a priori sign where nominal interest rate is negatively related to balance of payment (BOP). Real domestic credit at lags 1 and 2 are positively related to BOP indicating that an increase in real broad money supply leads to increase in BOP. The diagnostic test obtained from the regression shows that after the break the R square decrease from 89 per cent to 75 per cent.

Table 6.14: Short Run Result for BOP Model before Structural Break

ECM for variable BOP estimated by OLS based on co integrating VAR(6)

****

Dependent variable is dBOP

62 observations used for estimation from 1971Q3 to 1986Q4

****

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
Intercept	-838.9601	313.1479	-2.6791[.011]
dBOP1	.76769	.13909	5.5194[.000]
dLNREXR1	-182.4399	74.1855	-2.4592[.019]
dLNRM21	12.5846	76.5531	.16439[.870]
dLNRDCRED1	3.1586	24.3451	.12974[.898]
dIR1	-11.4288	7.9540	-1.4369[.160]
dBOP2	.017279	.12527	.13794[.891]
dLNREXR2	-45.4385	100.9368	-.45017[.655]
dLNRM22	58.5684	98.5125	.59453[.556]
dLNRDCRED2	31.6567	22.8539	1.3852[.175]
dIR2	-10.4602	9.0070	-1.1614[.254]
dBOP3	.19172	.13401	1.4306[.162]
dLNREXR3	25.0124	98.8374	.25307[.802]
dLNRM23	-104.3299	106.2835	-.98162[.333]
dLNRDCRED3	-47.7581	23.1807	-2.0603[.047]
dIR3	-5.6454	8.8305	-.63931[.527]
dBOP4	-1.1448	.15535	-7.3689[.000]
dLNREXR4	-4.9892	94.7666	-.052647[.958]
dLNRM24	26.7848	108.3135	.24729[.806]
dLNRDCRED4	-42.8800	24.0149	-1.7856[.083]
dIR4	-2.7886	8.0076	-.34824[.730]
dBOP5	.73235	.16593	4.4137[.000]
dLNREXR5	-27.0476	101.4289	-.26667[.791]
dLNRM25	38.0210	95.2829	.39903[.692]
dLNRDCRED5	-59.6318	25.8841	-2.3038[.027]
dIR5	1.5799	5.7333	.27557[.785]
ecm1(-1)	48.6831	20.2308	2.4064[.022]
ecm2(-1)	42.9780	20.2308	2.1244[.041]

****

R-Squared	.89137	R-Bar-Squared	.80511
S.E. of Regression	20.2308	F-stat. F(27, 34)	10.3332[.000]
DW-statistic	1.9330	System Log-likelihood	-4.7367

****

Table 6.15: Short Run Result for BOP Model after Structural Break

ECM for variable BOP estimated by OLS based on co-integrating VAR(6)

****

Dependent variable is dBOP

94 observations used for estimation from 1988Q3 to 2011Q4

****

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
Intercept	5.0341	820.5824	.0061348[.995]
dBOP1	.66723	.11273	5.9187[.000]
dLNREXR1	75.7198	77.5148	.97684[.332]
dLNRM21	50.8278	340.3659	.14933[.882]
dLNRDCRED	-17.2851	231.4500	-.074682[.941]
dIR1	-2.4057	6.8198	-.35276[.725]
dBOP2	-.32199	. 098632	-3.2645[.002]
dLNREXR2	67.1094	74.3699	.90237[.370]
dLNRM22	-65.1561	414.5990	-.15715[.876]
dLNRDCRE	-178.2374	283.9311	-.62775[.532]
dIR2	-2.4763	6.6187	-.37414[.710]
dBOP3	.19410	.10534	1.8426[.070]
dLNREXR3	76.3523	72.3928	1.0547[.295]
dLNRM23	-207.3941	409.1963	-.50683[.614]
dLNRDCRED3	143.3616	266.4696	.53800[.592]
dIR3	-4.7406	5.8069	-.81637[.417]
dBOP4	-1.0575	.12855	-8.2269[.000]
dLNREXR4	11.5680	70.2614	.16464[.870]
dLNRM24	-653.8691	406.3817	-1.6090[.112]
dLNRDCRED4	294.9049	268.7889	1.0972[.277]
dIR4	-5.5853	5.2382	-1.0663[.290]
dBOP5	.67589	.17352	3.8952[.000]
dLNREXR5	36.6298	72.0572	.50834[.613]
dLNRM25	-19.7570	365.4084	-.054068[.957]
dLNRDCRED5	-91.5680	246.3333	-.37172[.711]
dIR5	-2.8234	5.1986	-.54311[.589]
ecm1(-1)	163.3845	90.8996	1.7974[.077]
ecm2(-1)	227.8902	90.8996	2.5071[.015]
ecm3(-1)	130.9628	90.8996	1.4407[.154]

****

R-Squared .75293 R-Bar-Squared .64649

S.E. of Regression 90.8996 F-stat. F(28, 65) 7.0742[.000]

****

6.19.1 Summary Results of BOP Model before & after Structural Break

Table **6.16** shows the summary results of the coefficients of the variables. Under the two alternative sub periods as in tables 6.12 and 6.13 shows that the coefficients of the estimated regressions from both tables are not the same in the two sub periods. From the result the coefficient of real broad money supply has increased dramatically after the structural break and the coefficient of the real domestic credit slightly decreased after the break. There was significant change in the coefficient of interest rate; after the break nominal interest rate became negative meaning that increase in interest would reduce balance of payment deficit.

Table 6.16: BOP Model showing Summary Results before & after break

Non Policy variable	**Policy variables After Structural Break 1970Q1-1986Q4**	**Policy variables After Structural Break 1987Q1-2011Q4**
BOP	-1.0000	-1.0000
LNREXR	264.97	2584.0
LNRM2	170.49	2270.2
LNRDCRED	421.07	358.57
IR	67.0759	-120.45

6.20. STABILITY TEST RESULT FOR STRUCTURAL BREAK OF BOP MODEL

6.21. CUSUM AND CUSUMSQ PLOTS FOR BOP MODEL REGRESSIONS

The cumulative sum of residuals (CUSUM) and cumulative sum of squares of residuals (CUSUMSQ) are applied to examine the stability of the long-run coefficient together with short run dynamics. The results of CUSUM and CUSUM-SQ, for BOP model are presented in figure 6.3 below. The stability inference which is made evident under the graphical interpretation of the CUSUM and CUSUM-SQ graphs, before the structural break from 1970Q1-1986Q4, hold on the basis that the analysed equations are stable given that the recursive errors lie within the two critical lines of both test which indicate no evidence of any significant instability. However

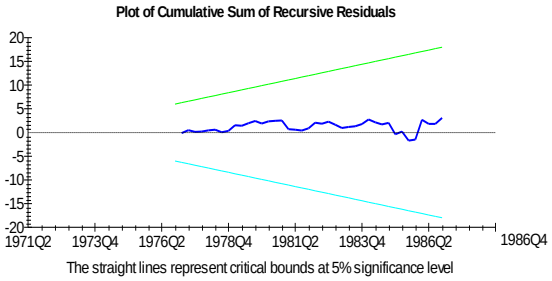
after the structural break (1987Q1-2011Q4), CUSUM-SQ plot slightly crosses the critical bound indicating instability for BOP. After the structural break from 1987Q1- 2011Q4 shows that the coefficients of the analysed equation were not stable given that recursive errors cut across the critical lines for both tests. This means that the structural adjustment programme introduced in 1987 bought changes to the external sector of the Nigerian economy. Therefore we reject the null hypothesis meaning that there was a structural break.

However, CUSUM and CUSUMQ tests have some weaknesses. For instance, if there is serial correlation problem between the data of the model, the explanatory power of model stability of CUSUM test is insufficient (Andrew, 1993; Yashchin, 1993). Therefore, if the model, allowing structural break, involves a constant term, CUSUM test produces more robust results.

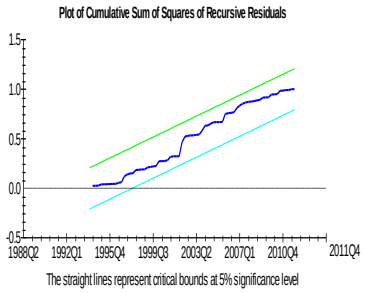
The CUSUM of squares test is more appropriate if you want to detect changes in the variance (rather than the conditional mean). For both problems (breaks in the mean / breaks in the variance) there are other tests which are usually more appropriate than the CUSUM or CUSUM of squares test .But depending on the model and hypothesis you want to test, another technique than CUSUM of squares might be more appropriate and also available in structural change. The limitation of CUSUM and CUSUM SQ tests is the inconvenience of having asymptotically a low level of coefficients instability but not at the entire vector of coefficients. To solve this problem, Ploberger, Krämer and Kontrus (1989) suggested that the parameters test should be based on the fluctuation test rather than the recursive residuals. A similar study was suggested by Sen (1980) for the case of simple regression model and by Ploberger (1983) for the case of fluctuation test.

Figure 6.3:CUSUM AND CUSUMSQ for BOP Model

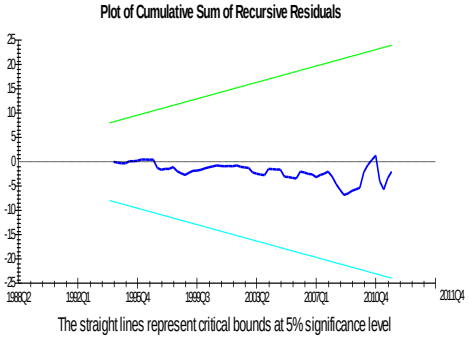
MODEL 3 BOP BEFORE STRUCTURAL BREAK CUSUM



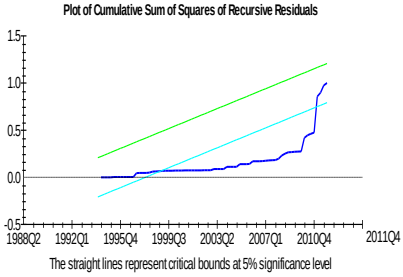
MODEL 3 BOP BEFORE STRUCTURAL BREAK CUSUSQ

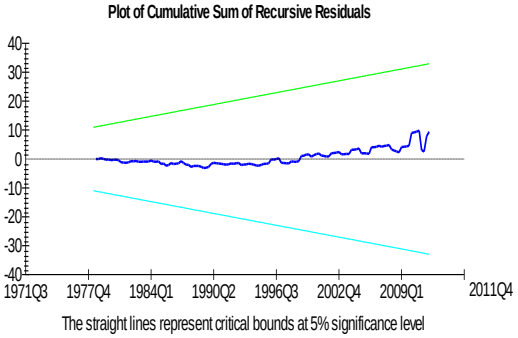


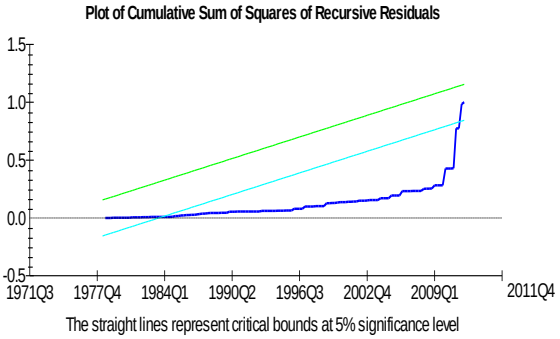
MODEL 3 BOP AFTER STRUCTURAL BREAK CUSUM



MODEL 3 BOP AFTER STRUCTURAL BREAK CUSUSQ







6.22. ESTIMATED EFFECTS OF MONETARY POLICY INNOVATIONS ON GDP, CPI &BOP

The three model GDP, CPI and BOP show 25 panels each of impulse response graphs indicating how innovations in monetary policy variables affect the growth of real domestic output, prices and the balance of payments position in Nigeria. The graphs display the effect (impulse response) of a one-standard deviation monetary policy shock defined as an exogenous, unexpected and temporary rise in the nominal interest rate, real broad monetary aggregate, real effective exchnage rate, and real domestic credit. Each panel illustrates the response of the non-policy variable [GDP, CPI and BOP] to its own one-standard deviation innovation which corresponds to a positive shock, the response of the non-policy variable to a one-standard deviation innovation in all the monetary policy variables (corresponding either to a positive or a negative shock), the response of each policy variable to its own one-standard error innovation, and the response of each policy variable to other policy variables. The analysis holds that a zero value is an indication of non-effect of monetary policy shock on the non-policy variables and as a result, the non-policy variable continues on the same path it would have followed, had there been no policy shocks in the system. A positive or negative value thus indicates that shocks would cause the variable to be above or below its natural path. The solid lines depict the estimated effects, while the dashed lines show the boundaries of a 95% confidence interval. The solid line is the point estimate while the dotted lines represent a one-standard error confidence bound around the point estimate. The standard errors are generated from a Monte Carlo simulation[6] of 10,000 draws. The sizes of the shocks and monetary policy innovation are measured by standard deviations of the corresponding orthogonal errors obtained from the model estimation. The impulse responses estimated for all three models support widely held conventional views of many macroeconomic dynamics.

[6] The term Monte Carlo was coined by S. Ulam and Nicholas Metropolis in reference to games of chance, a popular attraction in Monte Carlo, Monaco (Hoffman, 1998; Metropolis and Ulam, 1949).Moreover Monte Carlo simulation, or probability simulation, is a method used to understand the effect of risk and uncertainty in forecasting models, financial, project management and cost. When you develop a forecasting model – any model that plans ahead for the future – you make certain assumptions. These might be assumptions about the investment return on a portfolio, the cost of a construction project, or how long it will take to complete a certain task. Because these are projections into the future, the best you can do is estimate the expected value

Previous tests on structural break in this chapter have shown that the GDP model has no structural break. The study therefore rejects the occurrence of a break and would not analyse the impulse response of the two sub-periods, but would analyse the entire period from 1970Q1-2011Q4 for the GDP model. The structural break test for the CPI and BOP models show structural break for both models. Consequent upon this, the study analyse the two main sub-periods: from 1970Q1– 1986Q4 (this is the era before the structural adjustment programme in Nigeria) and from 1987Q –2011Q4 (this is the era after the structural adjustment programme in Nigeria) for the CPI and BOP models.

6.23. IMPULSE RESPONSES SHOCK TO GDP WITHOUT STRUCTURAL BREAK 1970Q1-1986Q4

The responses of real domestic output, nominal interest rate, real money supply, real domestic credit and real effective exchange rate to a one standard deviation negative shock to real GDP are presented in Figure **6.4.** It is evident that the response of real domestic output (real GDP) to an expansionary shock in the short-term interset rate measured by the nominal interest rate in Nigeria is favourable and statistically significant. The indication is that output responds steadily to an increase in the nominal interest rate in Nigeria. The response is rather slow for the very first quarter and gadually gains significant increases.

This result corroborates those of Chuku (2009) for the Nigerian economy, Eichenbaum (1992) for the US economy, Sims (1992) for OECD countries, Christiano, Eichenbaum and Evans (2002) for the US economy, Mbutu (2007) for Nigerian economy and Rafiq and Mallick (2008) for German. However this is against a priori expectation. France and Italian economies do not corroborate those earlier results found for Nigeria that a positive innovation in the minimum rediscount rate corresponds to a concessionary monetary policy with an insignificant choking effect on real GDP in the fisrt two quarters but thereafter it fizzles out in the third quarter with output returning to its natural path. Similarly contractionary monetary policy shocks in short term interest rate resulted in fall in output [Barachian and Crowe (2010) for U.S. economy, Mugume (2011) for Uganda].

One could have expected the positive rate of nominal interest rate effect on RGDP to open up a negative output gap that persists to make investment less attractive in Nigeria. The explanation could be credited to the fact that higher interest rates reduce consumer price inflation. In the restricted case the impact on inflation is larger in magnitude. While the slow output response to such a monetary shock may perharps reflect the usual marginal adjustment to policy innovation, the steady and significant response could be a reflection of the occurrence of significant changes in national income during the period that preceeds the monetary innovation. However, the time dynamics are perverse, especially when the rigid nature of domestic production techniques in the economy are brought into focus.

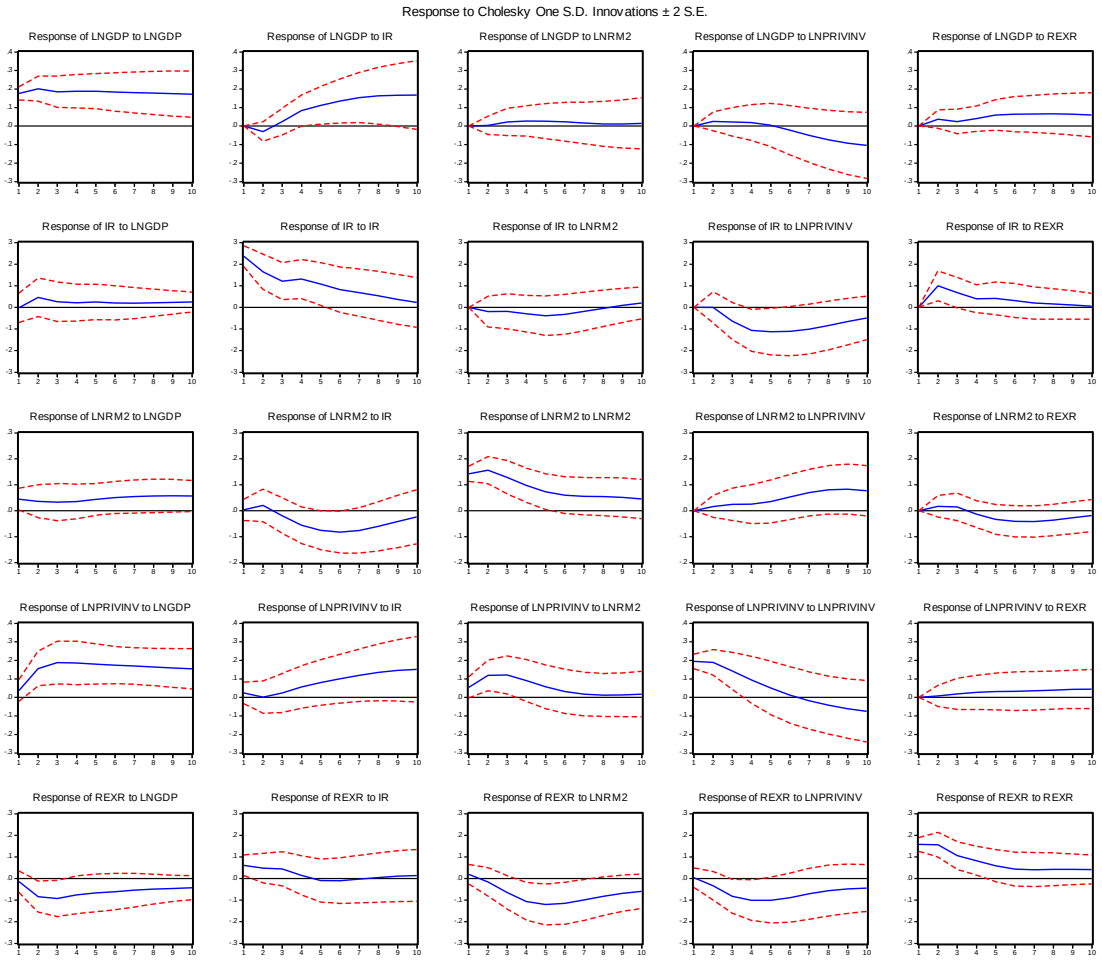
Measuring the output effects of monetary innovations in real broad money supply as measured by the (M_2) aggregate, the impulse-response results graphically revealed a sluggish response of real domestic output to a positive real money supply shock in over the entire quarter. Thus, it could be that economic agents adjust spending and investment gradually in response to the increased supply of cash balances in the economy. This result corroborates findings of Chuku (2009) in Nigeria where output rises quickly and significantly within the first three quarters, slows down and stabilizes. Not consistent with those found in Christiano et al (2002). Consistent with Ghosh (1996) for Ukraine.

The impulse-response also shows that when there is real effective exchange rate depreciation, real domestic output falls instanteneously and starts recovering at the third quarter. Practical experience shows that the results are not as expected because depreciation of the real effective exchange rate should make export cheaper, increase home production of exportable products, and hence increase world demand for locally produced commodities. Thus, our perverse result can be atrributed to weak domestic production base for tradables in the country.

Also, a positive shock in domestic credit in Nigera has a positive effect on domestic output. Such effect starts slowing down when it gets to the fifth quarter. The response of real domestic output to a positive shock in the real effective exchange rate, that is, a depreciation sluggishly increases output up to the second quarter and stabilizes there. Though, this response is insignificant, it is theoretically consistent for a small open economy like Nigeria with numerous trading partners in the world. The interest rate innovation is deemed to be an unanticipated tightening of monetary policy. This innovation seems particularly useful in analyzing policy

shocks as it converges quite quickly without fluctuations that may indicate effects other than a policy shift. The relationship between the interest rate and real domestic output is much stronger than that between real domestic output and levels of real money supply, real domestic credit and real effective exchange rate. This corroborates the study of Cortes and Kong (2007) in China where the interest rate outperforms the monetary aggregate M2 as a consistent indicator of monetary policy.

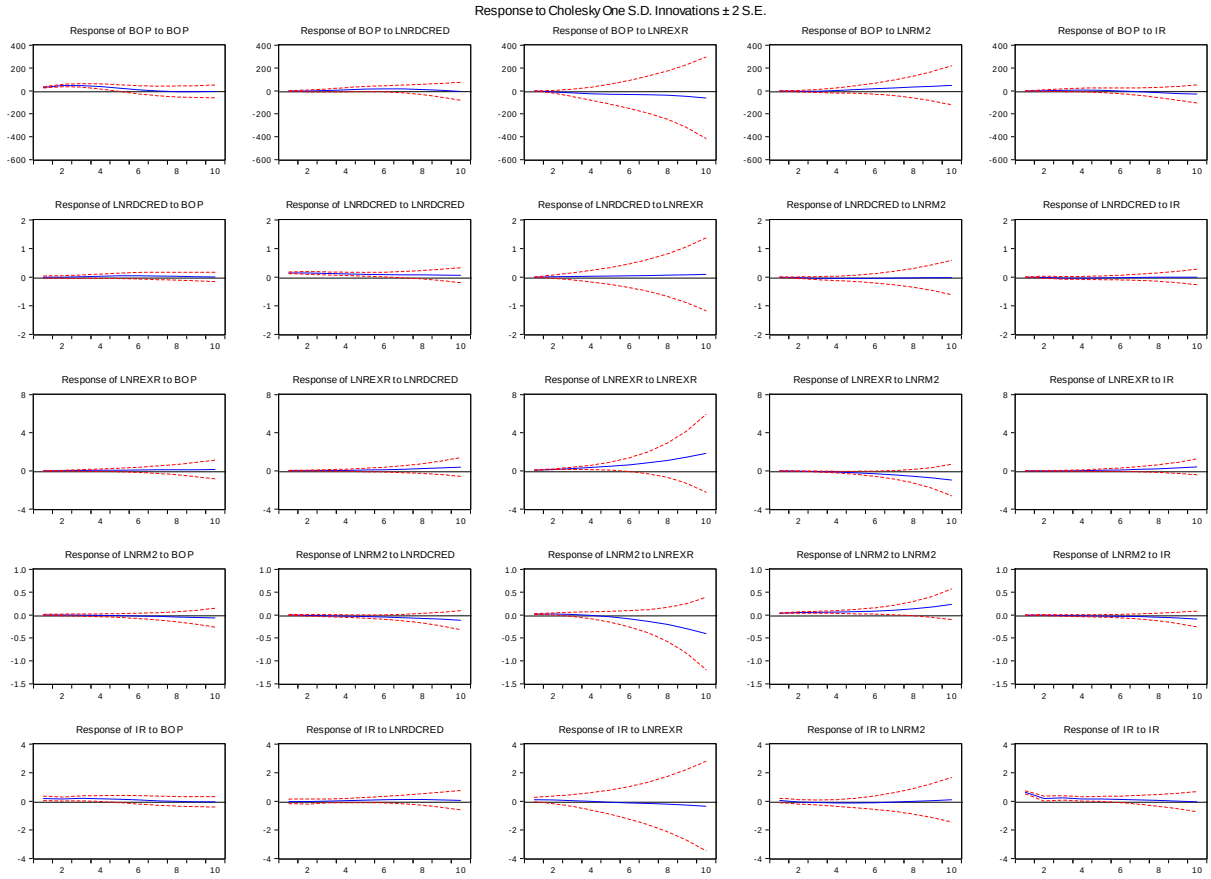
Figure 6. 4 Impulse Responses to One Standard Error Shock to GDP 1970Q1-2011Q4



6.24: IMPULSE RESPONSES SHOCK TO CPI BEFORE STRUCTURAL BREAK 1970Q1-1986Q4

The studies accept the CPI structural break test which shows that there was a structural break for the CPI models. The study, therefore examine the sub-periods for the CPI model. The responses of consumers' price index, nominal interest rate, real money supply, real domestic credit and real effective exchange rate to a one standard deviation shock to CPI before structural adjustment (SAP) are presented in Figure **6.5.** The impulse response results were generated from the residual of autoregressive estimation; included observations were 66 with a sample period from 1970Q1-1986Q4. In the structural period, the length period was too short for the software (Eview 7.0) to produce meaningful result hence the policy variables shows a zero value and the dotted lines which represent a one-standard error confidence bound around the point estimate all flattens out as shown in Figure **6.5.** The analysis holds that a zero value is an indication of non-effect of monetary policy shock on the non-policy variables and as a result, the non-policy variable continues on the same path it would have followed, had there been no policy shocks in the system. However the result of structural break for the CPI model is accepted.

Figure 6.5: Impulse Responses Shock to CPI before Structural Break 1970Q1-1986Q4



6.25. IMPULSE RESPONSES SHOCK TO CPI AFTER STRUCTURAL BREAK 1987Q1-2011Q4

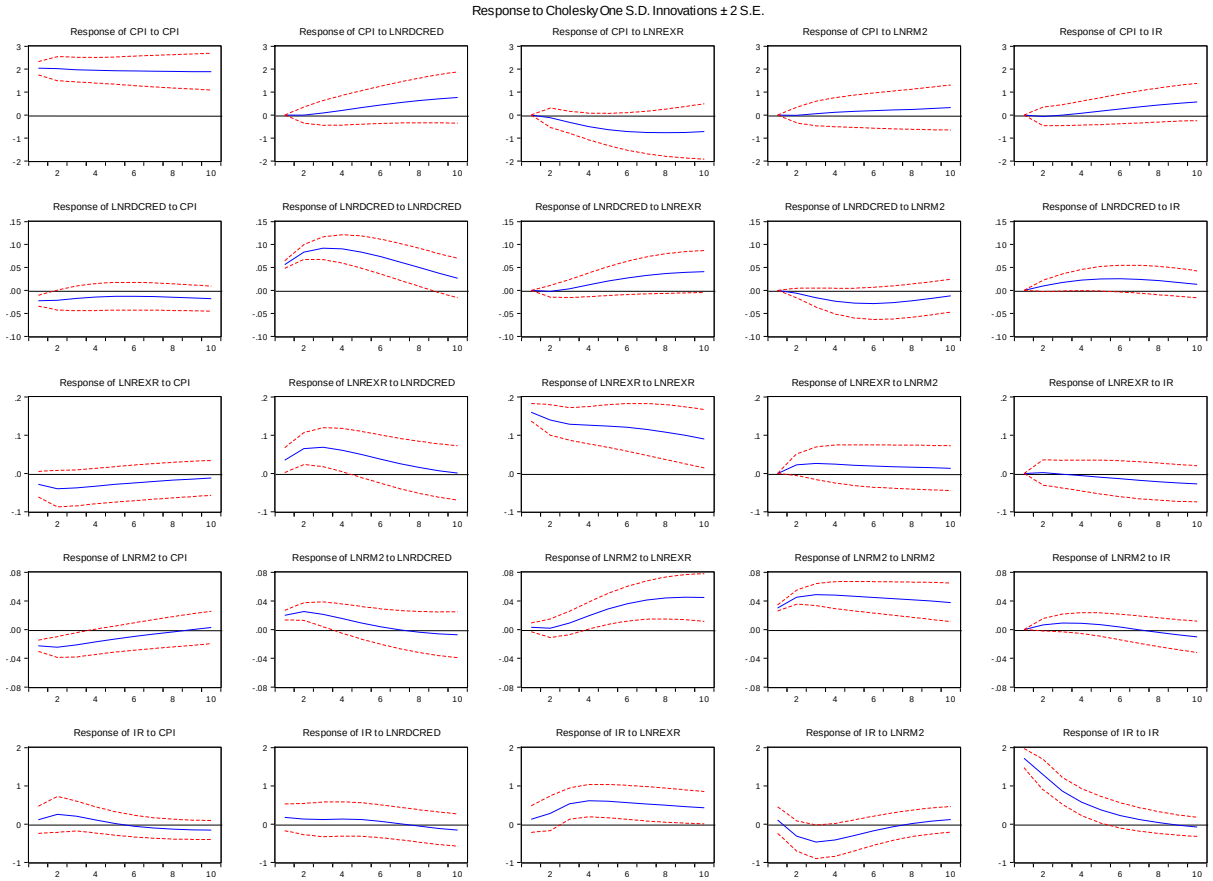
The response of consumers' price index, after structural adjustment programme are presented in figure 6.6.The price effect of monetary innovation in Nigaria has been captured by the response of CPI to real money supply. The results show, that the reponse of CPI positive shock in the real effective exchange rate is weak and rather unappreciative. By the impulse assessment, real effective exchnage rate depreciation leads to an instantenous decline in commodity prices and thereafter rises insignificantly after the fourth quarter and stabilizes for the remaining quarters. This is a deviation to real economic life situation, where depreciation is expected to increase world demand and hence put an upward pressure on the price level. The result did not corroborate with those of Mangani (2007) for Uganda; Al-Mashat and Billmeir (2007) for Egypt; Rotich et al (2007) for Kenya, where real effective exchange rate is the most single important variable in predicting prices.

According to the impulse-response result, an increase in real money supply instantenously generates sustanined increases in the price level in the country. The instantenous response of the price level to monetary impulses, is an indication that commodity prices in Nigeria are flexible as against the sticky price[7] phenomenon that underlies the Keynesian IS-LM models. This empirical finding is therefore, theoretically consistent with the monetary models of money supply. This corroborates the findings of Akinlo (2007) and Chuku (2009) that real money supply is a strong correlate of the price level in Nigeria. Regarding the response of the consumers' price index to real domestic credit, the impulse-response results show that real dometsic credit impacts positively on prices. This effect is far from being instantenous, but rather stabilizes when the seventh quarter is reached. A close examination of the response of CPI to a positive one standard deviation shock to interest rate represents an expansionary impulse. This effect is also accentuated in the VECM estimates. The immediate effect is a sharp and significant decline in the domestic price level which lasts for about one year. The significant effect of the nominal interest rate shocks on the consumer price level which brings into focus the "price puzzle effect"[8]. Do not uphold the results of Mbutu (2007) for Nigeria, Berument (2007) for the Turkish economy and those of Kahn *et al.* (2002) for the Israely economy following a shock to real money supply.

[7] Price stickiness is the tendency of prices to remain constant despite changes in supply and demand. Why don't firms change their prices more often in response to changes in demand or supply? Economists refer to this phenomenon as price "stickiness" or "rigidity," and some attribute it to Firms' unwillingness to pay the adjustment costs incurred in altering prices Goldberg and Hellerstein (2007).

[8] "Price puzzle": Against economic theory, tighter monetary policy is supposed to reduce prices, but rather prices are increasing. Money stock innovations in some time generate what is sometimes called the "price puzzle" – where monetary contraction apparently fails to produce any decline in prices. Money stock innovation demonstrates puzzling characteristics in response to shifts in monetary policy. This includes what is sometimes referred to as the "liquidity puzzle" – where monetary contraction apparently fails to produce any rise in interest rates.

Figure 6.6: Impulse Responses Shock to CPI after Structural Break 1987Q1-2011Q4

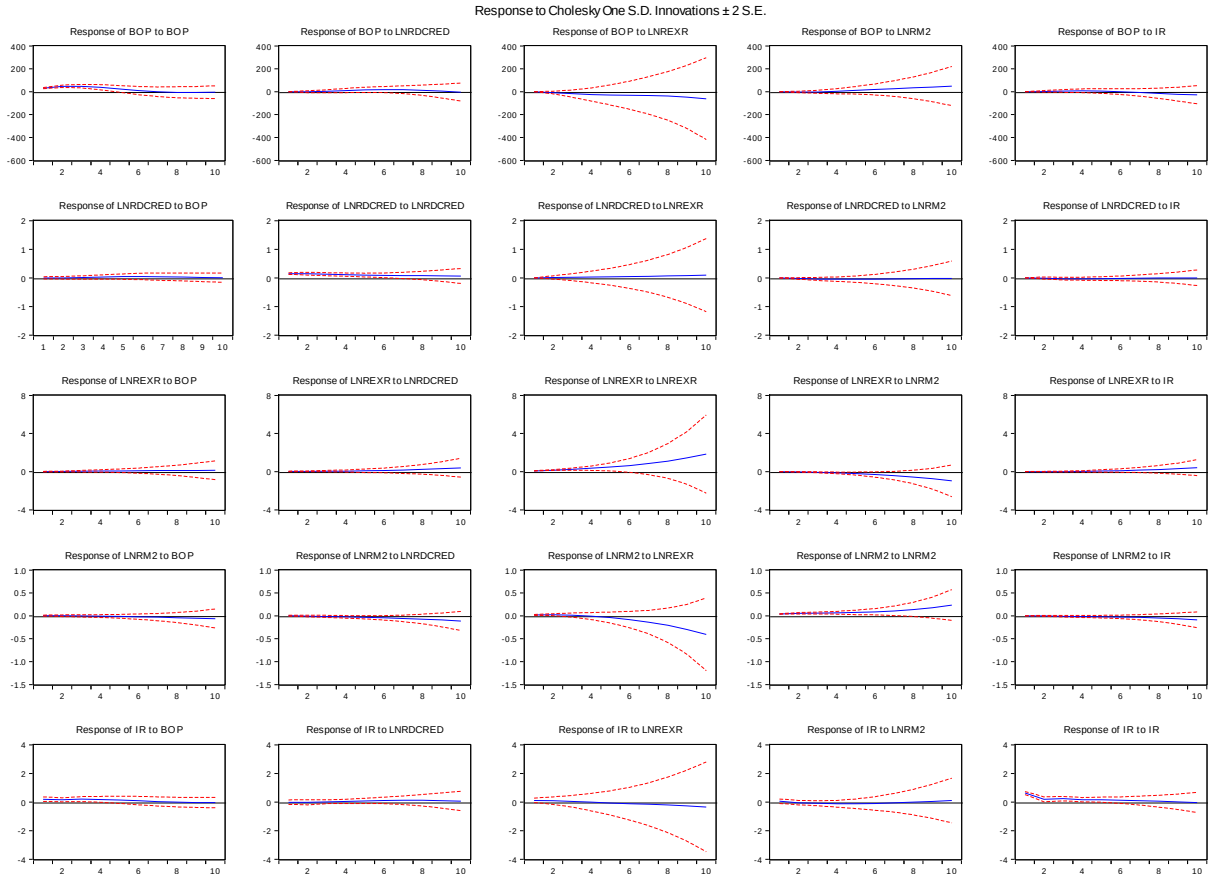


6.26. Impulse Responses Shock to BOP before Structural Break 1970Q1-1986Q4

The responses of balance of payment, nominal interest rate, real money supply, real domestic credit and real effective exchange rate to a one standard deviation shock to BOP before structural adjustment (SAP) are presented in Figure **6.7. T**he to the policy variables show a zero value as the solid line which is the point estimate and the dotted lines which represent a one-standard error confidence bound around the point estimate all flattens out as shown in Figure **6.7**. The impulse response results were generated from the residual of autoregressive estimation; included observations were 66 with a sample period from 1970Q1-1986Q4. Just like the CPI model before the structural period, the length period was too short for the software (Eview 7.0) to produce result, hence the policy variables show a zero value and the dotted lines which represent a one-standard error confidence bound around the point estimate, all flattens out as shown in Figure **6.7.** The analysis holds that a zero value is an indication of a non-effect

of monetary policy shock on the non-policy variables and as a result, the non-policy variable continues on the same path it would have followed, had there been no policy shocks in the system.

Figure 6.7: Impulse Responses Shock to BOP before Structural Break 1970Q1-1986Q4

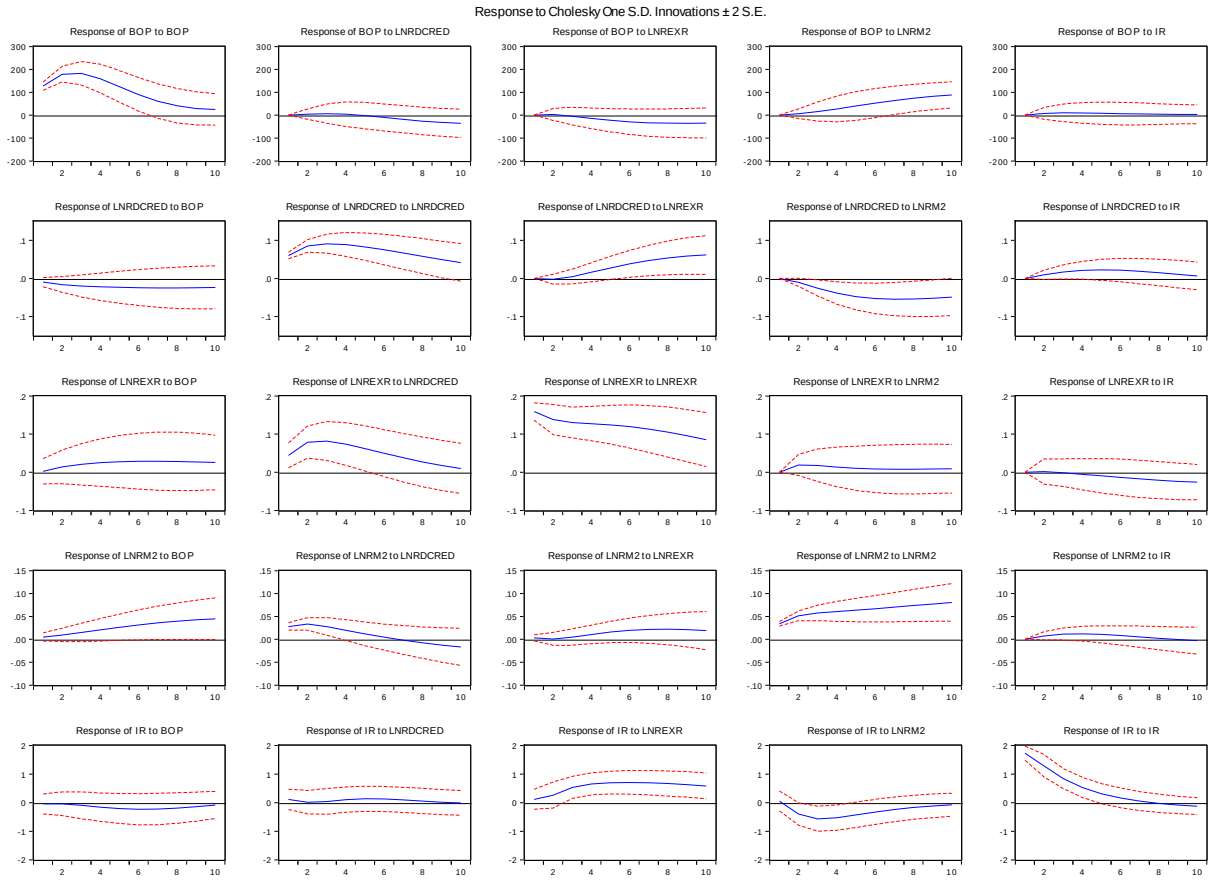


6.27. IMPULSE RESPONSES SHOCK TO BOP AFTER STRUCTURAL BREAK 1987Q1-2011Q4

Figure **6.8** shows the responses of the balance of payments after structural break to shocks in real effective exchange rate, real money growth, nominal rate of interest, and real domestic credit in Nigeria. Evidently, the results show a zero response of the balance of payments position to the policy variables over the study horizon for example the nominal interest rate flattens in the entire horizon. The impulses in this model, also show that the response of real domestic credit to a negative shock in the real effective exchange rate is negative for the entire horizon, only real broad money supply shows positive response. However, the impact was

negligible when policy variables were put together. We can see that the payments balance never improves, in response to the real effective exchange rate, real money supply and real domestic credit but rather deteriorates strongly after most part of the period. For over a period of 2 quarters, the confidence band for BOP spans zero. The result of structural break is accepted for the BOP model. Generally the result shows that monetary policy is not effective for the external balance.

Figure 6.8: Impulse Responses Shock in BOP after Structural Break 1987Q1-2011Q4



6.28. VARIANCE DECOMPOSITION ANALYSIS FOR GDP, CPI & BOP

The results of the variance decomposition reveal the dynamic behaviour of the variables in the VAR system of equations. In particular, we based the analysis of variance decomposition on the forecast error variance in order to capture the direction of which variable-effect is larger, so that we can subsequently make a distinction on the importance (significance) of variables in the system. The result of no structural break for the GDP model is accepted, having been confirmed in a structural break test. Therefore, we accept the null hypothesis which means that

there was no structural break in real domestic growth during the structural adjustment programme, introduced in 1987. From table **6.17** the results of variance decomposition of gross domestic product (GDP) without structural break 1970Q1-2011Q4, indicate that 65% of the forecast error variance of growth is accounted by previous growth of real domestic output, while the remaining 35% is accounted for by monetary policy variable shocks after the 8^{th} time period.

The variance decomposition of CPI before Structural break from 1970Q1-1986Q4, result is shown in table **6.18,** indicates that 47.1% variation is attributed to previous level of prices in the country in the 9^{th} time period, while 52.9% is explained by shocks in monetary variables. Furthermore, from table 6.19, the variance decomposition of CPI after the break (1970Q1-1987Q4) shows that 86.1% of the forecast error variance of price level is accounted by previous price level, while the remaining 13.9% is explained by shocks in the monetary variables. There was a dramatic increase in the 9^{th} time period after the structural break from 52.9% to 86.1% of what was accounted for by previous price level.

The variance decomposition of BOP before Structural Adjustment Programmed (SAP) from 1970Q1-1986Q4 result as shown in table **6.20,** shows that 35.4% innovation is accounted for by past payments balance in 9^{th} period and 64.6% is attributed to its determinants which include real effective exchange rate. The variance decomposition of BOP after SAP from 1987Q1-2011Q4 result as shown in table **6.21** shows that 82.2% innovation is accounted for by past payments balance in 9^{th} period and 17.8% is attributed to its determinants which include real effective exchange rate. There is dramatic increase in the 9^{th} period, after the break from 64.6% to 82.2%.

The relative importance of the monetary policy shock for fluctuations in each variable was weighted on the basis of the forecast error variance decompositions. The forecast error variance of output, prices and the real effective exchange rate at different forecast horizons can be attributed to the monetary policy shock. Under both the recursive and structural vector auto regressions, the monetary shock accounts for one third of the fluctuations in prices and a half of the fluctuations in the real effective exchange rate, while around a tenth of the fluctuations in output can be attributed to the monetary shock. Real domestic output is relatively sluggish in response to shocks in monetary policy variables. This is consistent with the impulse response

analysis in that, a monetary shock has significant impact on commodity price level and not on the payments position.

Table 6.17: Variance Decomposition of GDP without Structural Break 1970Q1-2011Q4

Period	S.E.	GDP	LNRDCRED	LNREXR	LNRM2	IR
1	0.176305	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.273034	96.10400	0.873421	1.826550	0.017806	1.178225
3	0.333010	95.44460	1.038490	1.759710	0.445468	1.311736
4	0.394685	90.54019	0.968903	2.271706	0.803471	5.415728
5	0.456059	84.85559	0.738115	3.425459	0.940168	10.04067
6	0.514840	79.31705	0.769453	4.235287	0.939551	14.73866
7	0.573215	73.94534	1.399356	4.719767	0.843338	19.09220
8	0.630010	69.22052	2.540065	5.012558	0.731922	22.49494
9	0.684119	65.24004	3.979048	5.121867	0.645082	25.01397
10	0.735038	61.99811	5.467217	5.107905	0.594485	26.83228

Table 6.18 Variance Decomposition of CPI before SAP 1970Q1-1986Q4

Period	S.E.	CPI	LNRDCRED	LNREXR	LNRM2	IR
1	0.034573	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.057991	99.29047	0.078132	0.494770	0.128961	0.007663
3	0.073443	97.00197	0.242513	0.890966	0.555147	1.309406
4	0.085204	93.28267	0.530190	0.710228	1.516847	3.960068
5	0.095543	88.05182	0.951988	0.882530	2.851945	7.261716
6	0.106096	81.15912	1.504346	2.784587	4.248258	10.30368
7	0.118408	72.18877	2.160212	7.787302	5.408347	12.45537
8	0.134629	60.76851	2.850338	17.02825	6.108589	13.24431
9	0.158288	47.15316	3.444791	30.78726	6.193824	12.42097
10	0.195085	32.87660	3.788399	47.49240	5.647922	10.19468

Table 6.19 Variance Decomposition of CPI after SAP 1987Q1-2011Q4

Period	S.E.	CPI	LNRDCRED	LNREXR	LNRM2	IR
1	2.043046	100.0000	0.000000	0.000000	0.000000	0.000000
2	2.875595	99.78211	0.000207	0.164492	0.000703	0.052486
3	3.505734	98.93731	0.066804	0.926527	0.033933	0.035432
4	4.050637	97.29457	0.313775	2.209762	0.117315	0.064580
5	4.550512	95.15089	0.766449	3.671229	0.220937	0.190495
6	5.021449	92.79210	1.401909	5.046867	0.328555	0.430564
7	5.470126	90.42136	2.172588	6.189275	0.437982	0.778791
8	5.899012	88.16950	3.022084	7.039104	0.554816	1.214493
9	6.308768	86.11193	3.896018	7.593489	0.688467	1.710091
10	6.699501	84.28378	4.748176	7.881227	0.850204	2.236617

Table 6.20: Variance Decomposition of BOP Model before break1970Q1-1986Q4

Period	S.E.	BOP	LNRDCRED	LNREXR	LNRM2	IR
1	30.48029	100.0000	0.000000	0.000000	0.000000	0.000000
2	55.84240	97.55027	0.060378	1.979405	0.245789	0.164156
3	75.54815	92.52658	0.156625	6.498164	0.182661	0.635967
4	89.11545	84.69268	1.219934	12.59528	0.302525	1.189579
5	98.71960	74.66241	3.416388	19.03185	1.581681	1.307670
6	107.3026	63.93887	5.766639	24.53058	4.656601	1.107310
7	116.9704	53.81306	6.950303	28.67691	9.222593	1.337140
8	129.0443	44.43090	6.579918	32.12543	14.33748	2.526269
9	145.0587	35.38622	5.310356	35.88203	19.04251	4.378888
10	167.3979	26.68459	4.042038	40.56619	22.63205	6.075130

Table 6. 21 Variance Decomposition of BOP Model 1987Q1-2011Q4 after SAP

Period	S.E.	BOP	LNRDCRED	LNREXR	LNRM2	IR
1	126.9002	100.0000	0.000000	0.000000	0.000000	0.000000
2	219.7682	99.75168	0.036737	0.017325	0.078027	0.116233
3	286.6534	99.35130	0.071664	0.034201	0.351389	0.191449
4	329.5623	98.54025	0.069351	0.204262	0.957121	0.229014
5	355.4281	97.02060	0.062676	0.578522	2.089722	0.248477
6	371.6919	94.55973	0.129473	1.140757	3.911902	0.258141
7	384.0218	91.11866	0.350196	1.812349	6.458100	0.260695
8	395.6895	86.89652	0.757522	2.488091	9.600372	0.257490
9	408.0257	82.24036	1.318229	3.084166	13.10719	0.250064
10	421.2614	77.50451	1.957268	3.561654	16.73650	0.240071

6.29. GRANGER CAUSALITY RESULT: EFFECTS OF MONETARY POLICY ON ECONOMIC PERFORMANCE

The Granger causality tests revealed that there is causality which only runs from monetary policy to macroeconomic performance at 5% level of significance. This implies that a change in monetary policy brings about a change in macroeconomic performance. Appendix E.3, Appendix F.3, and Appendix G.3, show the results of Granger causality and block exogeneity. Entries show the probabilities of accepting the null hypothesis, that the corresponding group of column variable did not Granger cross the row variable, based on Wald test statistics. All captures the p-values based on the block exogeneity test. The joint insignificance of column variables shows statistical significance at 5 % significance level. The overall results therefore reveal that we cannot reject the null hypothesis that there is no causal relationship between effects of monetary policy and macroeconomic performance.

6.30. COMPARING THE KEY 3 EQUATION WITH THE SVAR RESULT

This section compared the impulse response results from Structural VAR to the Key 3 equation. A critical look at coefficients of the long run result shows a positive result, a unit increase in real domestic credit induce increases in real domestic output in the long-run. Similarly result from impulse response to a positive shock in real domestic credit in Nigera also shows a positive effect on real domestic output. Such effects start slowing down when it gets to the fifth quarter. Thus, the equation model and the SVAR Model show that real domestic credit has positive result with real domestic output.

The result from equation of RGDP model without a structural break (1970Q1-2011Q4) shows that nominal interest rate is negatively related to RGDP. A unit increase of nominal interest rate induces a decrease in real RGDP. On the other hand, the RGDP result from impulse response of the SVAR without a structural break (1970Q1-2011Q4) indicates that real domestic output responds steadily to an increase in nominal interest rate in Nigeria. The response is rather slow for the very first quarter and gradually gains significant increases. The analysis holds that a zero value is an indication of non-effect of monetary policy shock on the non-policy variables.

Furthermore, equation model result without a structural break (1970Q1-2011Q4) shows a positive relationship between real money supply (M2) and real domestic output. The growth of real money supply was proportionate to the growth of real domestic growth; a unit growth increase in real money supply also leads to a unit growth in real domestic growth.On the other hand, results from SVAR result from impulse response of the SVAR without a structural break for the GDP model (1970Q1-2011Q4) revealed a sluggish response of real domestic output to a positive real money supply shock over the entire quarter. Thus, the equation model and the SVAR model shows that growth of real money supply has positive result with real domestic output. In addition equation model result without a structural break for GDP model (1970Q1-2011Q4) indicates that real effective exchange rate depreciation leads to increase in real domestic output. This result is in line with my a priori expectation. Similarly, a unit increase in real effective exchange rate leads to an increase in real GDP in the long run. On the other hand the impulse-response result of SVAR without a structural break for GDP (1970Q1-2011Q4)

shows that when there is real effective exchange rate depreciation, real domestic output falls instanteneously and starts recovering at the third quarter.

The second equation model for the long run results for the effect of monetary policy on CPI after structural break (1987Q1-2011Q4) The long-run elasticity of the price level with respect to real domestic credit, nominal interest rate, real effective exchange rate and real broad money supply have positive sign. Thus, a unit increase in all the variables induces increase in consumer price level. Results from impulse response of the SVAR without structural break (1970Q1-2011Q4) revealed the effect of an increase in real money supply, real domestic credit, real effective exchange rate and nominal interest rate on consumer price index generates sustanined increases in the price level in the country. The instantenous response of the price level to monetary impulses is an indication that commodity prices in Nigeria are flexible.

The result from impulse response of the SVAR before the structural break 1970Q1–1987Q4 for the CPI flattens out for nominal interest rate, real money supply growth, exchange rate and domestic output. The analysis holds that a zero value is an indication of non-effect of monetary policy shock on the non-policy variables. The results of impulse result from SVAR after the structural break 1987Q1- 2011Q4 reveal that the reponse of CPI positive shock in the real effective exchange rate is weak and rather unappreciative. By the impulse assessment, real effective exchnage rate depreciation leads to an instantenous decline in commodity prices and thereafter rises insignificantly after the fourth quarter and stabilizes for the remaining quarters. According to the impulse-response result, an increase in real money supply instantenously generates sustanined increases in the price level in the country. Result shows that dometsic credit impacts positively on prices. This effect is far from being instantenous, but rather stabilizes when the seventh quarter is reached.

For the BOP equation model, Nominal Interest rate is positively related to BOP, this is against hypothesis and a priori expectation which states that interest rate is negatively related to BOP. long run result for model 3 before structural break 1970Q1–1987Q4, shows that a unit increase in domestic credit, led to an increase of BOP and a unit point increase in money growth induce increases in balance of payment in the long-run.

The impulse response results on BOP shows the responses of the balance of payments to innovations and shocks in real effective exchange rate, real broad money supply, nominal rate of domestic interest and real domestic credit in Nigeria. The results of the impulse response functions differs from those of GDP growth and consumer price index, except for the domestic rate of ineterst. The graphs display nil effect (impulse response) of a one-standard deviation policy shock in the real money balances, and real domestic credit on Nigeria's balance of payments position. Evidently, the results show a zero response of the balance of payment position to the afforementioned variables over the study horizon. The impulses in this model also show that the response of broad money supply and real domestic credit to a negative shock in the real effective exchange rate is negative for the entire horizon. Even when the direct effects of nominal rate of nominal interest rate on BOP have been eliminated, it is evident that the payments balance never improves in response to the effective Naira-US$ exchange rate, real money balances and real domestic credit deteriorates gradually after most part of the period. The response of BOP to a positive BOP shock indicates a transitory effect and hence what can be described as a momentary scenery of this shock. For over a period of 2 quarters, the confidence band for BOP spans zero.

CHAPTER SEVEN

7.0 IN SAMPLE SIMULATION RESULTS

The previous chapter empirically assessed the effects of monetary policy on macroeconomics performance. The analysis of the result was based on interpretation of the coefficient of the long run and Error Correction Model (ECM) to determine the effects of monetary policy on macroeconomic performance. In addition, the analyses of the results were also based on the residual of the structural VAR model which is interpreted as linear combination of exogenous shock rather than identifying the autoregressive coefficients.

The main objective of this chapter is to simulate a small[9]–sized macroeconomic model of the Nigerian economy designed to be used for forecasting, counterfactual analysis and policy analysis. The simulation results were generated from the coefficient of the estimated model using system equation (three-stage least square, software is E-Views7.0). Forecasts are made from regression or other statistical equations. The result of the three-stage least square is presented below before proceeding to simulation. Previous tests on structural break in chapter six have shown that there was a structural break in CPI and BOP models and the results are accepted, hence the structural break test will not be carried out again in this chapter. Consequent upon this, the study proceeds to analyse the two main sub-periods: from 1970Q1–1986Q4 (this is the era before the structural adjustment programme in Nigeria) and from 1987Q1–2011Q4 (this is the era of the structural adjustment programme in Nigeria). Moreover, the structural models such as three stage least square (3-SLS) need stationary variables to be correct. This study therefore, proceeds to carry out stationary test before estimating the three stage least square.

[9] An economy is assumed to be small and open when the activities and prices in the country are affected by conditions in world markets where its own price own influence is minimal. Furthermore, the country is assumed to be a price taker for its exports of primary commodities Kwack et al (1989).

7.1 STATIONARY TEST FOR THE THREE STAGE LEAST SQUARE BEFORE & AFTER THE STRUCTURAL BREAK

Table, 7.0 and 7.0.1 present the stationary test before estimating the three stage least square. The criterion for selecting stationarity is to compare the critical value of the ADF with the test statistics of the ADF. It is stationary if the test statistics of the ADF is greater than the critical value of the ADF. In **table 7.0 and 7.01** at levels the critical values are greater than the test statistics of all the variables. For example, the test statistics for CPI is -1.0637 less than the critical value -3.4571 at level. After first difference the test statistics is now -5.1886 greater than the critical value -3.4824. All the variables are stationary after first difference, because their test statistics are all greater than their critical values. In table **7.0.1**, all the variables are not stationary at levels because their test statistics are less than their critical values, and after first difference, all the variables became stationary. All the variables were logged, except interest rate which was already in per centage. Equally, the CPI and BOP was not logged, therefore, they are not directly comparable. In fact, if we take the coefficient effects of a lagged log of a variable on a lagged log of another variable the effect is elasticity. So technically we cannot compare the magnitude of these effects as CPI and BOP is not log, while real money growth, real domestic credit and real effective exchange rate are lagged log.

Table 7.1 ADF Stationary Test for 3-Stage Least Square before Structural Break

	At level			At First Difference		
variable	With constant & Trend		Order of integration	With constant & Trend		Order of integration
	Test statistics	Critical ,Value		Test statistics	Critical Value	
CPI	-1.0637	-3.4812	1(0)	-5.1886	-3.4824	1(1)
LNREXR	-1.6671	-.2.9077	1(0)	.46301	-3.4824	1(1)
REXR	-2.7646	-2.9077	1(0)	-2.0122	-3.4824	1(1)
LNRM2	-.15132	-3.4812	1(0)	-4.8326	-3.4824	1(1)
IR	-1.7578	-2.9077	1(0)	-12.1078	-3.4824	1(1)
LNRDC	-1.7009	-3.4812	1(0)	-6.4521	-3.4824	1(1)
LNGDP	-2.0497	-3.4812	1(0)	-8.5729	-3.4824	1(1)
Bop	-1.5327	-3.4812	1(0)	-3.4595	-2.9084	1(1)

Table7.1.1 ADF Stationary Test for 3-Stage Least Square after Structural Break

	At level			At First Difference		
variable	With constant & Trend		Order of Integration	With constant & Trend		Order of Integration
	Test statistics	Critical Value		Test statistics	Critical Value	
CPI	-.021734	-3.4571	1(0)	-8.8489	-3.4576	1(1)
LNREXR	-1.8483	-3.4571	1(0)	-9.2998	-3.4576	1(1)
LNRM2	-1.5353	-3.4571	1(0)	-5.5754	-3.4576	1(1)
IR	-3.1998	-3.4571	1(0)	-9.3396	-3.4576	1(1)
LNRDC	-1.0087	-3.4571	1(0)	-5.0006	-3.4576	1(1)
LNGDP	-3.3763	-3.4571	1(0)	-11.2357	-3.4576	1(1)
Bop	-2.4254	-3.4571	1(0)	-5.6567	-3.4576	1(1)

7.2: 3-STAGE LEAST SQUARE FOR GDP MODEL WITHOUT STRUCTURAL BREAK 1970Q1-2011Q4

Previous tests on structural break in this chapter have shown that the GDP model has no structural break. The study therefore rejects the occurrence of a break and would not analyse the two sub-periods for the three stage least square, but would analyse the entire period from 1970Q1-2011Q4.The three-stage least squares estimation without, a structural break for the GDP model is shown in **Table 7.1**. All the variables were solved as a system equation and some of the variables were statistically significant, and properly sign in line with the study a priori expectation. Real domestic credit and real effective exchange rate is not statistically significant, but is properly sign in line with the study a priori expectation.

A unit increase real broad money supply induces, an increase in real GDP, the real broad money supply is correctly sign and statistically significant. It is evident that the response of real domestic output (RGDP) to an increase in the nominal interest rate in Nigeria is favourable and statistically significant. The indication is that output responds steadily to an increase in the nominal interest rate in Nigeria. The result of nominal interest rate corroborates with the result of the impulse response of this study in chapter six. The result corroborates those of Mbutu (2007) and Chuku (2009) for the Nigeria economy, and Rafiq and Mallick (2008) for the German economy. The diagnostic tests obtained from the three-stage least squares estimation were quite impressive. For example the R square and adjusted R for the GDP in the system was 68 per cent and 56 per cent respectively.

Table7.2: 3-Stage Least Square for GDP model without Structural Break 1970Q1-2011Q4

System: UNTITLED
Estimation Method: Three-Stage Least Squares
Date: 03/26/14 Time: 14:30
Sample: 1970Q2 2011Q4
Included observations: 167
Total system (balanced) observations 501
Linear estimation after one-step weighting matrix

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.001396	0.022731	0.040577	0.7315
C(2)	0.023067	0.042077	0.548209	0.3616
C(3)	0.685124	0.854725	0.801572	0.0032
C(4)	0.442520	0.439644	1.006543	0.3147
C(5)	0.021211	0.087981	0.241090	0.0056
C(6)	1.464141	1.257049	1.164745	0.2447
C(7)	-2.164692	2.304356	-0.939391	0.0480
C(8)	-17.32424	46.80951	-0.370101	0.0015
C(9)	-11.81875	24.07734	-0.490866	0.0037
C(10)	-3.665509	4.818335	-0.760742	0.0072
C(11)	85.87571	93.43413	0.919104	0.0000
C(12)	-109.4865	171.2786	-0.639231	0.0000
C(13)	-2635.657	3479.266	-0.757533	0.0091
C(14)	1319.115	1789.625	0.737090	0.4614
C(15)	-279.5898	358.1381	-0.780676	0.4354

Determinant residual covariance	24026.31

Equation: D1LNRGDP = C(1) + C(2)*D1LNRDC + C(3)*D1LNRM2 + C(4) *D1LNREXR + C(5)*D1IR
Instruments: D1LNRGDP(-1) D1LNRM2(-1) D1LNREXR(-1) D1LNRDC(-1) D1IR(-1) D1CPI(-1) D1BOP(-1) C
Observations: 167

R-squared	0.679953	Mean dependent var	0.788280
Adjusted R-squared	0.560322	S.D. dependent var	0.332330
S.E. of regression	0.126106	Sum squared resid	6.796234
Durbin-Watson stat	2.073961		

Equation: D1CPI = C(6) + C(7)*D1LNRDC + C(8)*D1LNRM2 + C(9) *D1LNREXR + C(10)*D1IR
Instruments: D1LNRGDP(-1) D1LNRM2(-1) D1LNREXR(-1) D1LNRDC(-1) D1IR(-1) D1CPI(-1) D1BOP(-1) C
Observations: 167

R-squared	0.656833	Mean dependent var	1.090299
Adjusted R-squared	0.614606	S.D. dependent var	1.984704
S.E. of regression	8.906260	Sum squared resid	7726.820
Durbin-Watson stat	1.982404		

Equation: D1BOP = C(11) + C(12)*D1LNRDC + C(13)*D1LNRM2 + C(14) *D1LNREXR + C(15)*D1IR
Instruments: D1LNRGDP(-1) D1LNRM2(-1) D1LNREXR(-1) D1LNRDC(-1) D1IR(-1) D1CPI(-1) D1BOP(-1) C
Observations: 167

R-squared	0.667571	Mean dependent var	14.70491
Adjusted R-squared	0.639117	S.D. dependent var	118.5828
S.E. of regression	513.3297	Sum squared resid	42688196
Durbin-Watson stat	1.882462		

7.3: 3-STAGE LEAST SQUARES FOR CPI & BOP MODELS BEFORE STRUCTURAL BREAK 1970Q1-1986Q4

The previous structural break test for the CPI and BOP models show structural break for both models and the test is accepted. Consequent upon this, the study proceeds to analyse the sub-periods of the structural break for both models from 1970Q1–1986Q4. The three-stage least squares estimation before the structural break, is shown in **Table 7.2**. From the equation of consumers' price index, before the structural break, all the equations as a system were all statistically insignificant, except the real effective exchange rate. Real broad money supply and real domestic credit had the wrong sign against my a priori expectation. For the BOP equation only real effective exchange rate is statistically significant. The likely reason for this is that other monetary variables do not have influence on the external sector of the economy. The diagnostic tests obtained from the three-stage least squares estimation are impressive. The R square and adjusted R for the CPI before the break is 54 per cent and 52 per cent respectively, while, the R square and adjusted R for the BOP is 38 and 34 per cent respectively.

Table7.3: 3-Stage Least Squares for CPI & BOP Models before Break 1970Q1-1986Q4

System: UNTITLED
Estimation Method: Three-Stage Least Squares
Date: 03/26/14 Time: 13:50
Sample: 1970Q2 1986Q4
Included observations: 67
Total system (balanced) observations 201
Linear estimation after one-step weighting matrix

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.008756	0.019280	0.454155	0.6502
C(2)	-1.13E-07	3.26E-05	-0.003458	0.9972
C(3)	0.103944	0.570011	0.182354	0.0055
C(4)	0.209846	0.192175	1.091957	0.2763
C(5)	-0.059268	0.045553	-1.301081	0.1948
C(6)	0.025911	0.006657	3.892245	0.0001
C(7)	-5.23E-06	1.13E-05	-0.464721	0.6427
C(8)	-0.196013	0.196810	-0.995954	0.3206
C(9)	0.020279	0.066353	0.305625	0.0004
C(10)	0.321312	0.015728	1.990826	0.7648
C(11)	7.003776	6.969357	1.004939	0.0163
C(12)	-0.002355	0.011791	-0.199727	0.0161
C(13)	-229.9029	206.0453	-1.115788	0.2660
C(14)	0.850389	69.46649	0.012242	0.0009
C(15)	9.966712	16.46636	0.605277	0.5457
Determinant residual covariance		0.037856		

Equation: D1LNRGDP = C(1) + C(2)*D1RDC + C(3)*D1LNRM2 + C(4) *D1LNREXR + C(5)*D1IR
Instruments: D1LNRGDP(-1) D1LNRM2(-1) D1LNREXR(-1) D1RDC(-1) D1IR(-1) D1CPI(-1) D1BOP(-1) C
Observations: 67

R-squared	0.681080	Mean dependent var	0.004099
Adjusted R-squared	0.664698	S.D. dependent var	0.112541
S.E. of regression	0.124035	Sum squared resid	0.953845
Durbin-Watson stat	2.178497		

Equation: D1CPI = C(6) + C(7)*D1RDC + C(8)*D1LNRM2 + C(9) *D1LNREXR + C(10)*D1IR
Instruments: D1LNRGDP(-1) D1LNRM2(-1) D1LNREXR(-1) D1RDC(-1) D1IR(-1) D1CPI(-1) D1BOP(-1) C
Observations: 67

R-squared	0.541908	Mean dependent var	0.223582
Adjusted R-squared	0.522353	S.D. dependent var	0.392723
S.E. of regression	0.042826	Sum squared resid	0.113712
Durbin-Watson stat	1.782313		

Equation: D1BOP = C(11) + C(12)*D1RDC + C(13)*D1LNRM2 + C(14) *D1LNREXR + C(15)*D1IR
Instruments: D1LNRGDP(-1) D1LNRM2(-1) D1LNREXR(-1) D1RDC(-1) D1IR(-1) D1CPI(-1) D1BOP(-1) C
Observations: 67

R-squared	0.375809	Mean dependent var	3.997463
Adjusted R-squared	0.343913	S.D. dependent var	44.07282
S.E. of regression	44.83557	Sum squared resid	124634.2
Durbin-Watson stat	0.858509		

7.4: 3-STAGE LEAST SQUARES FOR CPI & BOP MODELS AFTER STRUCTURAL BREAK 1987Q1-2011Q4

Table 7.3 Presents the result of the three-stage least square, after the break (1986Q1-2011Q4) for the CPI and BOP models. For the CPI model, only the real effective exchange rate is statistically significant. Real money supply is statistically significant and had a positive sign which corroborate with my a priori expectation, indicating that increase in real broad money supply will lead to an increase in price level. The result after the structural break shows that there was a dramatic change in the coefficient of money supply, the real broad money supply became positive and statistically significant. There was a dramatic change in real effective exchange after the break; it became significant with the correct sign. For the BOP equation only real effective exchange rate was statistically significant, while domestic credit and interest rate were statistically insignificant. Although real broad money supply was not statistically significant, it had a positive sign indicating that increase in money supply will increase the BOP deficit. The diagnostic tests obtained from the three-stage least squares estimation are quite impressive. Before the break, the R square and adjusted R for the CPI was 54 and 52 per cent, and after the break there was a dramatic increase to 74 and 74 per cent respectively. For the BOP before the break the R square and adjusted R was 37 and 34 per cent respectively, but after the break the R square and adjusted R for the BOP increased tremendously to 55 and 53 per cent respectively.

Table7.4 Three- Stage Least Square after Structural Break 1986Q1-2011Q4

System: UNTITLED
Estimation Method: Three-Stage Least Squares
Date: 03/26/14 Time: 15:01
Sample: 1987Q2 2011Q4
Included observations: 99
Total system (balanced) observations 297
Linear estimation after one-step weighting matrix

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.1758246	1.026452	-0.130470	0.6601
C(2)	0.016196	0.107701	0.130160	0.6604
C(3)	0.583992	1.741612	0.622407	0.0042
C(4)	0.135186	1.052238	0.128475	0.6757
C(5)	0.017433	0.045597	0.382330	0.0725
C(6)	41.84773	28.31940	1.477705	0.1406
C(7)	-4.149697	2.908472	-1.426762	0.1548
C(8)	42.37293	47.03218	0.900935	0.0000
C(9)	13.29138	28.41566	0.467748	0.0043
C(10)	-0.797589	1.231353	-0.647734	0.5177
C(11)	5101.220	7543.181	0.676269	0.4994
C(12)	-518.5199	774.7033	-0.669314	0.5038
C(13)	6146.996	12527.53	0.650327	0.0562
C(14)	5141.983	7568.821	0.679364	0.0060
C(15)	41.49527	327.9842	0.126516	0.8994

Determinant residual covariance 68211.86

Equation: D1LNRGDP = C(1) + C(2)*LNRDC1 + C(3)*D1LNRM2 + C(4) *D1LNREXR + C(5)*D1IR
Instruments: D1LNRGDP(-1) D1LNRM2(-1) D1LNREXR(-1) LNRDC1(-1) D1IR(-1) D1CPI(-1) D1BOP(-1) C
Observations: 99

R-squared	0.695227	Mean dependent var	0.080194
Adjusted R-squared	0.674811	S.D. dependent var	0.213236
S.E. of regression	0.124806	Sum squared resid	1.464206
Durbin-Watson stat	2.061247		

Equation: D1CPI = C(6) + C(7)*LNRDC1 + C(8)*D1LNRM2 + C(9) *D1LNREXR + C(10)*D1IR
Instruments: D1LNRGDP(-1) D1LNRM2(-1) D1LNREXR(-1) LNRDC1(-1) D1IR(-1) D1CPI(-1) D1BOP(-1) C
Observations: 99

R-squared	0.741019	Mean dependent var	1.823232
Adjusted R-squared	0.727871	S.D. dependent var	2.310511
S.E. of regression	3.370395	Sum squared resid	1067.799
Durbin-Watson stat	1.703025		

Equation: D1BOP = C(11) + C(12)*LNRDC1 + C(13)*D1LNRM2 + C(14) *D1LNREXR + C(15)*D1IR
Instruments: D1LNRGDP(-1) D1LNRM2(-1) D1LNREXR(-1) LNRDC1(-1) D1IR(-1) D1CPI(-1) D1BOP(-1) C
Observations: 99

R-squared	0.549252	Mean dependent var	22.09990
Adjusted R-squared	0.519432	S.D. dependent var	149.5832
S.E. of regression	897.7413	Sum squared resid	75758304
Durbin-Watson stat	1.882369		

Furthermore, the study presented historical simulation; the purpose of historical simulation is to check the tracking ability of the model. A model without a good tracking ability will not produce a good forecasting result. To evaluate the performance of the model, this study utilized the root-mean-square percent error [RMPE], the correlation coefficient and the Theil's inequality coefficient. From the historical simulation the study proceeds to the policy simulation. Policy simulation predicts the reaction of endogenous variables to changes in the exogenous or instrumental policy variables. It is an in- sample simulation because it is based on my collected data and did not go beyond the limit of my data period. Following Iyoha (2001) and Enoma (2004) studies with little modification, the study presents historical and policy simulation.

7.5. HISTORICAL SIMULATION RESULTS

The thrust of the historical simulation is to evaluate and validate the potency of the study empirical model for counter factual analysis. In terms of model validation, historical simulation facilitated the researcher's comparison of the simulated series obtained from the dynamic simulation with the actual series (Iyoha 2001). This enabled the researcher to observe how well monetary policy variables track the policy targets in order to forecast future behaviour of these targets. To evaluate the performance of the model, this study utilized the root-mean-square percent error [RMPE], the correlation coefficient and the Theil's inequality coefficient which was further decomposed into bias proportion, variance proportion and covariance proportion between the actual and simulated values of the endogenous variables in the model.

Thiel's inequality coefficient provides a measure of how well a time series of estimated values compares to a corresponding time series of observed values. The statistic measures the degree to which one time series ({Xi}, i = 1, 2, 3, ...n) differs from another ({Yi}, i = 1, 2, 3, ...n). For Thiel's inequality coefficient to be significant it must be bounded to the interval 0 and 1. A value of 0 indicates perfect prediction, while a value of 1 corresponds to perfect inequality or negative proportionality between the actual and predicted value [Raymond (1975)]. A second feature, although not unique, is that the numerator can be decomposed into its bias component (Theil 1958) allowing for possible evaluation as to the source of possible evaluation as to the source of the forecast.

The summary statistics for the historical simulation obtained in the study are presented in Table **7.4** below. The simulation is for the period 1987-2011 given that the effect of changes cannot be felt for more than six years[10]. Besides this is the period of Structural Adjustment Programme in Nigeria. Previous studies indicate similar lagged periods. For example, Kwenta and Smith (1973) used 20 years, Fagan et al. (2001), together with the model of Smets and Wouters (2002), seems to suggest that the maximum response to a monetary policy shock occurs within four or five periods from the shock. Furthermore, Sungsup Ra and Chang Yong Rhee (2005) opine that forecasting performance usually declines with the length of the forecasting horizon. Taking this into consideration, their forecasting horizon was set at 5 years.

Table 7.5 Historical Simulation Results

Endogenous Variable	Theil's Inequality Coefficient	Decomposition of Theil's Inequality			Root Mean Squared Error (%)	Correlation Coefficient
		Bias Proportion	Variance Proportion	Covariance Proportion		
GDP	0.23	0.00	0.03	0.98	0.25	0.95
BOP	0.30	0.00	0.05	0.96	0.05	0.80
CPI	0.45	0.00	0.09	0.89	0.09	0.95

As made evident in table **7.4**, the historical simulation results present the summary statistics for model evaluation, validation and counter factual analysis. An analysis of the historically simulated series shows that the simulated values for dependent variables, RGDP, BOP and CPI are close to the actual value. In effect, the macroeconomic model has absolutely described the potency of monetary policy for the Nigerian economy. The RGDP equation indicated that the correlation coefficient between actual and simulated series is 0.95, while the root-mean-square simulated error in percentage is 25 per cent. The Theil's inequality coefficient between actual and simulated RGDP series is 0.23 which lies between 0 and 1. Given that the coefficient is close to zero, it thus signifies that the simulated RGDP series tracks the actual RGDP series. In its entirety, the RGDP variable achieves remarkable performance in the estimated model.

The BOP equation indicated a correlation coefficient of 0.80 between actual series and simulated BOP series. This in essence portrayed a high degree of correlation for the BOP

[10] In the user- friendly version the forecasting horizon can be set as either 5 years or 10 years(Sungsup Ra and Chang Yong Rhee 2005)

series. Also, with a root-mean-square percent error of 0.05 per cent, and a calibrated Theil's inequality coefficient of 0.30 which lies between zero and unity, the historically simulated series shows a high-quality track of actual BOP series by simulated, that is, predicted BOP series. The CPI series simulated brilliantly with a correlation coefficient of 0.95 and a root-mean-square percent error of 0.09 representing 9 per cent error. The Theil's inequality coefficient for the CPI series is 0.45. It lies in between zero and unity. With a Theil's coefficient of 0.45 per cent, it thus follows that 45 percent of the simulated CPI series tracked the actual CPI series. In all, monetary policy is effective in influencing macroeconomic performance of the Nigerian economy.

7.6. POLICY SIMULATION RESULTS

The policy simulation result is presented in Tables **7.5, 7.6,** and **7.7.** In all, the simulated results provide the experimentation with our macro-econometric model using alternative policy scenario namely, changes in real domestic credit, changes in real money supply and nominal interest rate. In effect, we examined how changes in real domestic credit, changes in real money supply and nominal interest rate affect the RGDP, BOP, and CPI. Thus, policy simulation gives the policy makers the opportunity of testing the various exogenous or instrumental policy variables on the various endogenous variables and in this way predicts the reaction of endogenous variables to changes in the exogenous or instrumental policy variables. The model takes into view both the direct and indirect effects of the change in the policy variables on the Nigerian economy on the basis of the endogenous variables. The tables present the effect of a 10 per cent change in real domestic credit, real money supply and 10 per cent reduction in nominal interest rate on RGDP, BOP and CPI. The results of the controlled solution (base line) are without changes in exogenous policy variables, (real domestic credit, real money supply and nominal interest rate) and disturbed solution (solution with changes in policy variables) on RGDP, BOP and CPI as presented in tables **7.5, 7.6,** and **7.7.** The dynamic multiplier effects are obtained by dividing the difference between controlled solution (base line) and disturbed solution by 10 per cent (Iyoha 2001and Enoma 2003).

7.7: POLICY SIMULATION ON DOMESTIC CREDIT, MONEY SUPPLY AND INTEREST RATE ON GDP

A critical look at Table **7.5** (for the dynamic multiplier see table **7.8**) shows that a 10 per cent increase in domestic credit on GDP at the beginning of the year was 3.47 in 1987 and 4.0 in 1988 on the Nigerian GDP. Increase in domestic credit by 10 per cent improves gradually with the exception in 1992 where it recorded 3.06. It increased considerably to 15.03 and 15.72 in 1998 and 2003 respectively. Also, the simulation results show that a 10 per cent increase in the money supply at the beginning of the year generated a positive value of 2.65 on the country's GDP. This significantly improves continuously. In 1996 it was 11.44 and it started to decrease from 2000–2005. In 2006, it increased to 11.82 and continuously to 2008 where it recorded 13.9. The multiplier effect stood at 13.58 and 10.23 in 2010 and 2011 respectively.

With 10 per cent decline in the interest rate, the multiplier effect on GDP in Nigeria was negative in the first two periods as seen in the values, -1.35 and -1.37 for the first and second years respectively. However, the GDP effect of a 10 per cent decline in the interest rate stimulated significant positive multiplier effect of 2.71, 2.21, 5.59, and 2.11per cent for the third, fourth, fifth and sixth periods. In effect, even when the interest management of the Central Bank of Nigeria [CBN] was initially unimpressive, it gained improvement in the later period of implementation. This shows that GDP does not initially respond to interest rate reduction. However, the dynamic multiplier effect of interest rate on GDP was positive and significant as it stood at 4.11 per cent at the end of the year which is higher than both values of decline. Domestic credit and money growth policy management are most effective in influencing GDP in Nigeria. In the aggregate, the monetary management of the Nigerian economy is potent.

Table 7.6 Policy Simulations for 10 Units Increase in Domestic Credit, Money Supply and 10 Percent Reduction in Interest Rate on GDP [1987-2011]

Endogenous Variable	Years	Controlled Solution	Disturbed Solution		
			Changes in Domestic Credit	Changes n Money Supply	Changes in Interest Rate
GDP	1987	562.1	596.8	588.6	548.6
	1988	642.2	682.4	715.2	628.5
	1989	686.4	765.4	750.2	713.5
	1990	652.6	708.6	701.2	674.7
	1991	412.5	512.2	497.8	468.4
	1992	559.5	590.1	612.4	580.6
	1993	650.6	720.4	710.3	722.3
	1994	769.3	822.5	824.6	786.7
	1995	783.2	853.6	886.3	843.6
	1996	710.1	792.5	824.5	746.3
	1997	754.6	876.2	824.5	783.2
	1998	692.3	842.6	762.8	752.6
	1999	596.7	684.2	702.7	625.8
	2000	642.6	786.6	689.6	724.2
	2001	784.4	846.5	813.4	825.6
	2002	798.5	873.1	822.8	831.2
	2003	786.3	943.5	835.2	815.2
	2004	691.3	763.4	734.6	704.3
	2005	685.4	787.6	751.7	745.7
	2006	735.3	862.2	853.5	763.4
	2007	772.6	802.5	895.7	795.6
	2008	763.5	860.4	902.5	813.5
	2009	864.7	935.5	955.3	879.2
	2010	873.8	982.6	1009.6	924.1
	2011	886.4	986.2	988.7	927.5

7.8: POLICY SIMULATION ON DOMESTIC CREDIT, MONEY SUPPLY AND INTEREST RATE ON BOP

Table **7.6**, (for the dynamic multiplier see table **7.9**) shows the impact multiplier effect of domestic credit on BOP, the dynamic multiplier effect was 6.95 per cent. It increased considerably to 11.62 and 16.2 in 1999 and 2000 respectively, at the end of year it was 7.49 per cent. This shows that domestic credit in Nigeria has significant positive effect on the country's BOP. Also, the simulation results show that a 10 per cent increase in the money supply at the beginning of the year generated a positive value of 11.69 on the country's BOP. The effect of the increase in money supply was instantaneous and positive in the whole periods, because at the end of the year, it was 8.91. The BOP effect of a 10 per cent decline in the interest rate stimulated significant positive multiplier effect. The initial response was weak with 0.69 and 0.81 respectively. This significantly improves continuously, and at the end it was 5.11.In this case, interest rate reduction is a better monetary policy on BOP stability in Nigeria than money supply.

7.9: Policy Simulation on Domestic Credit, Money Supply and Interest Rate on CPI

A close examination of table **7.4** shows that all exogenous or instrumental policy variables resulted in changes in consumer price level as both the impact and dynamic multiplier effects were all positive. In this case, monetary management is effective in Nigeria. The impact multiplier of domestic credit on CPI is 1.64 while those of money supply and interest rate are 0.5 and -3.03 per cent respectively. Thus, the initial CPI effects of domestic credit and money supply are positive while that of interest rate is negative. However, the dynamic effects of all policy targets are positive and significant. For example, at the sixth quarter, the dynamic CPI effects of domestic credit, money supply and interest rate were 3.10, 3.94 and 2.51 respectively. Evidently, the dynamic multiplier effect of money supply on CPI is most substantial and superior. The superiority of real money supply further portrays the potency of monetary policy in macroeconomic stabilization for the Nigerian economy.

Table 7.7 Policy Simulations for 10 Units Increase in Domestic Credit, Money Supply and 10 Percent Reduction in Interest Rate on BOP [1987-2011]

Endogenous Variable	Years	Controlled Solution	Disturbed Solution		
			Changes in Domestic Credit	Changes n Money Supply	Changes in Interest Rate
BOP	1987	628.2	697.7	745.1	635.1
	1988	742.1	788.3	884.6	750.2
	1989	763.6	813.5	864.2	792.5
	1990	807.5	825.4	862.1	825.4
	1991	784.8	851.9	886.3	798.3
	1992	784.3	824.7	857.4	824.7
	1993	796.7	876.8	986.2	836.3
	1994	769.3	867.6	854.6	820.5
	1995	782.7	892.3	824.6	865.2
	1996	768.6	864.3	798.2	811.6
	1997	782.3	862.4	894.6	843.7
	1998	788.6	889.6	862.2	840.3
	1999	786.1	902.3	882.3	854.6
	2000	686.4	848.4	746.9	748.2
	2001	798.5	848.6	836.6	868.3
	2002	824.5	864.5	891.8	864.5
	2003	697.8	731.5	764.8	781.3
	2004	685.6	712.9	787.6	721.5
	2005	702.3	755.8	862.2	755.8
	2006	753.2	786.2	825.7	826.5
	2007	853.5	876.5	885.3	896.7
	2008	791.4	806.5	852.6	817.8
	2009	824.3	872.4	896.3	872.4
	2010	852.7	894.2	952.4	894.2
	2011	889.2	964.1	978.3	940.3

Table 7.8 Policy Simulations for 10 Unit s Increase in Domestic Credit, Money Supply & 10 Percent Reduction in Interest Rate on CPI [1987-2011]

Endogenous Variable	Years	Controlled Solution	Disturbed Solution		
			Changes in Domestic Credit	Changes n Money Supply	Changes in Interest Rate
CPI	1987	876.8	896.7	974.8	894.6
	1988	827.3	862.5	854.6	863.2
	1989	634.5	652.6	704.6	674.1
	1990	689.3	743.5	780.6	752.4
	1991	762.8	783.4	830.1	802.9
	1992	589.8	641.5	668.8	628.6
	1993	758.5	843.5	873.4	856.6
	1994	685.8	784.6	786.6	723.5
	1995	656.7	722.3	764.8	754.2
	1996	698.4	745.4	784.4	746.4
	1997	746.4	784.5	822.5	801.6
	1998	724.5	804.9	834.6	823.5
	1999	686.3	757.4	844.6	746.3
	2000	668.6	764.1	724.6	693.3
	2001	786.5	812.6	868.3	845.6
	2002	802.4	854.7	896.8	876.4
	2003	576.4	687.4	675.4	653.8
	2004	646.5	683.4	745.3	673.5
	2005	846.2	868.5	894.6	873.3
	2006	974.5	1009.3	996.4	986.7
	2007	824.6	854.4	892.9	842.4
	2008	564.9	635.4	663.6	653.5
	2009	839.4	886.3	895.9	864.6
	2010	823.5	896.4	904.3	874.4
	2011	843.6	907.6	936.7	898.1

7.10: DYNAMIC MULTIPLIER EFFECT OF CREDIT, MONEY SUPPLY AND INTEREST RATE ON GDP

An examination of table **7.8** shows that the dynamic multiplier of domestic credit is 3.47 per cent. The dynamic multiplier grew to an enormous value of 15.03 and 15.72 per cent in 1998 and 2003 respectively. At the end of the period, the dynamic multiplier grew to 10.88 and 9.98 in 2010 and 2011 respectively. Indeed, the GDP multiplier effects of 10 per cent increase in domestic credit are all positive. This provides the empirical evidence of the potency of monetary policy. In fact, the policy simulation results indicate that monetary policy is an effective instrument for counter-cyclical inflation stabilization in Nigeria.

An examination of the same table shows a positive multiplier effect of money supply on GDP in Nigeria. The multiplier was positive all through, and with the exception of 2008, with a value of 5.0, money growth grew at an increasing rate from 2006 to 2010 with a significant growth of 13.58 and 10.23 in 2011. This suggests that in a developing country like Nigeria, money supply is a useful monetary policy instrument for rekindling the growth rate of GDP. The dynamic multiplier effects of a 10 unit reduction in interest rate on GDP are presented in the same table the initial effect is negative and the later effect is positive. The GDP effect of interest rate reduction is 2.71, 2.21, 5.59, 2.11, 7.17, 10.17 and 6.04 per cent at the third, fourth, fifth and sixth seventh, eight, and ninth periods respectively.

Table 7.9 Dynamic Multiplier Effect of 10 Units Increase in Domestic Credit, Money Supply & 10 Percent Decrease in Interest Rate on GDP [1987-2011]

Years	Increase in Domestic Credit on GDP	Increase in Money Supply on GDP	Decrease in Interest Rate on GDP
1987	**3.47**	**2.65**	**- 1 .35**
1988	4	7.3	-1.37
1989	7.9	6.38	2.71
1990	5.6	4.86	2.21
1991	9.97	8.53	5.59
1992	3.06	5.29	2.11
1993	6.98	5.97	7.17
1994	5.32	5.53	1.74
1995	7.04	10.31	6.04
1996	8.24	11.44	3.62
1997	12.16	6.99	2.86
1998	15.03	7.05	6.03
1999	8.75	10.6	2.91
2000	14.4	4.7	8.16
2001	6.21	2.9	4.12
2002	7.46	2.43	3.27
2003	15.72	4.89	2.89
2004	7.21	4.33	1.3
2005	10.22	6.63	6.03
2006	12.69	11.82	2.81
2007	2.99	12.31	2.3
2008	9.69	13.9	5
2009	4.69	5.62	2.52
2010	10.88	13.58	5.03
2011	9.98	10.23	4.11

7.11: DYNAMIC MULTIPLIER EFFECT OF CREDIT, MONEY SUPPLY AND INTEREST RATE ON BOP

A close examination of table **7.9** shows a positive dynamic multiplier effect of domestic credit on BOP in Nigeria. The BOP effect of domestic credit was positive for all periods. The effect of a 10 per cent increase in credit on BOP is instantaneous. At the beginning of the year, it had an impact of 6.95; the greatest impact was in 1998, 1999, and 2000 with 10.1, 11.62, and 16.2 respectively. The effect of a 10 per cent increase in money supply on BOP was also instantaneous, at the beginning of the year the dynamic multiplier effects of money growth was

11.68 per cent; and at the end it was 7.49. From the table real money growth has the greatest impact on BOP. On the same table **7.9**, the dynamic multiplier effect of a 10 per cent interest rate reduction was positive for all the years. Although at the beginning the effect was weak with 0.69 and 0.81 in 1987 and 1988 respectively at the end it was 5.11. The policy simulation results indicate that monetary policy is an effective instrument for counter-cyclical BOP stabilization in Nigeria.

7.12. DYNAMIC MULTIPLIER EFFECT OF CREDIT, MONEY SUPPLY AND INTEREST RATE ON CPI

An examination of table **7.10** shows the dynamic multiplier effects of a 10 per cent increase in domestic credit, on the consumer price level. The dynamic multiplier effects are positive for all the years. At the beginning, it was 1.99 per cent. At the end of the period, the dynamic multiplier effect was 6.40. On the same table the dynamic multiplier effects of a 10 per cent increase in money supply on CPI are positive for all the quarters. On the same table **7.10**, the dynamic multiplier effect of 10 per cent interest rate reduction in CPI was 1.78 for the first year. At the end of the period, the dynamic multiplier effect of interest rate on the CPI was 5.45. The policy simulation results indicate that monetary policy is an effective instrument for counter-cyclical price stabilization in Nigeria.

Table 7.10 Dynamic Multiplier Effect of 10 Units Increase in Domestic Credit, Money Supply & 10 Percent Decrease in Interest Rate on the BOP [1987-2011]

Years	Increase in Domestic Credit on BOP	Increase in Money Supply on BOP	Decrease in Interest Rate on BOP.
1987	6.95	11.69	0.69
1988	4.62	14.25	0.81
1989	4.99	10.06	2.89
1990	1.79	5.46	3.67
1991	6.71	10.15	1.35
1992	4.04	7.31	4.04
1993	8.01	18.95	3.96
1994	9.83	8.53	5.12
1995	10.96	4.19	8.25
1996	9.57	2.96	4.3
1997	8.01	11.23	6.14
1998	10.1	7.36	5.17
1999	11.62	9.62	6.85
2000	16.2	6.05	6.18
2001	5.01	3.81	6.98
2002	4	6.73	4
2003	3.37	6.7	8.35
2004	2.73	10.2	3.59
2005	5.35	15.99	5.35
2006	3.3	7.25	7.33
2007	2.3	3.18	4.32
2008	1.51	6.12	2.64
2009	4.81	7.2	4.81
2010	4.15	9.97	4.15
2011	7.49	8.91	5.11

Table 7.11 Dynamic Multiplier Effect of 10 Units Increase in Domestic Credit, Money Supply & 10 Percent Decrease in Interest Rate on CPI [1987-2011

Years	Increase in Domestic Credit on CPI	Increase in Money Supply on CPI	Decrease in Interest Rate on CPI.
1987	1.99	9.8	1.78
1988	3.52	2.73	3.59
1989	1.81	7.01	3.96
1990	5.42	9.13	6.31
1991	2.06	6.04	4.01
1992	5.17	7.9	3.88
1993	8.5	11.49	9.81
1994	9.88	10.08	3.77
1995	6.56	10.81	9.75
1996	4.7	8.6	4.8
1997	3.81	7.61	5.52
1998	8.04	11.01	9.9
1999	7.11	15.83	6
2000	9.55	5.6	2.47
2001	2.61	8.18	5.91
2002	5.23	9.44	7.4
2003	11.1	9.9	7.74
2004	3.69	9.88	2.7
2005	2.23	4.84	2.71
2006	3.48	2.19	1.22
2007	2.98	6.83	1.78
2008	7.05	9.87	8.86
2009	2.69	3.65	2.52
2010	7.29	8.08	5.09
2011	6.4	9.31	5.45

CHAPTER EIGHT

SUMMARY, RECOMMENDATION AND CONCLUSION

8.1 SUMMARY OF RESEARCH FINDINGS

This study has as its objective, an empirical investigation of the effects of monetary policy on macroeconomic performance in Nigeria. The study uses quarterly data between 1970Q1 to 2011Q4, a sample period of forty one years. In addition, the study introduced structural break to the data. The structural break was applied to two sub-periods from 1970Q1 –1986Q4 before the structural adjustment programme in Nigeria, and from 1987Q1–2011Q4 period after the Structural adjustment programme in Nigeria. The study also estimates the entire period 1970Q1–2011Q4 without a structural break for the GDP model having been confirmed in a structural break test. As a result of this, the Central Bank of Nigeria commenced an extensive financial system and monetary policy reforms in 1986 which brought about a structural break. These reforms were based on the financial liberation theory by McKinnon and Shaw (1973) as part of a structural adjustment programme introduced by the World Bank in the early 1980s based on Washington's Consensus. In the methodology, three approaches were utilized. Firstly, estimation analyses were based on coefficients, of the variables using long-run and co-integrating Vector Error Correction Model (VECM). The results conform to my a priori expectation many of the variables were not statistically significant.

The summary results of the structural break of GDP model shows that the parameters of the analysed equations are stable given that recursive errors lie within the two critical lines for both tests. This means that the structural adjustment programme introduced in 1987 did not bring significant changes to the real domestic growth (GDP) of the Nigeria economy. Therefore we accept the null hypothesis, which means that there was no structural break in real domestic growth.

The summary results of the structural break of model 2 (CPI) shows that the coefficient of real broad money has increased dramatically after the structural reform, and the coefficient of the real domestic credit became positive after the reform. However, the structural break test shows that the parameters of the analysed equations were not stable, given that recursive errors cut across the critical lines for both tests. This means that the structural adjustment programme

introduced in 1987 increased inflation in the Nigerian economy. Therefore we reject the null hypothesis, meaning that there was a structural break for the CPI model.

The summary results of the structural break of model 3 (BOP) reveal that the coefficient of real broad money growth has increased dramatically after the structural reform and the coefficient of the real domestic credit slightly decreased after the reform. There was significant change in the coefficient of interest rate; after the reform interest rate became negative. Meaning that increase in interest rate would reduce balance of payment deficit. However, the structural break test shows that the parameters of the analysed equations were not stable, given that recursive errors cut across the critical lines for both tests. This means that the structural adjustment programme, introduced in 1987 had slight effects on BOP. Therefore we reject the null hypothesis meaning that there was a structural break in BOP.

Secondly, a small–sized macroeconomic model of the Nigerian economy was designed to be used for forecasting, counterfactual analysis and policy analysis. The macroeconomic model was simulated to demonstrate the effects of monetary policy on macroeconomic performance. The simulation results were generated from the coefficient of estimated three stage least square.Thus, the results obtained from the simulation were impressive and generally satisfactory; the results suggest the effects of monetary policy implementation for counter–cyclical income stabilization, BOP stabilization and CPI stabilization in Nigeria. Finally, estimation and analysis of results were based on the residual. To generate the results from residual, three SVAR econometric models were formulated and co-integrated.

The interpretation of the results follows mainly from the path of the impulse response functions generated from the recursively-orthogonalized estimated residuals of the SVARs. We conducted the conventional diagnostic tests to ensure that the impulse response and variance decomposition results are stable and statistically valid over the period of estimation. Thus, the impulse responses show the path of real domestic output growth, the price level and balance of payments, when there are shocks or innovations in the monetary policy variables. These variables were structurally modelled and hence tested empirically for their causal relationship with the domestic output, commodity price level and balance of payments in the long run. The co-integration tests show that any short-run disorder (disturbance) or disequilibrating force in the study variables settles at an equilibrium level, that is, at a steady state in the long run.

Based on the impulse-response results obtained from the study and the ensuing analysis, the following findings were made. The output and prices respond positively to a positive shock in interest rate and real money supply, and these positive effects lead to a rise in demand for money, and consequently, a rise in interest rates. There is a positive relationship between real money shock and growth of real domestic output in Nigeria. Sustainable price level effects and expected inflation effect dominate the liquidity effects. Although, the positive responses of output and prices are less sensitive, the brief liquidity effect could be attributed to countervailing pressure on interest rate, due to a stronger anticipated inflation effect.

A positive interest rate shock has an expansionary effect on output and prices. However, in Nigeria, prices are slow to adjust downward but rather fast in upward adjustment. This indeed gives fractional credence to a temporary price puzzle. It is evident that the response of real domestic output (real GDP) to an expansionary shock in the short-term interest rate, measured by the prime lending rate in Nigeria is favourable and statistically significant. The impulse-response also shows that when there is real effective exchange rate depreciation, real domestic output falls instanteneously and starts recovering at the third quarter. Measuring the output effects of monetary innovations in real broad money supply as measured by the (M_2) aggregate, the impulse-response results, graphicaly revealed a sluggish response of real domestic output to a positive real money supply shock. The results show that the reponse of commodity prices to a positive shock in the real effective exchange rate is weak and rather unappreciative.

By impulse assessment, real effective exchnage rate depreciation leads to an instantenous decline in commodity prices, and thereafter, rises insignificantly. The impulse-response further shows that an increase in money supply, instantenously generates sustained increases in the price level in the country. The instantenous response of the price level to monetary impulses, is an indication that commodity prices in Nigeria are flexible, as against the sticky price phenomenon. Following a shock to real money supply, it takes about six years for the confidence band for the price level to fall below zero, where it remains for the entire horizon. The impulse assessment for the BOP model shows a zero response of the balance of payment position to the real effective exchange rate, real domestic credit, real money supply and interest rate in Nigeria over the study horizon. This study has shown that monetary policy actually has a

positive effect on the economy, implying that the use of monetary instrument has effects on real sector variables.

Moreover, this study uses historical simulation to observe how well monetary policy variables track the policy targets in order to forecast future behaviour of the variable policy targets. To evaluate the performance of the model, this study utilized the root-mean-square percent error [RMPE], the correlation coefficient and the Theil's inequality coefficient. An analysis of the historically simulated series shows that the simulated values for dependent variables, RGDP, BOP and CPI are close to the actual value. In effect, the macroeconomic model has absolutely described the effects of monetary policy on macroeconomic performance for the Nigerian economy.

Furthermore, the study conducted policy simulation to examine how changes in real domestic credit, real money supply and nominal interest rate affect the RGDP, BOP, and CPI. A critical look at the policy simulation result shows that RGDP initially, did not respond to changes in real domestic credit, real money supply and nominal interest rate, but later improved significantly after some quarters. In addition policy simulation results on BOP show the impact of multiplier effects of real domestic credit on BOP. In the case of real money supply and interest rate, the computed impact multiplier effects show that interest rate reduction is a better monetary policy on BOP stability in Nigeria than real money supply.

Thereafter a close examination of policy simulation on CPI shows that all exogenous policy variables resulted in changes in consumers' price level as both the impact and dynamic multiplier effects were all positive. The dynamic effects of all policy targets are positive and significant. Evidently, the dynamic multiplier effect of real money supply on CPI is most substantial and superior. The superiority of money supply further portrays the effects of monetary policy on macroeconomic stabilization for the Nigerian economy. Domestic credit and interest rate policy management are most effective in influencing GDP in Nigeria. On the aggregate, the monetary management of the Nigerian economy is potent.

8.2. POLICY IMPLICATIONS OF RESULTS

The results generate vital issues that concern policy evaluation, and hence a reliable guide for effective monetary policy implementation in Nigeria. Monetary innovations are not all neutral in the short-term period; it rather depends on the monetary policy instrument used. Firstly, interest rate does explain an enormous impulse in the monetary transmission process in Nigeria. This could be attributed to high interest rates which are excessively high, to the extent that investors are discouraged from securing credit from the banking sector. Secondly, change in monetary policy leads to variations in the policy targets. The policy implication is straightforward, monetary policy in Nigeria is a veritable instrument, and hence an effective tool in maintaining internal balance but it is ineffective in achieving external balance. The reasons why the monetary policy is ineffective in achieving external balance is discussed in the next section.

8.2.1. Reasons for Poor Performance of the External Sector

Following reasons for poor performance of the external sector as regards the position of external balance are obvious; Nigeria is suffering from an undiversified export basket and a somewhat rigid import basket. More than 95 per cent of the country's total exports are made up of oil and gas. As a result, the inflow of export receipts is highly dependent on oil prices, and hence, on the performance of the oil sector. In effect, external shocks are often transmitted to the domestic economy through oil price shocks. Imports on the other hand, consist of a wide range of goods, including manufactured and capital goods.

The rigidity of the import basket stems from the fact that Nigeria lacks a manufacturing sector and thus, has to import almost all of its consumption goods. However, in spite of the strong domestic demand for foreign goods and despite low oil prices in 2009 and 2010, Nigeria had a negative trade balance. Given the enormous inflow of foreign capital, Nigeria is supposedly to acquire large increases in reserves. However, between 2009 to 2010, reserves shrunk rather than increase; a reflection of the lack of confidence in the domestic economy by foreign capital owners and investors. This has greatly been attributed to capital flight with a negative productivity spillover effect. High levels of capital outflows make the country's external balance position worrisome (Iyoha, 2011). Besides, Nigeria is a small open economy that does

elicit response from other economy, Nigeria is a price-taker because it exports mainly primary commodities, and highly prone to destabilizing macroeconomic shocks from advanced countries. The activities and prices in the country are affected by conditions in world markets where its own influence is minimal. (For details see Olayemi 2009).

Another reason for the poor external sector performance is the absence of a viable international capital market for naira-denominated financial assets. Iyoha (2002) asserted that the potency of monetary policy is often questioned on account of the structural rigidities, their under-developed money and capital markets, financial dualism and other systematic weaknesses; monetary policy is not as potent as in advanced economies. Specifically, macroeconomic variables react sluggishly, weakly, and with unduly long lag to changes in monetary policies. The financial market and institutions are highly unorganized, spatially fragmented, highly segmented and externally dependent. Money and capital markets are narrow, thin and shallow with little or no securities. In particular, the financial dualism undermines efforts by the monetary authority to implement a consistent monetary policy. Besides, the regulation and control of the monetary policy through interest rate variations is difficult when there is a considerable amount of liquidity outside the banking system. All these have been cited as limiting the performance of monetary policy in developing countries.

Just like other developing countries, exchange rate policies are often sensitive and controversial, mainly because of the kind of structural transformation required, such as reducing imports or expanding non-oil exports, which invariably implies a depreciation of the nominal exchange rate. Such domestic adjustment, due to their short run impact on prices and demand, are perceived as damaging to the economy; ironically, the distortions inherent in an overvalued exchange rate regime are hardly a subject of debate in developing economies that are dependent on imports for production and consumption. (Akpan and Atan, 2011).

Moreover, the effects of Nigeria's managed float policy on exchange rates; makes the country's external balance position worrisome. In Nigeria, exchange rate management techniques over the years have ranged from fixed, guided deregulation to freely floating. These considerations arose the need to adjust the demand for foreign currencies to the level of supply, maximize the use of available foreign exchange resources, by ensuring that essential imports of goods and services for development were given adequate priority and equally ensure the build up to the

nation's external reserves. The provisions of the Exchange Control Act were complemented with ad-hoc administrative measures to ensure the achievement of external viability.

Floating regimes could be volatile and unsustainable if the economic fundamentals are not right, and especially, when fiscal and monetary operations are not well synchronized and there is fiscal dominance. Before 1986, as a result of the prevailing trade practices in vogue, which also informed the fixed regime adopted in the determination of the exchange rate of the Naira, the currency was perceived to have been over-valued. This was the main contributory factor to the problems of Nigeria's external sector in those years, a fact which has also made the country more import dependent and less non-oil export driven. The country was, therefore, unable to achieve the main objectives of its policy during this period. In order to establish a realistic value of the naira, the approach of the Second-tier Foreign Exchange Market was adopted in 1986 under the Structural Adjustment Programme.

The earliest and leading theoretical foundation for the choice of exchange rate regimes rests on the optimal currency area (OCA) theory, developed by Mundell (1961) and Mckinnon (1963). According to the theory, a fixed exchange rate regime can increase trade and output growth by reducing exchange rate uncertainty and thus, the cost of hedging, and also encourage investment by lowering currency premium from interest rates. However, on the other hand, it can also reduce trade and output growth by stopping, delaying or slowing down the necessary relative price adjustment process.

An economic theory supporting the reason why BOP effect is zero or negligible, is the absorption approach to BOP. The absorption approach focuses on the fact that current imbalances can be viewed as the difference between domestic output and domestic spending (absorption). If devaluation raises domestic absorption relative to domestic income, current account will deteriorate. Due to the devaluation (price effect), exports become cheaper, measured in the foreign currency, and imports become more expensive, measured in domestic currency. The price effect clearly contributes to the worsening of the goods and services account.

8.3. POLICY RECOMMENDATIONS

Since foreign exchange, which is a means of settling international transactions is earned and disbursed in the course of undertaking international transactions; there is a close link between it and the balance of payments, which records transactions between the residents of one economy and the rest of the world. The exchange rate is a useful macroeconomic indicator, which aids policy makers to take informed actions to stimulate or sustain the economy on a long run growth path. This thesis recommends a basket approach to domestic currency (naira) real effective exchange determination in which the relative macroeconomic developments in major trading partner economies are factored into the market exchange rate of the naira.

Given the policy relevance of real effective exchange rate as a potent variable in economic analysis, policy evaluation, financial planning and economic forecasting, it becomes necessary for countries to consistently update their real exchange rate index to serve as a guide to real exchange rate management. This is against the limitations of relying on the one currency based real exchange rate in a country with multiple trading partners. The limitations of using changes in dollar or euro based bilateral exchange rate, to make policy decisions affecting other currencies has necessitated the need for developing an updated real effective exchange rate index that would more appropriately capture developments in one currency against the currencies of other trading partners at a point in time.

To achieve a realistic exchange rate, reduce speculative influences on foreign exchange and ensure the elimination of the tendency towards persistent exchange rate depreciation, bidding for foreign exchange should be within a band of 5 per cent, with the central rate, determined through rational approaches. This system, while not encouraging a fixed exchange rate regime, could eliminate exchange rate speculation, reduce the influence of foreign exchange arbitrageurs in the foreign exchange market, and make planning easier for both users and managers of foreign exchange. It will also reduce the inflationary expectations of exchange flexibility.

The management of foreign exchange resources is further informed by the need to set an appropriate clearing price in the foreign exchange market that would guarantee adequacy of supply in relation to the demand for foreign exchange management. Therefore, the art of

foreign exchange management is a conscious attempt to harness foreign exchange resources, deploy them to service the economy and to meet other international commitments while saving some to raise the level of the country's international reserves so as to prevent the economy from experiencing shocks due to foreign exchange volatility.

However, the problems of foreign exchange inadequacy, dependence on the oil sector for foreign exchange earnings, continuous depreciation of the naira, exchange rate and the attendant inflationary expectations are yet to be resolved. In order to find solutions to some of these problems, the exchange rate for the naira should be determined within a band to ensure stability. While still relying on market forces, demand management policies should continue to be restrictive to achieve stability in the short run, while supply side measures to increase foreign exchange receipt should be pursued as both a medium and long term objective.

The policy simulation results of this study indicate that monetary policy is an effective instrument for counter-cyclical BOP stabilization in Nigeria. The results suggest the effectiveness of monetary policy implementation for counter-cyclical income stabilization, BOP stabilization and CPI stabilization in Nigeria. However, the policy variables, interest rate and exchange rate had no impact on the external sector because Nigeria is a small open economy that does elicit response from other economies. Nigeria is a price-taker because it exports mainly primary commodities, and highly prone to destabilizing macroeconomic shocks from advanced countries. The activities and prices in the country are affected by conditions in world markets where its own influence is minimal.

Furthermore, more than 95 per cent of the country's total exports are made up of oil and gas. As a result, the inflow of export receipts is highly dependent on oil prices and hence, on the performance of the oil sector. In effect, external shocks are often transmitted to the domestic economy through oil price shocks. Therefore, the impact of external shock through oil price often supersedes the counter cyclical effects of the monetary authority. Consequent upon this, this study recommends a measure to stimulate non-oil export, and generous incentive should be offered to encourage local processing of these commodities. Also, the level of domestic output should be raised to provide more tradable commodities in order to raise the level of foreign exchange receipts and cut down on imports.

Monetary policy should be viewed as a very important macroeconomic policy instrument for influencing changes in aggregate output, prices and external balance position. However, there is still need for the Central Bank of Nigeria to embark on a comprehensive monitoring of monetary instruments or aggregates. In terms of policy forecasting and explanatory power, the effective monetary policy implementation should focus on controlling and manipulating instruments such as short-term interest rate in the form of treasury bill rate, minimum rediscount rate (prime lending rate) as major tool for transmitting monetary impulses for economic performance in the Nigerian economy.

There is need for the country's large shadow economy to be integrated into a formal financial sector. This could further deepen financial intermediation in Nigeria. Thus, there is the utmost need to fortify the financial sector reform drive by strengthening its regulatory and supervisory functions. Indeed, the Central Bank of Nigeria should improve on the level of liquidity management, such as strengthening further, the sale of securities that can be traded in the Nigerian Stock Exchange.

The Central Bank of Nigeria (CBN) should adopt monetary policy instrument, which combines quantity-based and price-based nominal anchors, to improve policy targets in Nigeria. This could lead to increased investment capacity and higher output growth. The monetary authority, the CBN, should device measures to ensure that monetary policy is implemented with a view to maintaining a stable exchange rate. In spite of the interest rate and money supply channels of monetary policy transmission, the exchange rate mechanism should be fortified for the purpose of strengthening the country's external balance position.

Monetary policy impulses, through the credit channel, could be enhanced by improving bank credit assessment. Indeed, through appropriate monetary policies that ease credit facilities, that is, policies that favour private investment either in terms of interest rate or availability of domestic credit, private sector investment, would gain momentum in the domestic economy. Monetary policy should be conducted with a view to minimizing inflationary tendencies which most often is a source of instability that exacerbate significant decline in investment. Thus, the government can achieve this by ensuring that domestic rate of interest and money supply respond to changes in aggregate demand and the consumer price level as early as possible. The

effectiveness of monetary policy in the economic development process of an economy must be anchored beyond it and complimented to some extent, by other economic policies.

Finally, effective coordination between the monetary and fiscal authorities in the future should depend, not only on the existing institutional arrangements and the recognition of monetary policy goals for sustainable growth, but also on the commitment by government, such that the public debt remains on a sustainable path in which monetary policy goals are not compromised.

8.4. CONTRIBUTION TO KNOWLEDGE

First, to measure the effects of monetary policy on macroeconomic performance, previous studies used one or two monetary policy target variable i.e. domestic output (GDP) and consumer price index (CPI), as indicators for the measurement of macroeconomic performance. However, some studies used one monetary variable policy target, domestic growth proxy by GDP. Examples of some of these studies are: Starr, 2005; Cortis and Kong (2007), Portang (2007), Olorunfemi and Faloye (2008). Others used two monetary variable policy targets GDP and inflation, example Bernanke, 1986; Sims, Leeper, and Zha, 1996; Gamber and Hakes (2005). Hsing and Hsieh (2004, 2006) Sims and Zha (2006); Adebiyi (2007), Saizar and Chalk (2008), and Barakchian and Crowe (2010). Diego (2010) Mugume (2011). This study improves on previous studies, by employing three monetary policy targets variables, as indicators for the measurement of macroeconomic performance. In addition to domestic output (GDP) and consumer price index (CPI), used by previous studies, this study added balance of payments (BOP) as indicator for the measurement of macroeconomic performance.

Secondly, it is more appropriate to use quarterly data in monetary policy, but quarterly data are not available in data source of Nigeria. Evidently, [Obadan, and Iyoha, (1996)] reports that the scarcity of quarterly data meant that existing econometric models for Nigeria have been estimated with annual data, yet quarterly data seems to be better for econometric model especially in monetary policy. The problem of scarcity of quarterly data in Nigeria was resolved in this study; the novelty is the construction of my data by converting the monthly data obtained from IMF to quarterly by an average of three months per quarter. One of the variables GDP was neither in monthly nor quarterly. Therefore, GDP data was obtained from the Statistical Bulletin of the Central Bank of Nigeria's 50^{th} year anniversary from 1970Q1 to

2008Q4. Data from 2009-2011 were absent; to obtain the data for the remaining years, this study extrapolated by using annual growth rate to compute the missing value. Annual growth rate for 2009 and 2010 were obtained from World Bank indicators. The growth rates are 7.0, and 8.7 respectively.

Although, Chuku (2009) used quarterly data to measure the effects of monetary policy innovations in Nigeria, his data were obtained from the Statistical Bulletin of the Central Bank of Nigeria's 50th anniversary. The only monetary variable in the statistical Bulletin is GDP, and no monthly data. His study converted annual data to quarterly data; conversion from annual to quarterly requires another close quarterly data that makes it not accurate. The construction of quarterly data in this study is therefore an improvement over previous data because monthly data were obtained from IMF.

The thirdly, contribution is in the area of methodology. This study used three different estimation techniques. In previous studies on effects of monetary policy, some have used Error Correction Model (ECM), some have used structural VAR, while others have used three stage least square (3-SLS) and simulation model. To the best of my knowledge, no study has empirically used three estimation techniques in their studies. This study used error correction model (ECM), in estimating three functional equation models. Besides, the study used impulse response, variance decomposition of structural VAR to determine the effects of monetary policy on macroeconomic performance. This study also used three stages least square to examine the effects of monetary policy on macroeconomic performance. Finally, this study used a small macroeconomic model for simulation, counter-cyclical analysis and forecasting. This is therefore is an improvement over previous study.

Fourthly, among the studies that have investigated the effects of monetary policy on macroeconomic performance in Nigeria, many focused on the traditional VAR methodology. Chuku (2009) used the structural VAR to measure the effects of monetary policy innovations in Nigeria, but did not specify structural VAR model specification. Adamu et al (2010), in estimating potential output for Nigeria used structural VAR in their methodology. My novelty is contribution to an area that is underworked. The contribution is the application of three structural Vector Auto Regressions (SVARs) methodology which reinforced the potential importance of structural restrictions in modeling the outcomes and hence the overall

performances of a small open economy like Nigeria. In particular, the relevance of the contributory role of this study is founded on its methodological approach to a problem which incorporates restrictions in both contemporaneous and lagged relationships in the structural VAR system (model). In this way, monetary policy effects through policy shocks were successfully identified in the model. Fittingly identifying the effects of monetary policy innovations is indispensable contribution of the study for effectual policy making.

Fifthly, with full regard to the foregoing, another significant contribution to knowledge of the present study is in the fact that, the study utilized longer periods of estimation. Using longer time periods in estimation to test for the effects of monetary policy shocks on domestic output, prices and the country's balance of payments position, trends are minimized and this possibly reflects in the aggregate, some value added-accuracy of the estimated effects of monetary innovations on economic performance in the short-run equilibrium. The study extended the time series data backward in time to 1970 to cast down doubts about the outcome of the estimated results on the effects of monetary policy in Nigeria. Thus, the present empirical evidence in support of the effects of monetary policy on macroeconomic performance in Nigeria cannot be regarded as being contentious and inconclusive.

8.5. CONCLUSION

The critical need for sustainable growth, price stability and payments in Nigeria cannot be over emphasized. The study shows the empirical fact that monetary policy is an effective tool in macroeconomic management in Nigeria. Overall, the study found that the output and prices respond positively to a positive shock in interest rate and money supply, there is a positive relationship between money stock and growth of domestic output. In Nigeria, sustainable price level and expected inflation effects dominate the liquidity effects. Although the positive responses of output and prices are less sensitive, the brief liquidity effect could be attributed to countervailing pressure on interest rate due to a stronger anticipated inflation effects. A positive interest rate shock has an expansionary effect on output and prices. However, in Nigeria, prices are slow to adjust downward but rather fast in upward adjustment, this indeed gives fractional credence to a temporary price puzzle.

The results of the structural break test for GDP, using CUSUM and CUSUM-SQ for the entire period from 1970Q1–2011Q4, shows that the parameters of the analysed equation are stable, given that recursive errors lie within the two critical lines of both tests. This means that the structural adjustment programme introduced in 1987 did not bring changes to the domestic growth (GDP) of the Nigerian economy. This meant that there was no significant structural break for the GDP model.

The results of the structural break test for CPI using CUSUM and CUSUM-SQ, after the structural adjustment programme from 1987Q1-2011Q4 shows that the parameters of the analysed equation were not stable, given that recursive errors cut across the critical lines of both tests. This means that the structural adjustment program me introduced in 1987 increased inflation rate in the Nigerian economy. This meant that there was a structural break for the CPI model.

The results of the structural break test for BOP, using CUSUM and CUSUM-SQ after the structural adjustment programme from 1987Q1-2011Q4, shows that the parameters of the analysed equation were not stable given that recursive errors cuts across the critical lines of both tests. This means that the structural adjustment programme introduced in 1987, brought about structural change on BOP. This also meant that there was a structural break for the BOP model.

The impulse-response also shows, that when there is real effective exchange rate depreciation, domestic output falls instanteneously and starts recovering at the third quarter. Measuring the output effects of monetary innovations in broad money supply as measured by the (M_2) aggregate, the impulse-response results graphicaly revealed a sluggish response of domestic output to a positive money supply shock. By impulse assessment, exchange rate depreciation leads to an instantenous decline in commodity prices and thereafter rises insignificantly. The impulse-response further shows that an increase in money supply instantenously generates sustained increases of the price level in the country. The instantenous response of the price level to monetary impulses is an indication that commodity prices in Nigeria are flexible as against the sticky price phenomenon. In conclusion, the results of this study provide empirical evidence to support the fact that the monetary policy is effective in the performance of the Nigerian economy.

In particular, the empirical impulse-response assessment indicates that an exogenous shock to the short-term nominal interest rate has the most significant positive effect on domestic output and consumer prices, followed by a transitory effect of the broad money. The response of the country's external payments' position to a structural shock, as measured by a one-standard deviation innovation in all the policy variables is zero. The policy implication is straightforward, monetary policy in Nigeria is effective in maintaining internal balance and ineffective in achieving external balance. This indeed, calls for the Central Bank of Nigeria to be more proactive in its implementation of monetary policy in Nigeria. Unlike money supply, the GDP effect of interest rate at the end of the period is larger than that of the money supply. The dynamic multipliers indicate that monetary policy affects GDP with a time lag.

Given that the coefficient is close to zero, it thus signifies that the simulated GDP series track the actual GDP series. In its entirety, the GDP variable achieves remarkable performance in the estimated model. The correlation coefficient of BOP Equation of historical simulation portrayed high degree of correlation for the BOP series. The historically simulated series on the other hand, shows a high-quality track of actual BOP series by simulated, that is, predicted BOP series. The CPI series simulated brilliantly with a significant correlation coefficient, root-mean-square per cent error and Theil's inequality coefficient. It thus follows that the simulated CPI series tracked the actual CPI series. However, the BOP result gives the most satisfactory historical simulation of all the endogenous variables. In all, monetary policy is effective in influencing macroeconomic performance of the Nigerian economy.

With respect to the policy simulation result, the reduction of interest rate was initially unimpressive; it gained improvement in the later period of implementation. This shows that GDP does not initially respond to interest rate reduction. However, the dynamic multiplier effect of interest rate on GDP is positive and significant. Domestic credit and domestic interest rate policy management are most effective in influencing GDP in Nigeria. On the aggregate, the monetary management of the Nigerian economy is potent. In this case, interest rate reduction is a better monetary policy on BOP stability in Nigeria than money supply.

A close examination of the policy simulation shows that all exogenous or instrumental policy variables resulted in changes in consumer price level as both the impact and dynamic multiplier effects are all positive. However, the dynamic effects of all policy targets are positive and significant. Evidently, the dynamic multiplier effect of money supply on CPI is most substantial and superior. The superiority of money supply further portrays the potency of monetary policy in macroeconomic stabilization for the Nigerian economy.

The dynamic simulation provides the empirical evidence of the potency of monetary policy. In fact, the policy simulation results indicate that monetary policy is an effective instrument for counter-cyclical inflation stabilization in Nigeria. The dynamic multiplier effects are positive in all the years for the BOP, and the domestic credit effect on the BOP is positive for all period. The policy simulation results indicate that monetary policy is an effective instrument for counter-cyclical BOP stabilization in Nigeria. The results suggest the effectiveness of monetary policy implementation for counter-cyclical income stabilization, BOP stabilization and CPI stabilization in Nigeria.

8.6 AREA FOR FUTURE STUDIES

There is a large informal sector that undermines the monetary policy; which has further weakened the effects of monetary policy on macroeconomic performance in Nigeria. The informal sector does not have direct link with the monetary authority, but their activities indirectly affect monetary policies. Transactions in informal sector tend to be based primarily on currency; the large currency holdings that are accumulated, therefore, have the potential of reducing the monetary authority's control of the money supply. Goswani et al (2006) study, show that there is evidence to support the view that the effects of monetary policy are dampened but not completely frustrated by the activities of the informal sector. Furthermore, Nnanna et al (2004) report that the existence of a large informal sector in an economy is detrimental to an effective financial system, as well as hampers the effectiveness of monetary policy actions. When a large amount of money is outside the banking system, the ability of the central bank to influence financial and monetary conditions, through the manipulation of deposit money banks reserve balances, by using indirect monetary policy instruments, is impaired. In this regard the existence of dualistic financial markets has a serious constraint on monetary policy management in Nigeria. If the informal sector is large and significant, there is

a clear evidence of market distortions, poor governance and disproportionate administrative regulations.

Thus, there is need for the country's large shadow economy to be integrated into a formal financial sector. This could further deepen financial intermediation in Nigeria. Therefore, there is the utmost need to fortify the financial sector reform drive, by strengthening the regulatory and supervisory functions. Indeed, the Central Bank of Nigeria should improve on the level of liquidity management, such as strengthening further, the sale of securities that can be traded in the Nigerian Stock Exchange.

Secondly, this study focused on domestic output, consumers' price index and balance of payments, as indicators for the measurement of macroeconomic performance. Balance of payments position is an additional indicator that has not been used before. From the result monetary policy is not effective in external balance. Thus, future study may focus on the balance of payments position to ascertain the validity of this result. Finally, unemployment is an indicator for measuring macroeconomic performance. However, this factor was not included in this study because of absence of data. Future studies may include it as a measurement of macroeconomic performance.

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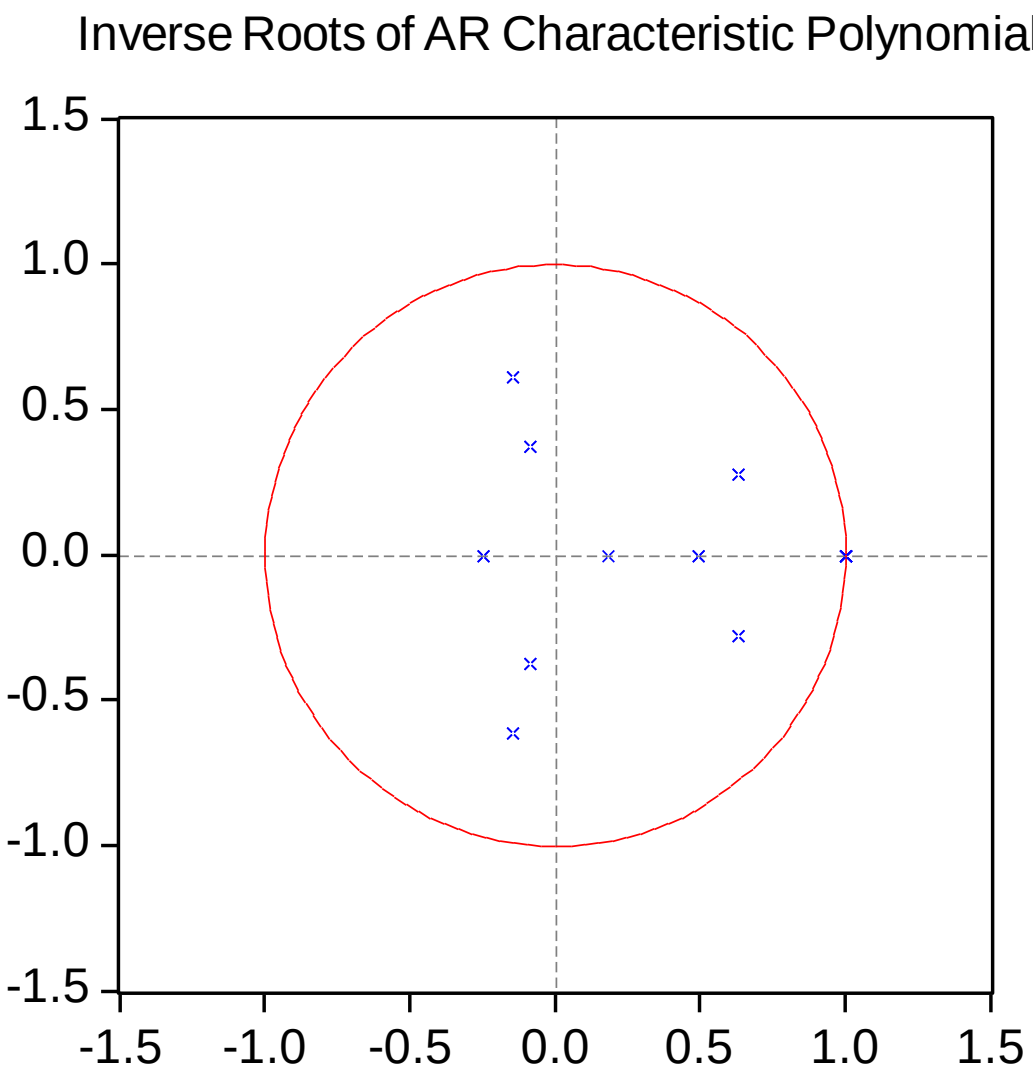
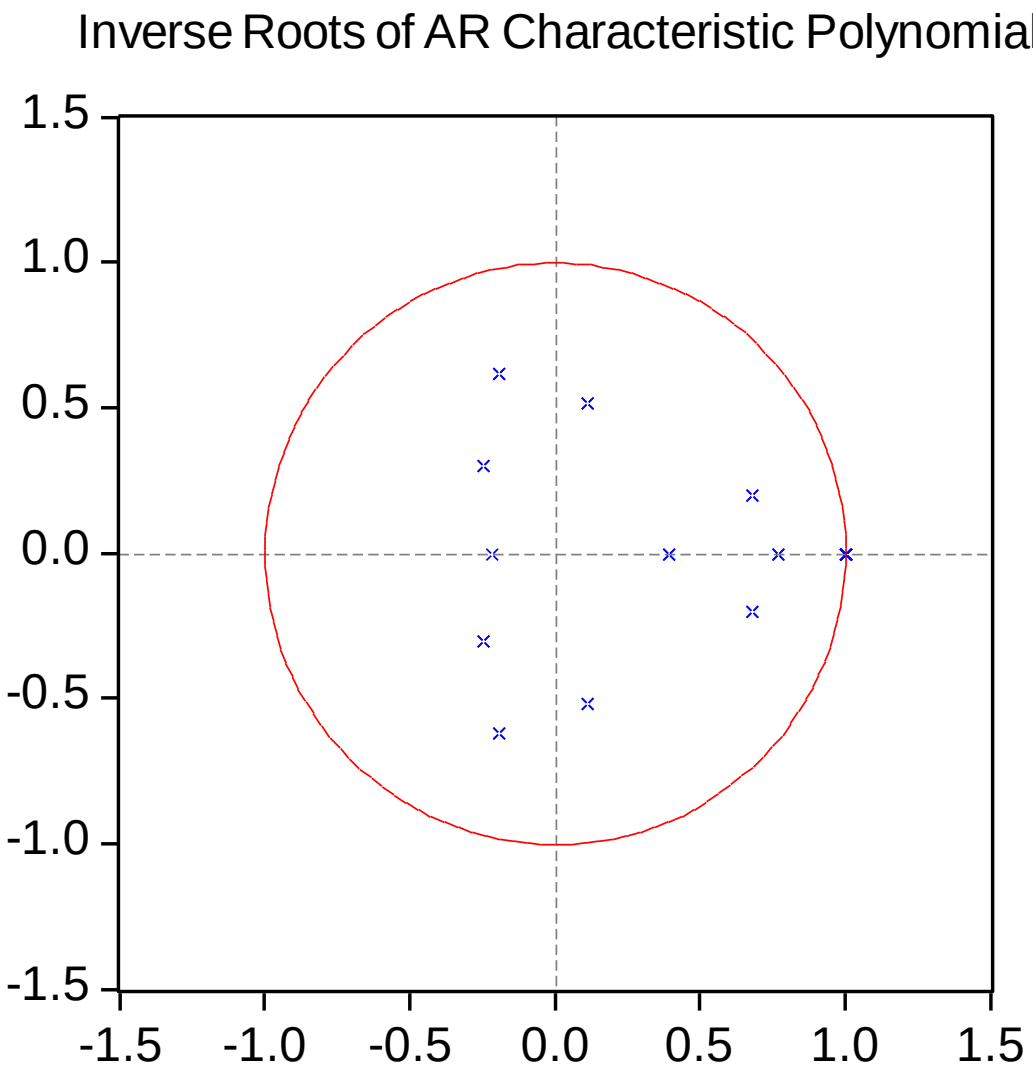
APPENDICES

APPENDIX A: INVERSE ROOTS OF AR CHARCTERISTICS POLYNOMIAL

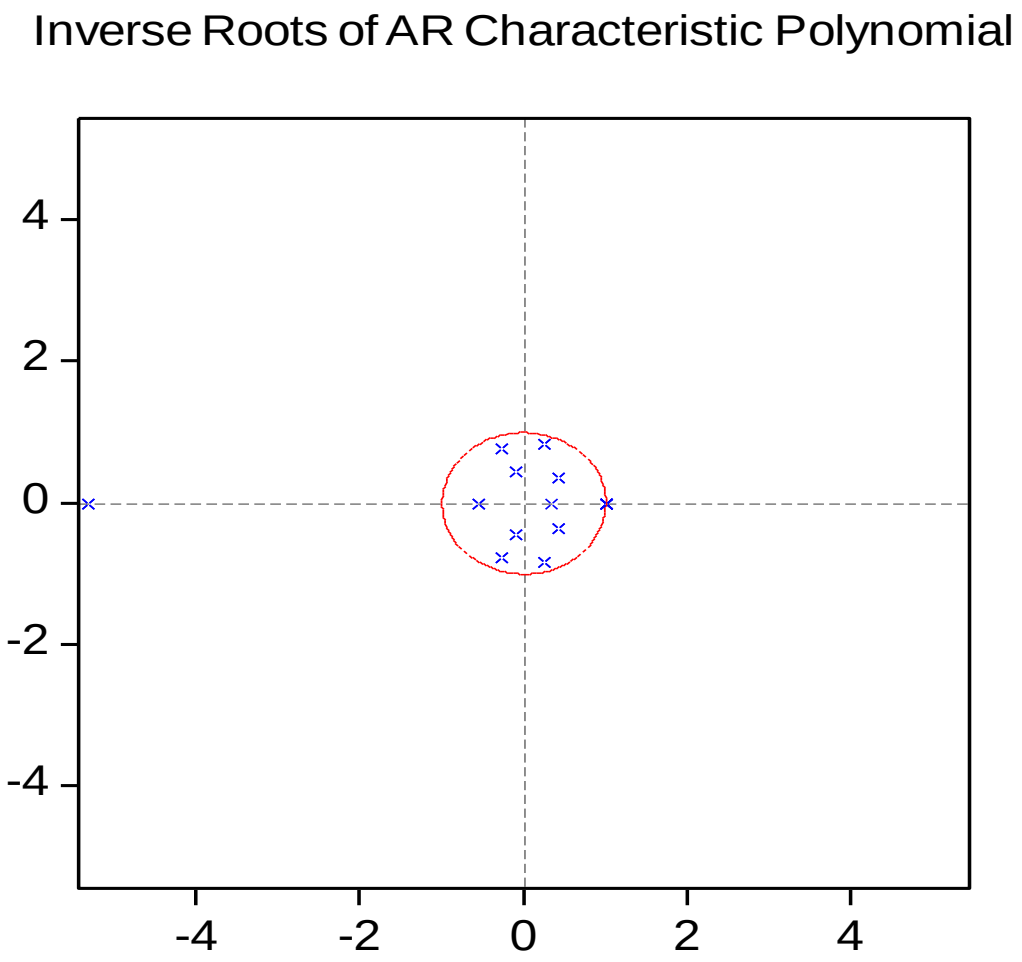
Appendix A1: Inverse Root of GDP Model



Appendix A2: Inverse Root of CPI Model



Appendix A3: Inverse Root of BOP Model



APPENDIX B: STATIONARY (UNIT ROOT) TEST RESUTLS

Appendix B1: ADF Test Results

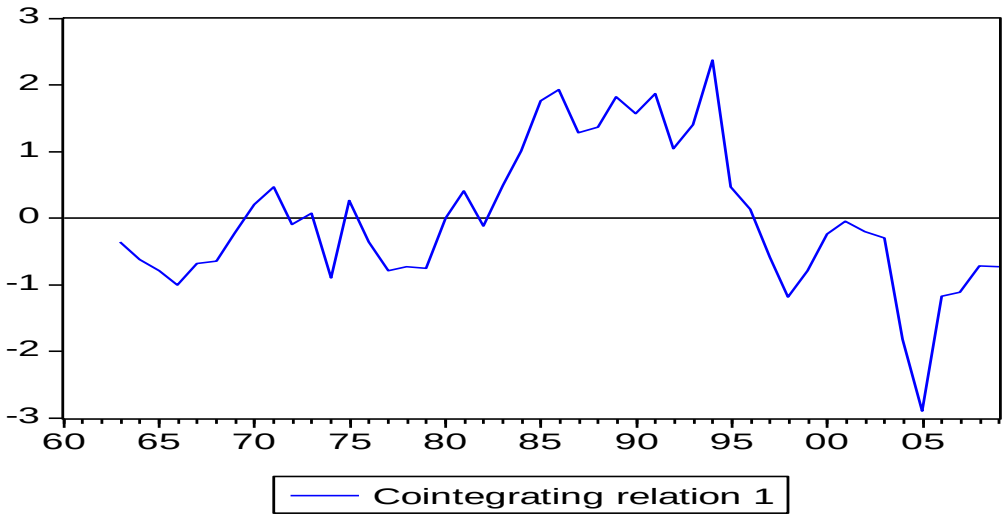
Table 5.2. UNIT ROOT TEST FOR MY VARIABLES USING AUGUMENTED DICKEY FULLER (ADF) TEST

	At Level			At First Difference			
Variable	With Constant	With Constant & Trend	With None	With Constant	With Constant & Trend	With None	Order of Integration
GDP	-0.71988	-1.15766	-0.71235*	-0.51969*	-1.6431*	0.155654*	I (1)
LNGDP	-0.51181	-1.92334	3.331509	-7.57425*	-5.00153*	-2.048575**	I (1)
RGDP	-0.43783	-1.54286	1.067447	-5.63286*	-5.65875*	-5.42342*	I (1)
LNRGDP	-1.31651	-2.29502	1.527498	-5.90019*	-5.88098*	-5.55332*	I (1)
RCRR	-1.754854	-2.420904	-1.75259	-4.10449*	-4.120806*	-4.061056*	I (1)
LNRCRR	-0.093844	-2.717705	-0.214074	-5.93419*	-5.944037*	-5.322358*	I (1)
IR	-1.76817	-1.82672	-0.35958	-12.962*	-12.9608*	-12.9894*	I (1)
RIR	2.956142	1.367565	2.894283	-2.81546	-4.36527*	-1.01804	I (1)
EXR	0.399748	-1.657127	1.514125	-11.8946*	-11.99017*	-11.67752*	I (1)
LNEXR	-0.097771	-1.863376	1.569785	-11.65190*	-11.62735*	-11.17390*	I (1)
REXR	-2.984	-2.947	-2.049	-4.874*	-4.90*	-4.83*	I (1)
LNREXR	-2.366188	-2.317729	-2.450799	-11.22267*	-11.20783*	-11.20921*	I (1)
CPI	3.168075	2.145111	3.138419	-1.138158	-3.221436***	-0.380750	I (1)
LNCPI	-0.736926	-1.830075	0.390945	-3.109**	-3.124	-1.713***	I (1)
BOP	2.455139	1.351695	2.777552	-2.494040	-3.532318**	-1.971520**	I (1)
RBOP	-2.822	-3.363	-0.723	-4.936	-4.0947*	-4.916*	I (1)
DCRED	-1.360057	-3.094472	-0.624370	-3.693435*	-3.686829*	-3.634387*	I (1)
RDCRED	-2.645696***	-2.604841	-0.701336	-4.639831*	-4.913*	-4.655232*	I (1)
LN RDCRED	-2.072012	-1.9066165	-0.157264	-4.713043*	-4.862102*	-4.728263*	I (1)
M2	1.374558	0.812402	1.500284	-1.204148	-2.302900	-0.765827	I (1)
RM2	1.528	0.472	2.211	-3.265**	-3.676**	-2.878*	I (1)
LNRM2	-0.883197	-1.770492	1.528962	-4.60026*	-4.596115*	-4.296960*	I (1)

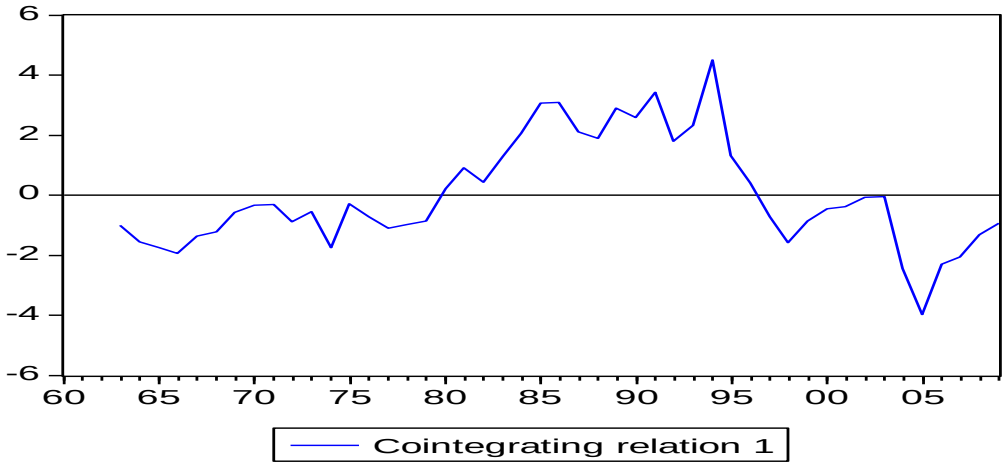
*NB: *, **, *** imply 1%, 5% and 10% levels of statistical significance respectively.*

APPENDIX C: CO-INTEGRATION GRAPHS FOR POLICY TARGETS

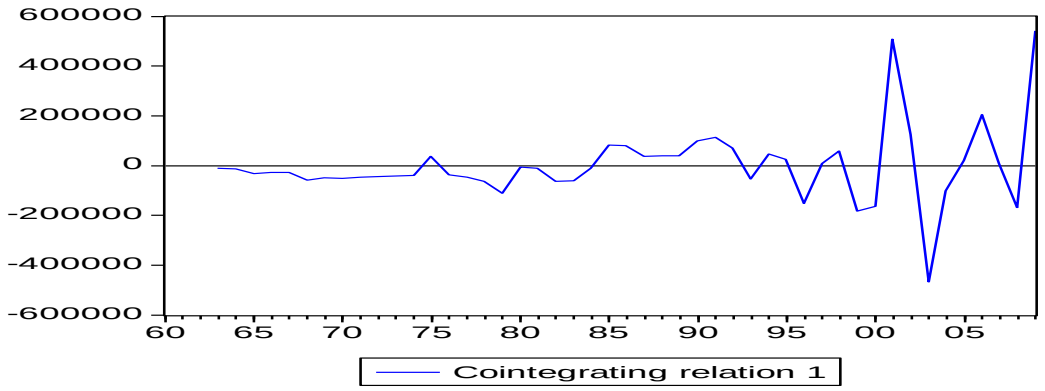
Appendix C1: Co-integration Graph for the GDP Model



Appendix C2: Co-integration Graph for the CPI Model



Appendix C3: Co-integration Graph for the BOP Model



APPENDIX D: MODEL VALIDATION AND STABILITY

Appendix D1: Goodness-of-Fit Statistics for the VECM Estimates

Model 1	Measure	Statistic(s)
	1. R-Squared	.42165
	2. Adj. R-Squared	.33551
	3. F-statistic	4, 8950
	4. DW-Statistics	1.9403
	5. S.E. Regression	.094475
Model 2	**Measure**	**Statistic(s)**
	1. R-Squared	.54321
	2. Adj. R-Squared	.47507
	3. F-statistic	7, 9817
	4. DW-Statistics	2.0037
	5. S.E. Regression	.035043
Model 3	**Measure**	**Statistic(s)**
	1. R-Squared	.82325
	2. Adj. R-Squared	.78921
	3. F-statistic	24.1846
	4. DW-Statistics	2.1814
	5. S.E. Regression	24.7040

Appendix D2: CUSUM and CUSUMSQ Plot of Structural Break Points

Fig. 1: CUSUM

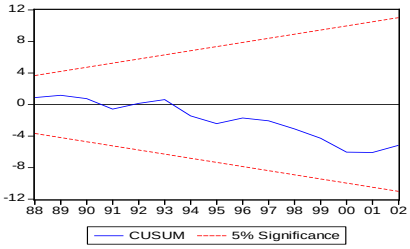
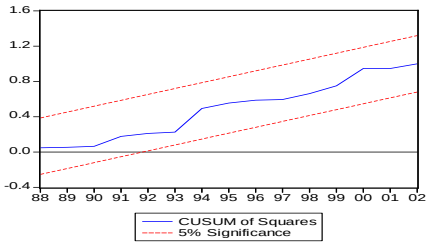
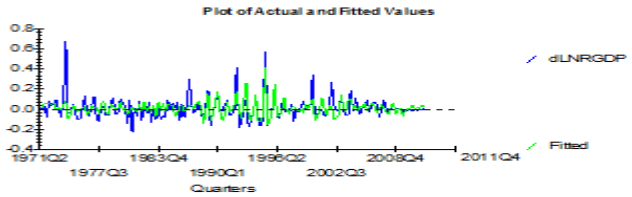


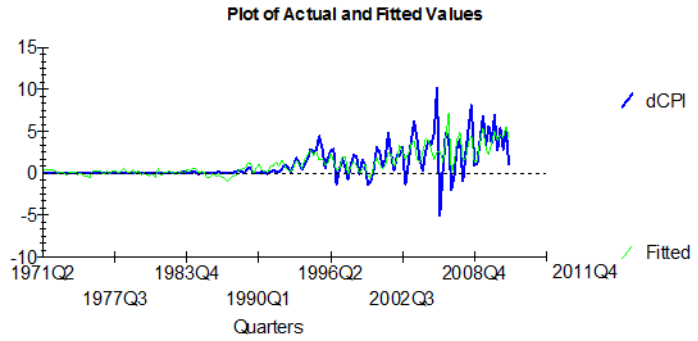
Fig. 2: CUSUMSQ



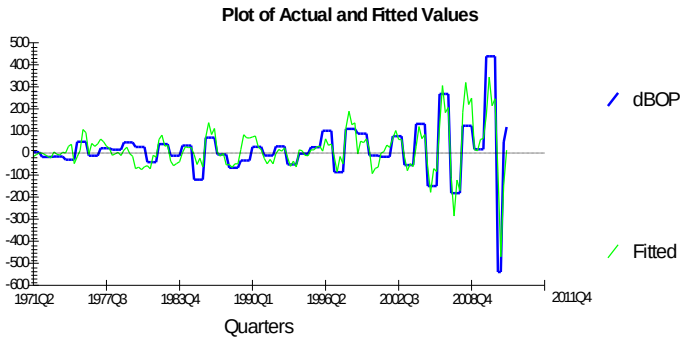
Appendix D2.1 : Plot of Actual and Fitted GDP Model



Appendix D2.2 : Plot of Actual and Fitted CPI Model



Appendix D2.3: Plot of Actual and Fitted BOP Model



Appendix D3: Diagnostic Test Statistics for the VECM Estimates

Model 1	Test	Chi-Square Statistic(s)	Probability
1. VAR Residual Normality			
	Skewness	6.170206	0.2900
	Kurtosis	7.083371	0.2145
	Jacque-Bera Statistic	13.25358	0.2098
2. VAR Residual Serial Correlation			
	Breusch-Godfrey LM test	24.07698	0.5149
3. Specification Error			
	Ramsey RESET Test	0.2226	0.0000
4. VAR Residual Heteroskedasticity			
	White Heteroskedasticity Test	321.6629	0.1865

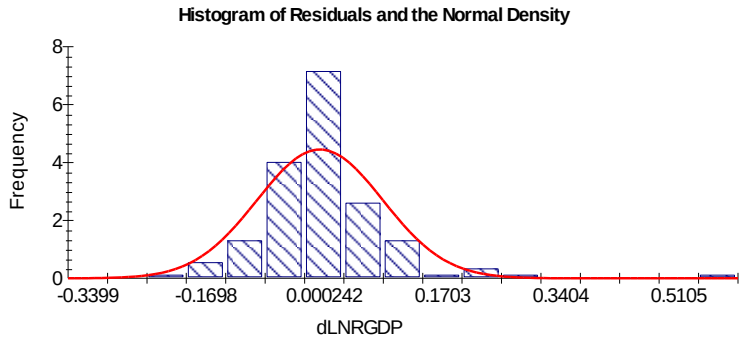
Model 2	Test	Chi-Square Statistic(s)	Probability
1. VAR Residual Normality			
	Skewness	7.147032	0.2099
	Kurtosis	1.375194	0.9270
	Jacque-Bera Statistic	8.522227	0.5780
2. VAR Residual Serial Correlation			
	Breusch-Godfrey LM test	30.76037	0.1971
3. Specification Error			
	Ramsey RESET Test	0.64200	0.0022
4. VAR Residual Heteroskedasticity			
	White Heteroskedasticity Test	336.4836	0.0721

Model 3	Test	Ch-Square Statistic(s)	Probability
1. VAR Residual Normality			
	Skewness	28.27358	0.0000

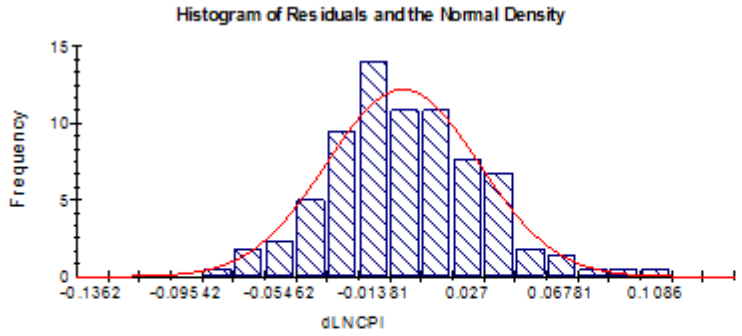
Kurtosis	100.3728	0.0000
Jacque-Bera Statistic	128.6464	0.0000
2. VAR Residual Serial Correlation		
Breusch-Godfrey LM test	43.77922	0.0115
3. Specification Error		
Ramsey RESET Test	0.02528	0.6688
4. VAR Residual Heteroskedasticity		
White Heteroskedasticity Test	336.7335	0.0709

Appendix D3.1: History of residuals and Nominal Density for Model 1

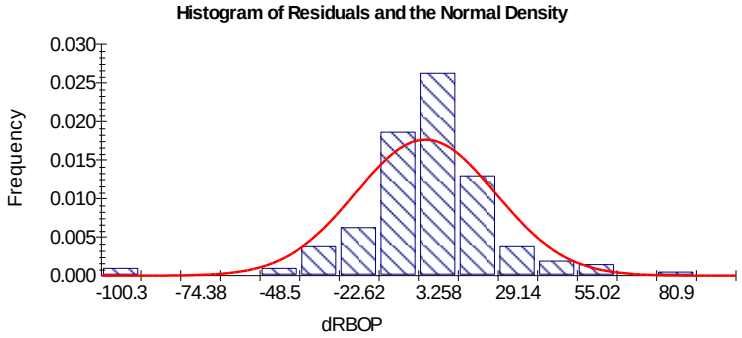
–



Appendix D3.2: History of residuals and Nominal Density for Model 2



Appendix D3.3: History of residuals and Normal Density for Model 3



APPENDIX E: MODEL 1

APPENDIX E.1: VAR Lag Order Selection Criteria
Sample: 1971Q1 to 2011Q4
Lag length Selection for **model 1(**GDP)

lag	LR	FPE	AIC	HQIC	SBIC
0		.3e+08	21.507	21.5147	21.5261
1	534.48	4.8e+06	18.2201	18.2356	18.2582
2	1.9975	4.8e+06	18.2201	18.2434	18.2773
3	12.842	4.5e+06	18.1532	18.1842	18.2294
4	2.4912	- 4.5e+06	18.1502	18.1889	18.2455
5	17.475*	4.1e+06*	18.0547*	18.1011*	18.169*
6	.58971	4.1e+06	18.0634	18.1175	18.1968

*indicates lags selection order
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

APPENDIX E.2: VAR lag Exclusion Wald Tests
Sample: 1971Q1 to 2011Q4
Included observations: 164

Chi-squared test statistics for lag exclusion:
Numbers in [ ] are p-values

	LNGDP	IR	LNRM2	LNRDCRED	REXR	Joint
Lag 1	70.20848	37.72526	60.71945	90.76275	70.44920	320.084
	[9.27E-14]	[4.28E-07]	[8.63E-12]	[0.000000]	[8.26E-14]	[0.00000
Lag 2	15.48586	13.31720	12.16727	18.63122	17.43275	87.5819
	[0.008476]	[0.020581]	[0.032566]	[0.002251]	[0.003748]	[7.07E-0
Df	5	5	5	5	5	25

APPENDIX E.3: VAR Pairwise Granger Causality/Block Exogeneity Wald Tests For GDP Model 1 Sample:1970Q1 to 2011Q4 .Included observation: 164

Dependent variable: LNGDP

Exclude	Chi-sq	Df	Prob.
IR	13.78933	2	0.0010
LNRM2	1.145133	2	0.5641
LNRDCRE	1.082250	2	0.5821
REXR	2.559080	2	0.2782
All	17.47900	8	0.0255

Dependent variable: IR

Exclude	Chi-sq	df	Prob.
LNGDP	5.626098	2	0.0600
LNRM2	3.621920	2	0.1635
LNRDCRE	3.524466	2	0.1717
REXR	10.27020	2	0.0059
All	18.79458	8	0.0160

Dependent variable: LNRM2

Exclude	Chi-sq	df	Prob.
LNGDP	0.361227	2	0.8348
IR	6.132945	2	0.0466
LNRDCRE	0.898789	2	0.6380
REXR	1.700534	2	0.4273
All	14.95000	8	0.0601

Dependent variable: LNRDCRED

Exclude	Chi-sq	df	Prob.
LNGDP	13.52490	2	0.0012
IR	4.138657	2	0.1263
LNRM2	5.130236	2	0.0769
REXR	0.544354	2	0.7617
All	25.40592	8	0.0013

Dependent variable: REXR

Exclude	Chi-sq	df	Prob.
LNGDP	11.77071	2	0.0028
IR	0.103808	2	0.9494
LNRM2	2.508031	2	0.2854
LNRDCRE	4.695767	2	0.0956
All	22.79713	8	0.0036

APPENDIX E.4: VAR Residual Serial Correlation LM Tests
H0: no serial correlation at lag order h
Sample: 1970Q1 to 2011Q4
Included observations: 164

Lags	LM-Stat	Prob
1	24.07698	0.5149
2	22.93780	0.5812
3	29.42861	0.2464
4	28.81156	0.2719
5	42.49684	0.0159
6	25.83218	0.4166
7	25.40363	0.4399
8	31.21196	0.1821
9	33.71078	0.1142
10	15.13025	0.9383
11	36.47406	0.0647
12	29.44215	0.2459

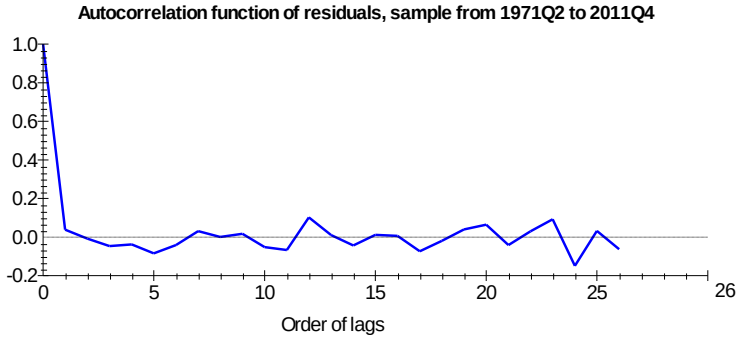
Probs from chi-square with 25 df.

APPENDIX E.5: VAR Residual Portmanteau Tests for Autocorrelations
H0: no residual autocorrelations up to lag h
Sample: 1970Q1 to 2011Q4
Included observations: 164

Lags	Q-Stat	Prob.	Adj Q-Stat	Prob.	df
1	9.117301	NA*	9.311286	NA*	NA*
2	25.03540	NA*	25.92148	NA*	NA*
3	48.48266	0.0033	50.93189	0.0016	25
4	74.36395	0.0143	79.16603	0.0054	50
5	107.6383	0.0080	116.3094	0.0016	75
6	131.4265	0.0192	143.4961	0.0029	100
7	152.5719	0.0473	168.2516	0.0060	125
8	175.5586	0.0753	195.8356	0.0071	150
9	203.7241	0.0676	230.5008	0.0031	175
10	217.3677	0.1901	247.7348	0.0122	200
11	243.2338	0.1925	281.2909	0.0064	225
12	266.4827	0.2263	312.2894	0.0045	250

*The test is valid only for lags larger than the VAR lag order.
df is degrees of freedom for (approximate) chi-square distribution

APPENDIX E.6: Autocorrelation Residual test for GDP Model



APPENDIX E.7: VAR Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
H0: residuals are multivariate normal
Sample: 1970Q1 to 2011Q4
Included observations: 164

Component	Skewness	Chi-sq	df	Prob.
1	0.530853	2.254442	1	0.1332
2	0.468700	1.757440	1	0.1849
3	0.186100	0.277065	1	0.5986
4	0.199550	0.318561	1	0.5725
5	0.441970	1.562698	1	0.2113
Joint		6.170206	5	0.2900

Component	Kurtosis	Chi-sq	df	Prob.
1	2.056057	1.782058	1	0.1819
2	2.923561	0.011686	1	0.9139
3	1.901741	2.412346	1	0.1204
4	2.309752	0.952884	1	0.3290
5	2.019083	1.924398	1	0.1654
Joint		7.083371	5	0.2145

Component	Jarque-Bera	df	Prob.
1	4.036500	2	0.1329
2	1.769126	2	0.4129
3	2.689411	2	0.2606
4	1.271445	2	0.5296
5	3.487096	2	0.1749
Joint	13.25358	10	0.2098

APPENDIX E.9: VAR Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)
Sample: 1970Q1 to 2011Q4
Included observations: 164

Joint test:

Chi-sq	df	Prob.
321.6629	300	0.1865

Individual components:

Dependent	R-squared	F(20,27)	Prob.	Chi-sq(20)	Prob.
res1*res1	0.456046	1.131827	0.3763	21.89020	0.3465
res2*res2	0.735233	3.748820	0.0008	35.29118	0.0186
res3*res3	0.403905	0.914739	0.5753	19.38743	0.4968
res4*res4	0.587265	1.920864	0.0570	28.18872	0.1050
res5*res5	0.497410	1.336084	0.2383	23.87566	0.2479
res2*res1	0.491598	1.305379	0.2559	23.59670	0.2605
res3*res1	0.533021	1.540925	0.1461	25.58503	0.1800
res3*res2	0.331527	0.669528	0.8207	15.91329	0.7220
res4*res1	0.763265	4.352568	0.0002	36.63670	0.0129
res4*res2	0.424592	0.996161	0.4953	20.38041	0.4344
res4*res3	0.319087	0.632632	0.8528	15.31617	0.7580
res5*res1	0.537138	1.566636	0.1372	25.78262	0.1731
res5*res2	0.394773	0.880569	0.6101	18.94912	0.5251
res5*res3	0.388411	0.857364	0.6340	18.64372	0.5451
res5*res4	0.372152	0.800203	0.6930	17.86331	0.5964

APPENDIX F : MODEL 2

APPENDIX F.1: VAR Lag Order Selection Criteria for Model 2 (CPI)
Endogenous variables: LNCPI IR LNRM2 LNDCRED REXR
Exogenous variables: C

Selection-order criteria
Sample: 1971q3 - 2011q4 Number of obs = 162

lag	LR	FPE	AIC	HQIC	SBIC
0		2578.58	10.6929	10.7006	10.7119
1	252.22	550.267	9.14828	9.16376	9.1864
2	47.927	414.43	8.86478	8.88799	8.92196
3	17.029	377.715	8.77201	8.80296	8.84824
4	8.3679	363.159	8.7327	8.77139	8.828*
5	3.9804*	358.752*	8.72047*	8.7669*	8.83483
6	.21941	362.724	8.73147	8.78563	8.86488

Endogenous: **CPI**
Exogenous: _cons

*indicates lag order selection by criterion

LR: sequential modified LM test statistic(each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

APPENDIX F.2:VAR Lag Exclusion Wald Tests
Sample: 1970Q1 to 2011Q4
Included observations:162

Chi-squared test statistics for lag exclusion:
Numbers in [ ] are p-values

	LNCPI	IR	LNRM2	LNRDCRED	REXR	Joint
Lag 1	83.66438	40.96506	64.95333	89.90699	49.12703	303.112
	[1.11E-16]	[9.54E-08]	[1.15E-12]	[0.000000]	[2.09E-09]	[0.00000
Lag 2	22.01289	16.77571	13.22024	16.16356	9.525305	75.9419
	[0.000521]	[0.004945]	[0.021400]	[0.006392]	[0.089859]	[4.87E-0
df	5	5	5	5	5	25

APPENDIX F.3: VAR Pairwise Granger Causality/Block Exogeneity Wald Tests
Sample: 1970Q1 to 2011Q4
Included observations: 162

Dependent variable: LNCPI

Exclude	Chi-sq	df	Prob.
IR	17.97151	2	0.0001
LNRM2	13.87372	2	0.0010
LNRDCRED	0.021703	2	0.9892
REXR	2.265603	2	0.3221
All	39.08556	8	0.0000

Dependent variable: IR

Exclude	Chi-sq	df	Prob.
LNCPI	7.787120	2	0.0204
LNRM2	0.731654	2	0.6936
LNRDCRED	1.597251	2	0.4499
REXR	13.77618	2	0.0010
All	21.62320	8	0.0057

Dependent variable: LNRM2

Exclude	Chi-sq	df	Prob.
LNCPI	1.472263	2	0.4790
IR	3.779771	2	0.1511
LNRDCRED	3.026627	2	0.2202
REXR	0.751941	2	0.6866
All	16.49487	8	0.0358

Dependent variable: LNRDCRED

Exclude	Chi-sq	df	Prob.
LNCPI	6.332201	2	0.0422
IR	2.425344	2	0.2974
LNRM2	9.337168	2	0.0094
REXR	1.990943	2	0.3695
All	16.52185	8	0.0355

Dependent variable: REXR

Exclude	Chi-sq	df	Prob.
LNCPI	10.77207	2	0.0046
IR	0.047296	2	0.9766
LNRM2	2.358168	2	0.3076
LNRDCRED	6.529061	2	0.0382
All	21.57271	8	0.0058

APPENDIX F.4: VAR Residual Serial Correlation LM Tests
H0: no serial correlation at lag order h
Sample: 1970Q1 to 2011Q4
Included observations: 162

Lags	LM-Stat	Prob
1	30.76037	0.1971
2	30.30912	0.2129
3	33.48342	0.1194
4	39.92179	0.0297
5	34.10833	0.1056
6	33.94408	0.1091
7	35.40103	0.0812
8	40.05561	0.0288
9	53.63684	0.0007
10	25.60247	0.4290
11	47.40962	0.0044
12	33.15212	0.1273

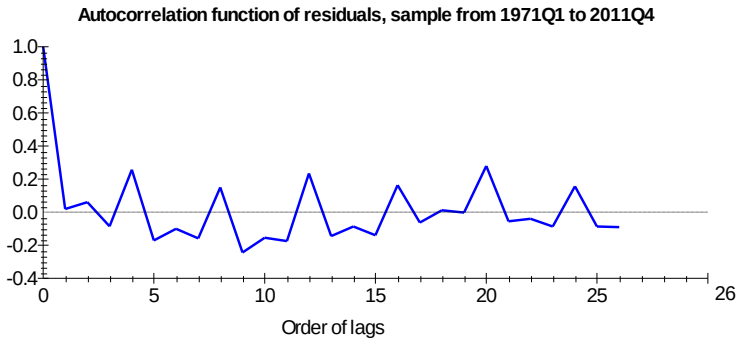
Probs from chi-square with 25 df.

APPENDIX F.5: VAR Residual Portmanteau Tests for Autocorrelations
H0: no residual autocorrelations up to lag h
Sample: 1970Q1 to 2011Q4
Included observations: 162

Lags	Q-Stat	Prob.	Adj Q-Stat	Prob.	df
1	9.426181	NA*	9.626738	NA*	NA*
2	32.56677	NA*	33.77343	NA*	NA*
3	54.59905	0.0006	57.27453	0.0002	25
4	81.56440	0.0032	86.69128	0.0010	50
5	108.0594	0.0075	116.2671	0.0016	75
6	137.3564	0.0079	149.7494	0.0009	100
7	162.5138	0.0135	179.2019	0.0011	125
8	188.9074	0.0172	210.8743	0.0008	150
9	227.5057	0.0046	258.3799	0.0000	175
10	246.8147	0.0135	282.7702	0.0001	200
11	278.0988	0.0091	323.3550	0.0000	225
12	300.1464	0.0163	352.7518	0.0000	250

*The test is valid only for lags larger than the VAR lag order.
df is degrees of freedom for (approximate) chi-square distribution

APPENDIX F.6:Autocorrelation Residual test for CPI Model



APPENDIX F.7:VAR Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
H0: residuals are multivariate normal
Sample: 1970Q1 to 2011Q4
Included observations: 162

Component	Skewness	Chi-sq	Df	Prob.
1	0.380734	1.159669	1	0.2815
2	0.155308	0.192965	1	0.6605
3	0.250240	0.500962	1	0.4791
4	0.320222	0.820337	1	0.3651
5	0.747755	4.473099	1	0.0344
Joint		7.147032	5	0.2099

Component	Kurtosis	Chi-sq	Df	Prob.
1	2.765093	0.110362	1	0.7397
2	2.961631	0.002944	1	0.9567
3	2.709336	0.168971	1	0.6810
4	2.260794	1.092851	1	0.2958
5	2.994273	6.56E-05	1	0.9935
Joint		1.375194	5	0.9270

Component	Jarque-Bera	df	Prob.
1	1.270031	2	0.5299
2	0.195909	2	0.9067
3	0.669933	2	0.7154
4	1.913189	2	0.3842
5	4.473165	2	0.1068
Joint	8.522227	10	0.5780

APPENDIX F.8: VAR Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)
Date: 08/21/11 Time: 14:44
Sample: 1970Q1 to 2011Q4
Included observations: 162

Joint test:

Chi-sq	df	Prob.
336.4836	300	0.0721

Individual components:

Dependent	R-squared	F(20,27)	Prob.	Chi-sq(20)	Prob.
res1*res1	0.725091	3.560709	0.0012	34.80435	0.0212
res2*res2	0.834599	6.812006	0.0000	40.06078	0.0049
res3*res3	0.354684	0.741997	0.7519	17.02481	0.6514
res4*res4	0.585580	1.907566	0.0589	28.10785	0.1069
res5*res5	0.313539	0.616609	0.8659	15.04988	0.7735
res2*res1	0.197500	0.332242	0.9932	9.479984	0.9767
res3*res1	0.583012	1.887506	0.0620	27.98459	0.1098
res3*res2	0.312508	0.613660	0.8682	15.00039	0.7764
res4*res1	0.607245	2.087260	0.0377	29.14777	0.0849
res4*res2	0.441570	1.067492	0.4302	21.19536	0.3857
res4*res3	0.393676	0.876532	0.6143	18.89644	0.5286
res5*res1	0.397106	0.889198	0.6013	19.06107	0.5179
res5*res2	0.367852	0.785574	0.7079	17.65687	0.6100
res5*res3	0.357131	0.749961	0.7439	17.14228	0.6437
res5*res4	0.396292	0.886181	0.6044	19.02203	0.5204

APPENDIX G: MODEL 3

APPENDIX G.1: VAR Lag Order Selection Criteria for Model 3 (RBOP)

Endogenous variables: LNCPI IR LNRM2 LNDCRED REXR

Exogenous variables: C

Sample: 1972q3 - 2011q4 Number of obs = 158

lag	LL	LR	FPE	AIC	HQIC	SBIC
0	-1112.88		77801.8	14.0998	14.1077	14.1192
1	-851.588	522.59	2884.3	10.8049	10.8207	10.8437
2	-801.663	99.85	1552.67	10.1856	10.2092	10.2438
3	-800.236	2.8541	1544.31	10.1802	10.2117	10.2577
4	-799.197	2.0783	1543.57	10.1797	10.2191	10.2766
5	-794.1	10.193	1465.59	10.1279	10.1751	10.2442
6	-784.546	19.11*	1315.2*	10.0196*	10.0747*	10.1552*
7	-784.215	.66089	1326.43	10.028	10.091	10.1831
8	-783.8	.83047	1336.34	10.0354	10.1063	10.2099
9	-783.232	1.1352	1343.73	10.0409	10.1196	10.2348
10	-783.084	.29758	1358.37	10.0517	10.1383	10.2649

APPENDIX .G3:VAR Pairwise Granger Causality/Block Erogeneity Wald test
Sample: 1970Q1 to 2011Q4
Included observations: 164

Dependent variable: BOP

Exclude	Chi-sq	df	Prob.
REXR	2.686589	2	0.2610
LNRM2	2.072087	2	0.3549
IR	3.288809	2	0.1931
LNRDCRE	0.608302	2	0.7377
All	12.13392	8	0.1453

Dependent variable: REXR

Exclude	Chi-sq	df	Prob.
BOP	0.540321	2	0.7633
LNRM2	0.659035	2	0.7193
IR	18.41835	2	0.0001
LNRDCRE	6.339498	2	0.0420
All	24.94623	8	0.0016

Dependent variable: LNRM2

Exclude	Chi-sq	Df	Prob.
BOP	2.041473	2	0.3603
REXR	1.248794	2	0.5356
IR	3.206985	2	0.2012
LNRDCRE	1.231977	2	0.5401
All	8.439446	8	0.3918

Dependent variable: LNIR

Exclude	Chi-sq	Df	Prob.
BOP	1.930889	2	0.3808
REXR	1.146361	2	0.5637
LNRM2	1.563560	2	0.4576
LNRDCRE	0.358326	2	0.8360
All	7.478620	8	0.4860

Dependent variable: LNRDCRE

Exclude	Chi-sq	df	Prob.
BOP	1.853155	2	0.3959
REXR	2.220151	2	0.3295
LNRM2	6.531692	2	0.0382
IR	10.07851	2	0.0065
All	17.64863	8	0.0240

APPENDIX G.4 :VAR Residual Serial Correlation LM Tests
H0: no serial correlation at lag order h
Sample: 1970Q1 to 2011Q4
Included observations: 164

Lags	**LM-Stat**	Prob
1	43.77922	0.0115
2	47.45562	0.0043
3	22.33246	0.6165
4	46.01742	0.0064
5	30.35205	0.2114
6	27.51728	0.3305
7	34.72113	0.0934
8	56.51185	0.0003
9	49.67467	0.0023
10	46.90825	0.0050
11	37.19642	0.0553
12	24.64417	0.4825

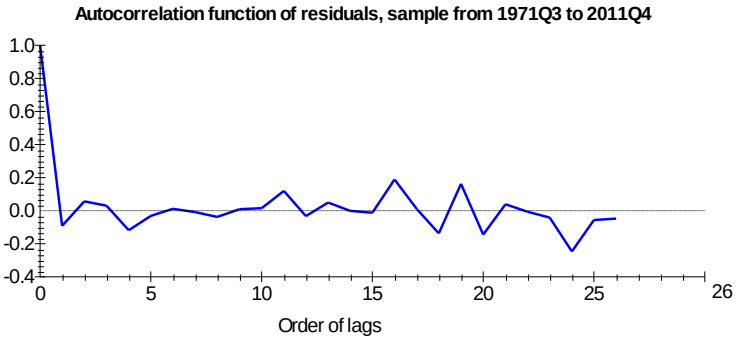
Probs from chi-square with 25 df.

APPENDIX G.5:VAR Residual Portmanteau Tests for Autocorrelations
H0: no residual autocorrelations up to lag h
Sample: 1970Q1 to 2011Q4
Included observations: 164

Lags	Q-Stat	Prob.	Adj Q-Stat	Prob.	Df
1	9.021259	NA*	9.213200	NA*	NA*
2	36.02260	NA*	37.38851	NA*	NA*
3	51.20686	0.0015	53.58506	0.0008	25
4	86.44760	0.0011	92.02950	0.0003	50
5	105.3083	0.0120	113.0834	0.0030	75
6	125.8965	0.0410	136.6127	0.0088	100
7	151.5620	0.0531	166.6601	0.0076	125
8	175.2713	0.0775	195.1113	0.0078	150
9	209.4580	0.0385	237.1872	0.0012	175
10	233.3096	0.0533	267.3155	0.0010	200
11	253.8369	0.0907	293.9456	0.0014	225
12	264.8791	0.2475	308.6685	0.0067	250

*The test is valid only for lags larger than the VAR lag order.
df is degrees of freedom for (approximate) chi-square distribution

APPENDIX G.6:Autocorrelation Residual test for BOP Model



APPENDIX G.7:VAR Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
H0: residuals are multivariate normal
Sample: 1970Q1 to 2011Q4
Included observations: 162

Component	Skewness	Chi-sq	df	Prob.
1	-1.578821	19.94141	1	0.0000
2	0.561337	2.520792	1	0.1124
3	0.522796	2.186526	1	0.1392
4	0.481196	1.852400	1	0.1735
5	-0.470699	1.772457	1	0.1831
Joint		28.27358	5	0.0000

Component	Kurtosis	Chi-sq	df	Prob.
1	9.973056	97.24702	1	0.0000
2	2.867352	0.035191	1	0.8512
3	3.661485	0.875124	1	0.3495
4	2.650336	0.244529	1	0.6210
5	2.007295	1.970926	1	0.1603
Joint		100.3728	5	0.0000

Component	Jarque-Bera	df	Prob.
1	117.1884	2	0.0000
2	2.555983	2	0.2786
3	3.061650	2	0.2164
4	2.096929	2	0.3505
5	3.743383	2	0.1539
Joint	128.6464	10	0.0000

APPENDIX G.8:VAR Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)
Sample: 1970Q1 to 2011Q4
Included observations: 164

Joint test:

Chi-sq	df	Prob.
336.7335	300	0.0709

Individual components:

Dependent	R-squared	F(20,27)	Prob.	Chi-sq(20)	Prob.
res1*res1	0.925634	16.80349	0.0000	44.43044	0.0013
res2*res2	0.388892	0.859103	0.6322	18.66683	0.5436
res3*res3	0.260470	0.475483	0.9547	12.50255	0.8977
res4*res4	0.357333	0.750623	0.7433	17.15201	0.6431
res5*res5	0.399387	0.897702	0.5926	19.17056	0.5108
res2*res1	0.632147	2.319946	0.0212	30.34307	0.0645
res3*res1	0.423558	0.991955	0.4993	20.33081	0.4374
res3*res2	0.319609	0.634152	0.8515	15.34122	0.7566
res4*res1	0.795278	5.244300	0.0000	38.17333	0.0084
res4*res2	0.330320	0.665890	0.8240	15.85538	0.7256
res4*res3	0.221478	0.384055	0.9846	10.63094	0.9552
res5*res1	0.670314	2.744803	0.0077	32.17506	0.0415
res5*res2	0.438115	1.052625	0.4433	21.02950	0.3954
res5*res3	0.333304	0.674911	0.8159	15.99860	0.7167
res5*res4	0.551980	1.663259	0.1082	26.49504	0.1501

Appendix G9: Simulation Formulae

Root Mean Square Error [RMRE]

$$RMSE = \sqrt{\frac{\Sigma(P_i - A_i)^2}{N}}$$

Theil's Inequality Coefficient [U^2]

$$U^2 = \frac{\Sigma(P_i - A_i)^2 / N}{\Sigma A_i^2 / N}$$

Variance Proportion [U_S]

$$U_S = \frac{\Sigma(S_P - S_A)^2}{\Sigma(P_i - A_i)^2 / N}$$

Bias Proportion [U_M]

$$U_M = \frac{(\overline{P} - \overline{A})^2}{\Sigma(P_i - A_i)^2 / N}$$

Covariance Proportion [U_C]

$$U_C = \frac{2(1 - r_{PA})S_P S_A}{\Sigma(P_i - A_i)^2 / N} = 1 - \left[\frac{(\overline{P} - \overline{A})}{\Sigma(P_i - A_i)^2 / N} + \frac{\Sigma(S_P - S_A)^2}{\Sigma(P_i - A_i)^2 / N} \right]$$

Definition of Variables:

P_i is the predicted [forecasted] change in the endogenous variable,

A_i is the actual [realized] change in the endogenous variable,

$\overline{P}$ is the mean of predicted change in the endogenous variable,

$\overline{A}$ is the mean of actual change in the endogenous variable,

S_P is the standard deviation of predicted change in the endogenous variable,

S_A is the standard deviation of actual change in the endogenous variable,

r_{PA} is the correlation coefficient between predicted and actual changes in the endogenous variables and

N is the number of observations

Appendix G10: Small Macroeconomic Model

@INST LNRGDP(-1) LNRM2(-1) LNREXR(-1) LNRDCRED(-1) LNRDCRED(-1) CPI(-1) BOP(-1)
LNRGDP = C(1) + C(2)*LNRDCRED + C(3)*LNRM2 + C(4)*LNREXR + C(5)*IR
LNCPI = C(6) + C(7)*LNRDCRED + C(8)*LNRM2 + C(9)*LNREXR + C(10)*IR
BOP = C(11) + C(12)*LNRDCRED + C(13)*LNRM2 + C(14)*LNREXR + C(15)*IR

@INST D1LNRGDP(-1) D1LNRM2(-1) D1LNREXR(-1) D1RDC(-1) D1CPI(-1) D1BOP(-1)
D1LNRGDP = C(1) + C(2)*D1RDC + C(3)*D1LNRM2 + C(4)*D1LNREXR + C(5)*D1IR
D1CPI = C(6) + C(7)*D1RDC + C(8)*D1LNRM2 + C(9)*D1LNREXR + C(10)*D1IR
D1BOP = C(11) + C(12)*D1RDC + C(13)*D1LNRM2 + C(14)*D1LNREXR + C(15)*D1IR

@INST D1LNRGDP(-1) D1LNRM2(-1) D1LNREXR(-1) D1LNRDC(-1) D1CPI(-1) D1BOP(-1)
D1LNRGDP = C(1) + C(2)*D1LNRDC + C(3)*D1LNRM2 + C(4)*D1LNREXR + C(5)*D1IR
D1CPI = C(6) + C(7)*D1LNRDC + C(8)*D1LNRM2 + C(9)*D1LNREXR + C(10)*D1IR
D1BOP = C(11) + C(12)*D1LNRDC + C(13)*D1LNRM2 + C(14)*D1LNREXR + C(15)*D1IR