CENTRAL BANK OF NIGERIA

MONETARY SECTOR MODEL FOR NIGERIA

RESEARCH DEPARTMENT, CENTRAL BANK OF NIGERIA

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Executive Summary

1. *The design and conduct of monetary policy globally in the past three decades have witnessed significant regime shift apparently reflecting the challenges in establishing the appropriate link to price and output effects of monetary policy. In this regard, Nigeria's monetary policy strategy undergone significant changes, from predominantly direct controls to a relatively liberalized environment. In recent times, however, the task of monetary management has come under severe pressures arising from developments in the global financial system. The challenge of monetary policy, therefore, was obviously ensuring that the transmission mechanism supported the preference of the monetary authorities. This study, therefore, aims at building a monetary sector model that would aid projection of key financial and monetary sector indicators.*

2. *Modeling the monetary sector focuses largely on transmission conditions from the monetary to other sectors of the economy. Several empirical works on the monetary sector have focused on the estimation of the demand for money functions following traditional specifications with real national income, rate of inflation and rate of interest. Although the level of income and the opportunity cost are key determinants of money demand functions, evidence from literature shows that money demand functions differ in terms of specification, aggregation and estimation over the years. In view of this, the monetary sector is modeled on both the demand and supply side to reflect interactions with the fiscal, real and external sectors of the economy, using the interest rate determination process serves as an equilibrium mechanism.*

3. *In Nigeria, monetary policy has evolved through two major phases, namely the era of direct and indirect monetary management. An assessment of monetary policy outcomes revealed moderation in price volatility and increased convergence amongst the measures in recent times.*

4. *The model adopted a framework that incorporated both the demand and supply sides. Market equilibrium is achieved through the adjustment of the interbank call rate. It consists of 13 equations namely: net domestic credit, net foreign assets, credit to the private sector, DMBs credit to government, demand deposits, currency-in-circulation, total deposit,*

treasury bill rate, monthly deposit rate (3-months), inter-bank call rate and prime lending rate.

5. *Eight equations were divided from the components of money supply, while the other five divided from relevant market interest rates were endogenous.*

6. **The findings of the study include, amongst others:**

- **Net Domestic Credit**
  The estimates revealed that a percentage point change in the growth of net foreign assets (NFA) would moderate the rate of credit growth in the domestic economy by about 0.39 percentage point. The size of government fiscal operations specified as change in government expenditure has a positive correlation with net domestic credit (NDC) since liquidity conditions influence the ability of lenders to advance credit in the economy.

- **DMBs Credit to the Government**
  A percentage increase in total deposit liabilities of the DMBs leads to a corresponding increase of 0.44 per cent in DMBs credit to government, reflecting high government patronage. Similarly, a change in treasury bills rate would result in increase in credit to government and government expenditure. The findings further showed that credit to government significantly crowds out credit to the private sector.

- **Demand Deposits**
  The estimated model revealed that non–agricultural output, which is driven, mainly, by retail and wholesale trade, services and industry, has significant positive impact on demand deposits.

- **Currency – in – Circulation**
  The pace of economic activities reflected in non-agricultural output impacts significantly on the demand for currency. A percentage increase in non-agricultural output explains about 0.78 per cent of developments in currency in circulation (CIC).

- **Other Deposits**
  The result showed that money supply positively influence other deposits in the banking system, while non-oil GDP has a negative impact.
- ***Interest rates***

The estimation showed that an increase in the one period lag of Treasury bill and the average of interest rates would result in an increase in the contemporaneous rates. The 3-month deposit rate was influenced largely by the average interest and one period lag of the 3-months deposit rates suggesting that an increase in either of the predictors would bring out a positive response by the 3-month deposit rate.

7. ***Model Simulation and Scenarios Analysis***

The in-sample simulation showed that the model performed reasonably well and is suitable and reliable for forecasting. Some of the alternative scenarios considered include:

- *Scenario 01:- A decrease in monetary policy rate (MPR) by 200 basis points*
- *Scenario 02:-A reduction in MPR and CRR by 200 basis points, each.*
- *Scenario 03:- A depreciation in the exchange rate from N155/$ to N158/$.*
- *Scenario 04:- A decrease in total government expenditure by 10 per cent.*
- *Scenario 05:- An increase in total government expenditure by 10 per cent.*

8. ***Scenarios 01 – A decline in Monetary Policy Rate by 200 Basis Points***

The out-of-sample simulation of a 200 basis points reduction in the monetary policy rate showed that monetary easing would exacerbate inflationary pressures. The result suggested a humped-shaped response of inflation to an anticipated monetary policy shock. The easing reduced the prime lending rate and other rates such as the 3-month deposit and TB rates constraining demand deposits, and hence the demand for money. Deposit money banks' credit to the private sector declined and was compensated by a jump in credit to government, reflecting the crowding out syndrome that has characterized the economy in the past. With currency in circulation declining, it is an indication that the public is probably revealing preference for long-term instruments such as time deposits and are finding alternative investment havens such as the real estate and government bonds that are attractive enough to apply their held monies.

9. ***Scenario 2 - A decline of MPR and CRR by 200 basis points***

A decline in the baseline of MPR from 12.0 to 10.0 per cent and CRR from 8.0 to 6.0 per cent showed that the impact on currency-in-circulation (CIC) over the forecast horizon was mixed, while the impact on credit to

private sector (CPS) and prime lending rate (PLR) was negative. Credit to government by DMBs (CGDMBs), interbank call rate (IBCR) and inflation responded positively to the shock. The evidence indicated a crowding out effect of 0.5 per cent in 2012Q1 and 8.2 per cent in 2014Q4 of private credit. The effects of the shocks culminated in a rise in inflation rate by 3.0 percentage points in 2012Q4 and 4.7 percentage points in 2014Q4.

10. ***Scenario 3 – Nominal exchange rate (NER) depreciates (reaching the ceiling, ₦158/$)***

The result of the out-of-sample forecast indicated that a depreciation in nominal exchange rate to the ceiling (₦158/$) helped to boost export and rein in more foreign earnings leading to increased output and inflation. From the findings, inflation increased by 2.1, 2.9, 3.6 and 4.5 percentage points in 2012Q3, 2012Q4, 2013Q2 and 2014Q4, respectively. The shock also pushed the currency in circulation up by 0.1 per cent in 2012Q1 through 1.3 per cent in 2013Q1 to 3.8 per cent in 2014Q4. The model also showed that there was a crowding out effect on the private sector.

11. ***Scenarios 04 – A 10 per cent decline in the total government expenditure***

A 10 per cent reduction in government expenditure subdued the money stock. The impact was felt immediately on the total money stock, as it fell by 4 per cent in the first quarter. Credit to the private sector followed the same pattern. The decline in government expenditure results in a decline in time deposit and other deposit. The liquidity squeeze in the economy as a resulted of the reduction in government spending raises the cost of borrowing.

12. ***Scenarios 05 – A 10 per cent increase in the total government expenditure***

A 10 per cent increase in government expenditure stimulated steady increase in money supply, time and other deposits. Money supply increased by 1.56 per cent to 4.06 per cent from baseline, over the forecast period. Increase in money supply unaccompanied by a commensurate expansion in money demand, resulted in money market disequilibrium. This positive supply gap exerted a downward pressure on the call rate, thus, lowering the rate over the forecast period. Similarly, the prime lending and deposit rates followed the same downward trend.

13. ***Policy Implications***

- *A glimpse into the finding on an anticipated reduction in monetary policy rate by 200 basis points brings to the fore the lending preference of DMBs to the public sector. Consequently, monetary policy design elements should incorporate incentive mechanisms that would encourage the flow of more credit to the private sector relative to the public sector. Caution must be exercised to avoid the second round effects on inflation of government spending financed by the banking system when the central bank eases the monetary policy rate.*

- *Given the relative preference for long-term investment instruments, deepening the long-term segment of the market to complement other tools of monetary policy implementation provides an effective response to subdue inflationary pressures and enhance financial intermediation.*

- *A decline in the MPR and CRR by 200 basis points apiece showed that the impact on currency in circulation (CIC) over the forecast horizon was mixed, while the impact on credit to private sector (CPS) and prime lending rate (PLR) was negative. However, credit to government by DMBs (CGDMBs), interbank call rate (IBCR) and inflation responded positively. This finding suggests that once economic agents have made necessary adjustments to a positive monetary policy shock, a surprise action by the central bank would rarely change their position. In that regard, the timing of monetary policy action must be consistent with the long-term policy objectives of the central bank so as to avoid issues of dynamic inconsistency and economic agents' misunderstanding of the intent of the monetary authority.*

- *Also, a simulation of a reduction in government expenditure reduces the total money stock by 4.0 per cent in the first quarter. The result re-emphasizes the liquidity effect and challenges of the fiscal operations of government on monetary policy implementation. Fiscal and monetary policy coordination should be strengthened in order to realize optimal growth benefits.*

The out-of-sample forecast following a depreciation in nominal exchange rate to ₦158/$ indicated a boost to export, enhanced foreign earnings and increased output. However, with possible overheating and inflation tipping up by 2.1, 2.9, 3.6 and 4.5 percentage points in 2012Q3, 2012Q4, 2013Q2 and 2014Q4, respectively, complementary actions are required to stem risks to inflation.

Chapter One

I.0 Introduction

The design and implementation of monetary policy globally in the past three decades have witnessed significant changes, apparently reflecting the challenges in establishing the appropriate link of monetary policy to price and output. For instance, the transition from a strictly monetary to inflation targeting framework of monetary policy showed the underlying instability in the demand for money function in the wake of recession. Several countries have implemented different variants of monetary policy regimes, either combining monetary with output targeting or adopting a modified inflation targeting regime that also targets interest rate.

Similarly, Nigeria's monetary policy management strategy underwent significant changes, from predominantly direct controls to a relatively liberalized environment of indirect controls. The major objectives of policy, however, has remained unchanged, that is, price stability and sustainable growth of the economy. In recent times, however, the task of monetary management has come under severe pressures from developments in the global financial system. Financial innovations, sustained by the influences of globalization, played a key role in molding the influence of monetary policy on financial assets during the period.

Consequently, the complex nature of the evolving global financial system requires the central bank to strictly anchor its monetary policy strategy on an established theoretical framework. While theoretically, monetary policy was seen to impact on the real economy through the direct and indirect mechanisms, the complex nature of the evolving transmission mechanism with increased globalization and financial innovation lent credence to the continual refining of the Bank's monetary policy management strategy.

Thus, the monetary policy strategy of the Bank over the period 1959 to 1973 was exchange rate targeting; designed to provide a sound basis for the national currency introduced soon after independence. Monetary policy, therefore, was designed to nurture the international acceptability of the newly introduced legal tender currency. In the period 1968 to 1979, the direct control strategy of monetary policy management, which coincided with massive injection of petrodollars into the economy arising from huge oil windfalls of the period, directed funds to critical sectors of the economy. The Bank was not very effective in stabilizing inflationary swings around single digit as inflation was not a major

goal of monetary policy. During this period, the goals of monetary policy were stimulating output growth with high employment.

Since the 1980s, however, inflationary developments in Nigeria created fundamental challenges to the task of monetary management. The various monetary policy strategies of the Bank were not very effective in containing the upward trending inflation. Domestically, the CBN began to seriously examine the implications of rising inflation on the efficacy of monetary policy and, thus, began to rethink the direct approach to monetary management.

In 1993, the Bank adopted the indirect approach to monetary management where emphasis was on observing money market conditions to examine the behaviour of variables such as nominal interest rates, CBN credit to deposit money banks (DMBs) and the free reserves of the banking system (excess reserves minus borrowings). Attempt to fine-tune the economy from this Keynesian macroeconometric framework by exploiting the Phillips curve long-run trade-off between unemployment and inflation for achieving low inflation led to increased monetary and fiscal policy activism at the Bank during the period 1993 to 2006. These developments led to unintended consequences as inflation accelerated.

Consequently, the Bank resorted to targeting the monetary aggregates premised on Friedman's thesis that fluctuations in the growth rate of the money supply were far more capable of explaining economic fluctuations and inflation than nominal interest rates. This monetarist view provided the framework used by the Bank that monetary policy should focus on controlling inflation through a pursuit of steady growth in money supply consistent with the development objectives of the economy.

The challenge of monetary policy, therefore, was obviously ensuring that the transmission mechanism supported the preference of the monetary authorities. The major area of concern in Nigeria, however, is the commitment of the fiscal authorities to adhere in the future to prudent fiscal operations which will rule out financing by the banking system, especially the CBN. This raised the question of dynamic inconsistency in monetary policy that became one of the thorny issues in the way central banks attempt to 'manipulate' economic agents or choose to 'lean against the wind' and the delicate balance of finding the right policy target or identifying the right nominal anchor.

In order to assist policy makers in formulating and implementing policies, the need to develop and utilize various types of models to aid the understanding of the inter-linkages between the sectors and the economy becomes imperative. At

the CBN, efforts at modeling the monetary sector in the past merely focused on the estimation of money demand and money supply functions. However, there has been a preliminary study on the monetary sector model of the Nigerian economy by Asogu and Mordi, (unpublished).

Against this backdrop, in order to sufficiently capture the inter-relationship and dynamics between the major monetary variables and other macroeconomic indicators, the Bank found it necessary to initiate the construction of the monetary sector model that would enhance policy simulation and analysis among sectors. The study, therefore, aims at building a monetary sector model that would complement and serve as input to the maintenance of the macro model as well as aid projection of key macroeconomic indicators through simulation of impact of policy changes.

To achieve the above objectives, the paper is divided into five sections. Following the introduction is the theoretical framework and empirical literature review in section 2. Section 3 covers an overview of the structure of the Nigerian monetary sector while section 4 contains the methodology covering data, model specification, techniques of analysis and model flow chart. Section 5 presents the empirical findings, simulation and scenario analysis and policy implications, while section 6 concludes the study.

Chapter Two

2.0 Literature Review

2.1 Theoretical Literature

2.1.1 Theory of Demand and Supply of Money

2.1.1.1 Demand for Money

Demand for money is determined by the behavior of economic agents, especially by households and firms. Keynes (1936) highlighted three motives for the demand for money namely; transactionary, precautionary and speculative motives According to him while the transactionary motive for holding money is premised on economic agents' need to meet daily contractual obligations, the precautionary motive is related to the need to hold money for emergencies and other unforeseen situations. As a store of value or wealth, money is held for speculative purposes so as to take advantage of prevailing market opportunities. In other words, during regimes of high interest rate, bond prices would rise, making it more attractive to hold bonds than money. Similarly, during a low interest rate regime, bond prices fall making it more attractive to hold money than bonds. Money demand, therefore, is inversely related to the interest rate under the speculative demand. Money held for transactions and precautionary purposes is primarily a function of income, while speculative demand for money is a function of both income and the rate of interest. Therefore, the total demand for money can be expressed as a function of the level of income and the rate of interest. The demand for money is the demand for real money. Money is held to finance transactions and, therefore, demand for money increases with real output.

The monetarists, following the Quantity Theory of Money (QTM) hypothesis, have attributed the determination of the price level or the value of money to the quantity of money, such that any change in the quantity of money produces an exactly direct and proportionate change in the price level. The QTM is traceable to Irving Fisher's famous exchange equation:

$$MV = PQ \qquad (1)$$

where *M* stands for the stock of money; *V* for the velocity of circulation of money; *Q* is the volume of transactions which take place within the given period; while *P* stands for the general price level in the economy. Transforming the equation by substituting *Y* (total amount of goods and services exchanged for money) for *Q*, the equation of exchange becomes:

$$MV = PY \quad (2)$$

The introduction of *Y* provides the linkage between the monetary and the real sectors of the economy. In this framework, however, *P, V* and *Y* are endogenously determined within the system. The variable *M* is the policy variable, which is exogenously determined by the monetary authorities. The monetarists emphasize that any change in the quantity of money affects only the price level or the monetary side of the economy, with the real sector of the economy totally insulated. This indicates that changes in the supply of money do not affect the real output of goods and services, but their values or the prices at which they are exchanged only. An essential feature of the monetarist model is its focus on the long-run supply-side properties of the economy as opposed to short-run dynamics (Dornbusch, et al, 1996).

Velocity, *V*, is defined more precisely as total spending *PY* divided by the quantity of money.

$$V = \frac{P * Y}{M}$$

By multiplying both sides of the equation by *M*, we obtain the exchange equation, which relates nominal income to the quantity of money and velocity:

$$MV = PY$$

If both *V* and *Y* are constant, then changes in *M* must cause changes in *P* to preserve the equality between *MV* and *PY*. This is the quantity theory of money: *a change in the money supply, M, results in an equal percentage change in the price level P*. We can further modify this relationship by dividing both sides by *V*:

$$M = {}^{1}/_{V} * PY$$

Since *V* is constant we can replace (*1/V*) with some constant, *k*, $M = k * PY$ and when the money market is in equilibrium, *Md* = *Ms*. So our equation becomes

$$Md = k * PY$$

2.1.1.2 Money multiplier

The multiplier model of money supply, originally developed by Brunner and Meltzer (1964) has become the standard paradigm in macroeconomics to explain how policy actions of the central bank influence the money stock (Garfeld and Thornton 1991). It has particularly been used to support the links between money demand and primary goals of monetary policy actions, which include ensuring price stability. The base money stock provided by the monetary authority is multiplied through the banking system creating additional deposits that become the major components of the final money supply. This money multiplier process describes how the final monetary aggregates are determined in an economy and establishes the relationship between the changes in the final money supply for a given change in the monetary base or the reserve money.
The money multiplier is depicted as follows:

$$mm = \frac{M_1}{RM} = \frac{CIC + DD}{CIC + R}$$

Dividing the numerator and the denominator by *DD* (demand deposit), we have

$$mm = \frac{{}^{CIC}/_{DD} + {}^{DD}/_{DD}}{{}^{CIC}/_{DD} + {}^{R}/_{DD}}$$

If the currency to deposit ratio is denoted with c, and the reserve to deposit ratio is denoted with r, we have

$$mm \frac{c+1}{c+r}$$

Because *k* is a constant, the level of transaction generated by a fixed level of nominal income (*PY)* determines the quantity of money (Md) that people demand. Therefore, Fisher's quantity theory of money suggests that the demand for money is purely a function of income, and interest rates have no effect on the demand for money. Fisher believed that people hold money only to conduct transactions and have no freedom of action in terms of the amount they want to hold. The demand for money is determined by the

- level of transactions generated by the level of nominal income PY
- Institutions in the economy that affect the way people conduct transactions.

Milton Friedman also developed a model for money demand based on the general theory of asset demand. Money demand, like the demand for any other asset, should be a function of wealth and the returns on other assets relative to money. His money demand function is expressed as follows:

$$\frac{M^d}{P} = f\left(Y_p, r_b - r_m, r_e - r_m, \ \Pi_{e-} r_m\right)$$

where Y_p = permanent income (the expected long-run average of current and future income)
r_b= the expected return on bonds
r_m = the expected return on money
r_e = the expected return on stocks
π(e) = the expected inflation rate (the expected return on goods, since inflation is the increase in the price (value) of goods)

2.1.1.3 Equilibrium

The equilibrium at the money market is reached when the quantity of money demanded and supplied becomes equal to the rate of interest.

2.1.2 Theory of Interest and Exchange Rates

2.1.2.1 Interest Rate

The rate of interest is determined by the interaction of investment and savings. Two common theoretical approaches to the determination of interest rate in the literature are the speculative demand for money as postulated by Keynes (known as the liquidity preference theory) and the loanable funds theory. Theoretically, the liquidity preference theory assumes that savers make a decision between consumption now and consumption in the future. In other words, the more people consume now out of present income (and the less they save and hence the smaller are the funds available for investment), the lower will be future income. Thus, a trade-off always exists between the present and future consumption. Hence, to persuade them to save and provide funds for investment, interest must be paid. The real interest rate is, therefore, the rate needed to persuade people to forgo present consumption.

On the other hand, the loanable funds theory assumes real investment to be a negative function of the interest rate since the interest rate reflects the productivity of investment projects. The lower the rate of interest the more investment projects become profitable and the more investors will be willing to borrow in order to invest. The Fisher hypothesis suggests that (expected) inflation is

the main determinant of interest rates: as the inflation rate increases by one per cent, the rate of interest increases by one percent.

Although domestic monetary factors are found to be highly significant in explaining some domestic market rates (Bhole and Sebastian, 1996), exchange rates seem to play an important role in determining some other interest rates (Trivedi, 1998). Edwards and Khan (1985) methodology have been popularly used to determine interest rates as a function of both closed and open economy factors. For the closed economy, it is assumed here that there is no inflow or outflow of capital. According to Keynes, money held for transactions and precautionary purposes is primarily a function of income, (Lt=f(y), while speculative demand for money is a function of both income and the rate of interest. Therefore, the total demand for money can be expressed as a function of the level of income and the rate of interest. The demand for money is the demand for real money. Money is held to finance transactions and, therefore, demand for money increases with real output. Holding money has an opportunity cost measured by the nominal rate of interest. Higher interest rates discourage the holding of wealth in the form of money. If M is assumed to be the nominal stock of money and P is the price level, real money demand is defined as M/P, which is a function of the interest rate, i and the output, Y. Short run equilibrium in the money market exists when the demand for money is equal to the supply of money.

If an economy is completely open to the rest of the world, domestic and foreign interest rates will be closely linked and the following uncovered interest rate arbitrage condition will hold:

$$i_t = i_t^* + e_t^{.e} \qquad (3)$$

where: i_t^* = world interest rate for a financial asset with the same characteristics as the domestic instrument and $e_t^{.e}$ = expected rate of change of exchange rate.

2.1.3 Inflation

The overriding objective of monetary policy in central banks' the world over is price stability. The emphasis given to price stability in the conduct of monetary policy designed to promote sustainable growth and development as well as strengthening the purchasing power of the domestic currency amongst others.

2.1.3.1 The Phillips Curve

Two essential goals of interest to policy makers are low inflation and low unemployment, but quite often, these goals conflict. The adoption of monetary and/or fiscal policy moves the economy along the short-run aggregate supply curve to a point of higher output and a higher price level. A situation of higher output is followed by lower unemployment, with firms employing more workers when production increases. This trade-off between inflation and unemployment is termed the Phillips curve. The Phillips curve is supported due to the established relationship between prices and unemployment with the assumption that wages and prices move in the same direction. The strength of the Phillips curve is that it captures an economically important and statistically reliable empirical relationship between inflation and unemployment. However, a major criticism of the Phillips curve is that it does not consider the interactions in the underlying or structural behaviours of consumers and firms in the economy, rather captures correlations between unemployment and inflation rates using historical data. The greatest weakness of the Phillips curve is its lack of theoretical underpinnings, (Olofin, 2001). Despite these shortcomings, the Phillips curve is still being used as a basis for forecasting inflation.

2.1.3.2 The Keynesians

The Keynesians believed that the relationship between changes in the quantity of money and prices is non-proportional and is indirect, through the rate of interest. The strength of Keynesian theory lies in its integration of monetary theory and value theory on the one hand and the theory of output and employment through the rate of interest on the other hand. Thus, when the quantity of money increase, the rate of interest falls, leading to an increase in aggregate investment and demand, thereby raising output and employment. In other words, the Keynesians observed a link between the real and monetary sectors of the economy – an economic phenomenon that describes equilibrium in the goods and money market (IS-LM). The theory also examined the relationship between the quantity of money and prices under situations of unemployment and full employment. Accordingly, so long as there is unemployment, output and employment will change in the same proportion as the quantity of money, but there will be no change in prices. At full employment, however, changes in the quantity of money will induce a proportional change in price, (Olofin, 2001).

However, several weaknesses of the Keynesian postulation have been documented. For instance, Keynesians assume prices are fixed, so that the effect of money appears in terms of quantity of goods traded rather than their average prices. Keynesians also assume that monetary changes are largely absorbed by changes in the demand for money. They fail to appreciate the true nature of

money and assume that money could be exchanged for bonds only. However, it is known that money can be exchanged for many different types of assets like, securities, physical assets, human wealth, etc.

2.1.3.3 Neo-Keynesian

The Neo-Keynesian theoretical exposition combines both aggregate demand and aggregate supply. It assumes a Keynesian view on the short-run and a classical view in the long-run. The approach is to consider changes in public expenditure or the nominal money supply and assume that expected inflation is zero. As a result, aggregate demand increases with real money balances and, therefore, decreases with the price level. Neo-Keynesian theory focuses on productivity, because, declining productivity signals diminishing returns to scale and, consequently, induces inflationary pressures, resulting mainly from over-heating of the economy and widening output gap. From the neo-Keynesian perspective, budget balancing and restraints on spending do not control inflation, and persistent budget deficits do not cause inflation. It was argued that what cause inflation are increase in the velocity of money and the reduction in efficiency caused by excessive current consumption versus investment.

A major development under this theory is the concept of 'potential output', which at times is referred to as the natural output[1]. This level of output also corresponds to the natural rate of unemployment, or what is also referred to as the non-accelerating inflation rate of unemployment[2] (NAIRU). According to the neo-Keynesians, inflation depends on the level of potential output or the natural rate of unemployment. However, the exact level of potential output or natural rate of unemployment is generally unknown and tends to change over time.

The neo-Keynesians recognise the fact that most economic decisions are made under conditions of uncertainty. However, given their preoccupation with the dynamics of growth and long-run considerations, it is logical to expect that they cannot successfully abstract from the reality of uncertainties surrounding dynamic analysis.

[1]This is a level of output where the economy is at its optimal level of production, given the institutional and natural constraints.

[2]NAIRU is the unemployment rate at which the inflation rate is neither rising nor falling or the natural rate of unemployment described as the normal rate of unemployment around which the unemployment rate fluctuates. It is the rate of unemployment that is beyond the influence of monetary policy and determined by structural factors of the labour market, wage bargaining process and social benefit system.

2.1.4 The Concept of the Unholy Trinity

The core mandate of most central banks is to ensure price stability and in the process promote economic development. To achieve this, the monetary policy is focused on determining and providing monetary growth consistent with the desired level of aggregate demand and stable inflation; ensuring a stable and competitive exchange rate and achieving positive interest rate. The achievement of appropriate stability levels for these prices remains a challenge to the monetary authorities. This challenge couched within the framework of the Mundell-Fleming set up by Robert Mundell and Marcus Flemming as an extension of the IS-LM model. Whereas the traditional IS-LM Model deals with economy under autarky (or a closed economy), the Mundell-Fleming model tries to describe an open economy. The model is used to argue that an economy cannot simultaneously maintain a fixed exchange rate, free capital movement, and an independent monetary policy and is referred to as the Unholy Trinity in the literature. It suggests that no Central Bank can control all three variables simultaneously. Under any macroeconomic circumstances, only two of these objectives may be simultaneously met (Soludo, 2009).

As earlier mentioned, inflation is a persistent increase in the general price level, a fall in the purchasing power of money, a situation in which the prices of goods and services rise generally and continuously over a period of time. The growing interest on price stability as a major goal monetary is premised on the fact that low inflation provides a necessary base for sustained economic growth and development. However, inflation is difficult to tackle since any meaningful attempt to curb it entails a trade-off among other important macroeconomic and social objectives such as increased employment, economic growth and social safety nets in the short run. Being a monetary phenomenon, inflation can hardly be sustained without accommodating increase in money supply. If money supply rises beyond the absorptive capacity of the economy, domestic prices will increase. Generally, low inflation (stable prices) enhances economic growth and macroeconomic stability. Price stability promotes efficiency and long-term growth by providing a conducive monetary and financial environment. Conversely, high inflation promotes uncertainty, discourages savings and investment. Excessively low inflation tends to cause cyclical downturns that last unnecessarily longer. A little inflation makes it easier for firms to reduce real wages necessarily to maintain employment during economic downturns. At very low level of inflation, nominal interest rate may be close to zero, limiting a central banks ability to ease policy response to economic weakness. No central bank has developed the magic wand to control these three prices simultaneously, without resorting to the policy of direct regulation. The exchange rate and the interest rate can be kept low and stable only if the central bank succeeds in

keeping inflation low and stable over time. If the central bank artificially keeps the interest rate low, the economy must be prepared to live with a depreciated exchange rate. Similarly, if the exchange rate is kept strong, the economy must live with high interest rate. In most jurisdictions, interest is usually used as a policy instruments while low inflation and stable exchange rates are objectives of policy. In most economies, interest rate is varied to contain inflation and positive real interest rate is the norm. For interest rate to fall on a sustained basis, inflation must fall and inflation expectation must be low. If interest rate and exchange rate must be controlled, as was the case in the 1970's – 1980s in Nigeria, inflation should then be at any level. The concept of unholy trinity here related to the fact that the three prices cannot be controlled at the same time. Recently, the link between these three has featured prominently in the theoretical and empirical literature.

For Nigeria, the necessary and sufficient condition for the achievement of low and stable exchange and interest rates include: a diversified productive and export base which will enhance the supply of foreign exchange; improvement in the physical and social infrastructure; reduced cost of doing business and fiscal prudence; and reduction in overhead costs by banks to reduce the cost of funds.

2.2 Review of Empirical Literature

Modeling the monetary sector largely entails modeling the transmission of conditions in the financial sector to other sectors by endogenising some measures of liquidity. This takes into account the level to which money supply and other assets are affected by public sector deficits, developments in the balance of payments, and reflecting the effects of decisions made by financial institutions on the monetary sector, Pauly (2000).

Crouch (1967) modeled United Kingdom's monetary sector using the demand and supply side of monetary assets. The variables were currency, bank reserves, demand deposits, time deposits, and total deposits. The model was closed by a simple distributed lag version of the quantity theory of money. The model was generally recursive with selective interdependent system leading to the deployment of ordinary least square (OLS) and two-stage least square (TSLS) estimators in the estimation of the structural coefficients. It ignored the real sector owing to the fact that the real and trade sectors had been adequately captured in other studies. An important outcome the UK monetary sector model is the fact that "the special deposit mechanism is a treacherous instrument of monetary policy as this instrument acts perversely", (Crouch, 1967:416).

A monetary sector model of India had been estimated by Khetan (1973). The model consisted three sectors, namely the commercial banking, the private non-bank, and the government sectors and comprised 8 behavioural equations. The demand and supply of six principal financial assets in the Indian money market included bank credit, currency with the public, demand deposits, excess reserves, government securities and time deposits. But the absence of feedback to and from the real sector limited the operational usefulness of this model.

Mishkin (1984) studied the real interest rate movements in seven OECD countries for the period 1967 to 1979 in the euro deposit market. He found a close relationship between nominal interest rates and expected rates of inflation for the UK, the US and Canada. He found that Germany, the Netherlands, and Switzerland exhibited much weaker Fisher effect.

Palanivel and Klien (1999) modeled the monetary sector of the Indian Economy, using the OLS technique to understand its interaction with the fiscal, real and external sectors of the economy. The imperative for linking the monetary sector to the fiscal sector hinged on the substantial effect of fiscal stimulus occasioned by the huge size of deficit financing through net credit to the government, an important source of reserve money creation. As an interaction with the real sector, it was reflected in the demand for money functions and its components, and in price formation. To relate the monetary sector to the external environment, the net foreign asset was used as a critical link to the money supply determination process. The overall performance of the model in terms of its predictive ability established its validity and robustness and provides a reasonable basis for undertaking forecasts in the future.

Jager (1998) modeled the monetary sector of South Africa using the OLS technique to examine the interrelationship between financial variables such as interest rates, monetary and credit aggregates and the goods and services markets of the South African economy. A simulation of the model suggested that changes in the Bank rate could influence the magnitude of monetary aggregates such as money supply (M3) and the claims of the DMBs on the private sector. In addition, changes in the monetary aggregates were driven by changes in interest rates and total domestic income. Reductions in real income in the short-term led to sustained longer-term benefits in the form of higher income and growth in employment from reduction in overall inflation.

Sánchez (2005) examined the link between exchange rates and interest rates in both advanced and developing countries using a simple model. The model incorporated the role of exchange rate pass-through into domestic prices and

distinguishes between cases of expansionary and contractionary depreciations. The model results showed that the correlation between exchange rates and interest rates, conditional on an adverse risk premium shock, was negative for expansionary depreciations and positive for contractionary ones.
Parikh and Starmer (2006) estimated a model of the monetary sector of Bangladesh using annual data for the period 1974–87. Evaluating the model with a range of diagnostic tests and the results from dynamic simulations, it was observed that inflation, real output growth and monetary growth are consistent with the structuralist framework, which shows that exogenous shocks such as harvest failures play a key role in monetary expansion through their effects on food prices.

Parikh, Booth and Sundrum (2007) developed an econometric model of the Indonesian monetary sector to quantify the relationship between money income and prices in a macroeconomic context using a simple ordinary least square technique. In the model, the components of money supply were separated, permitting part of the money supply to be endogenously determined. The model had an aggregate demand function for money balances, three components of money supply government budget receipts and expenditure and different price components. The estimation of money supply was found to be influenced by government domestic expenditure and revenue, foreign expenditure and different price components. The demand for money on the part of the public was found to be the demand for real balances.

Utami and Inanga (2009) tested and analysed the influence of interest rate differential on exchange rate changes for the USA, Japan, Singapore, and the UK, based on the International Fisher Effect theory and the influence of inflation rate and interest rate differentials in Indonesia using quarterly and yearly data for the interest rates, inflation rate differentials, and changes in exchange rates over a five-year period, 2003-2008. The regression results showed also that overall; inflation rate differentials had positive significant influence on interest rate differential.

Several other empirical works on the monetary sector have focused largely on the estimation of the demand for money functions following traditional specifications with real national income, rate of inflation and rate of interest. Although the level of income and the opportunity cost are key determinants of money demand functions, evidence from literature shows that money demand functions differ in terms of specification, aggregation and estimation over the years. Musila (2002) and Randakuwa et al (1995) found positive influence of the rate of interest on demand for quasi money, while the rate of inflation showed a

negative effect on narrow money. Haque et al. (1990) in an earlier specification included the nominal interest rate and the level of income with partial adjustment to capture dynamics. The use of nominal interest rate followed the uncovered interest parity conditions which emboiedy the rate prevailing abroad and the expected change in the value of domestic currency.

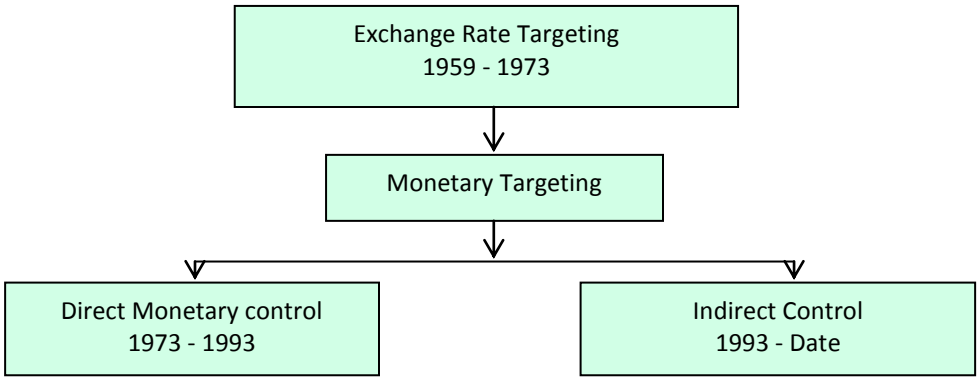
Chapter Three

3.0 Monetary Policy in Nigeria

Monetary policy is a blend of measures and/or set of instruments designed by the central bank to regulate the value, supply, and cost of money consistent with the absorptive capacity of the economy or the expected level of economic activity without necessarily generating undue pressure on domestic prices and the exchange rate (Mordi, 2009:2). In other words, it is the deliberate use of monetary instruments at the disposal of monetary authorities such as a central bank, in order to achieve macroeconomic stability. The objective of monetary policy is to ensure that the expansion in domestic liquidity is consistent with government's objective of price stability, high and sustainable economic growth and balance of payments equilibrium. There are two types of instruments, the direct and the indirect instruments. The former is characterized by the use of credit ceiling, sectoral credit allocation, administrative control of interest and exchange rates; moral suasion etc, while the latter are market-based instruments and therefore, requires a well-developed and functional financial market.

In Nigeria, the monetary authority has used two monetary policy frameworks for the implementation of monetary policy – the exchange rate and monetary targeting frameworks.

Figure 1: Approaches of Monetary Policy in Nigeria



3.1 Exchange Rate Targeting (1959 – 1973)

The conduct of monetary policy in Nigeria at the inception of the Bank prior to Nigeria's independence was influenced and predicated on the economic developments in Britain. The instrument of monetary policy at that time was the fixed exchange rate. The Nigerian pound was fixed in relation to the British pound in line with the prevailing world economic scenario at that time. The fixing of the exchange rate provided a more effective mechanism for the maintenance of balance of payments and inflation control in the Nigerian economy (Ojo, 2000). The Nigerian currency not being a traded currency had its exchange rate, largely, subjected to administrative management. The exchange rate was largely passive as it was dictated by the fortunes or otherwise of the British pound sterling. The naira was pegged to the pound sterling up to 1967 when the pound was devalued and thereafter to the dollar.

Following the breakdown of the IMF par value system in December 1971, the naira was adjusted in relation to the dollar. However, there were problems associated with pegging the Nigerian currency (naira) to a single currency. One of such problems was that the naira had to undergo de-facto devaluation with the dollar, while the economic fundamentals dictated otherwise in 1973 and 1975, respectively. Based on the downsides of pegging to a particular currency, the authority in 1978 decided to peg the naira to a basket of 12 currencies of the major trading partners.

3.2 Monetary Targeting (1973 - till date)

Monetary targeting involves the use of a quantity anchor, usually of monetary aggregates to achieve the ultimate monetary policy objective. It involves the use of direct and indirect instruments.

During the direct control, the major objective of the monetary policy was to promote rapid and sustainable economic growth. To achieve this, the monetary authorities imposed differential quantitative ceilings on all sectors of the economy, giving higher credit ceilings at below market lending rate to the preferred sectors, namely: agriculture, manufacturing and construction. This was to ensure that these sectors were given the utmost attention to take the lead in growing the economy through the multiplier effect. The level and structure of interest rates were administratively determined by the CBN. Both savings deposit and term deposit rates were fixed to attain the social optimum in resource allocation, promote growth of the preferred sectors, achieve orderly growth of the financial market, subdue inflation, and lessen the burden of internal debt servicing of the government.

By 1993, the central bank switched to the indirect approach to monetary policy. This switch did not preclude nor change the goals of monetary policy, which includes: achievement of domestic price and exchange rate stability; maintenance of a favorable balance of payment position; development of a sound financial system; and promotion of rapid and sustainable rate of economic growth. The CBN focuses on liquidity management to achieve the objective of maintaining price and macroeconomic stability. The primary instruments for liquidity management are OMO, complemented by cash reserve requirements, discount window operations, etc. The anchor for the Bank's monetary policy was the minimum rediscount rate (MRR), which was meant to anchor short term interest rates in the financial system. The intermediate target for monetary targeting was base money, which the Bank sought to control to have a hold on inflation trend in the economy.

The MRR, as an indicative rate, signals the direction of interest rate and impact of monetary policy. Between 1999 and 2005, the Monetary Policy Committee (MPC), adjusted the MRR in line with monetary conditions. However, in the face of the problem of liquidity overhang that persisted in the banking system over the years from the excessive fiscal operations of preceding governments prior to 1999, the MRR was not effective as an anchor rate because it could not exert immediate impact on short-term rates. Moreover, the rates in the money market remained largely, volatile leading to inefficiencies in the money market as the MRR could not transmit monetary policy effectively. To establish a good truly transactionary policy rate that will effectively signal the direction of monetary policy and smoothen the volatility in the money market rates, a new framework for implementing monetary policy was introduced that took effect on December 11, 2006.

The ultimate goal of the new framework was to achieve a stable value of the domestic currency through stability in short-term interest rates around an "Operating Target" interest rate, "Monetary Policy Rate" (MPR). MPR is determined and operated by the CBN to serve as an indicative rate for transactions in the inter-bank money market as well as other Deposit Money Banks'(DMBs) interest rate. The MPR replaced the Minimum Rediscount Rate (MRR), which had been relatively ineffective in mobilizing control of interest rate movements in the financial markets.

The main principle guiding the new policy is to control the supply of settlement balances of banks and motivate the banking system to target zero balances at the CBN, through an active inter-bank trading or transfer of balances at the CBN. This is aimed at engendering symmetric treatment of deficits and surpluses in the

settlements accounts, so that for any bank, the cost of an overdraft at the Central Bank would be equal to the opportunity cost of holding a surplus with the Bank. The Central Bank intervention in the market takes the form of a standing lending facility, which ensures orderly market operations or behaviour thereby reducing interest rate volatility. The standing lending facility is available as an overnight lending to banks with deficits, at a fixed interest rate, i.e. the upper band of the CBN standing facility. The Bank stands ready to supply any amount the banks may require at the standing lending rate. The Central Bank also set up a standing deposit facility that pays banks with surplus funds, a fixed interest rate in their deposit or reserves, which they keep with the Bank. This arrangement allows the Bank to keep the overnight inter-bank interest rate within a corridor with an upper and lower limit on interest rate.

For policy effectiveness, the CBN adjusts the MPR in line with the liquidity and macroeconomic conditions. Since its introduction, the MPR has varied between 6 per cent, in April 2008, and 12 per cent in October 2011. A major advantage of the new framework is that the CBN is able to operate in the market daily and ensures that adequate liquidity is provided to enable banks trading in the inter-bank market to complete settlement at interest rates around the MPR. Inter-bank rate is, therefore, maintained at a level between the lending and deposits rates at the CBN. The maintenance of interest rates band has helped significantly to reduce volatility in the money market compared with the inter-bank rates received in the past.

Table 1: Monetary Policy Framework

Monetary Policy framework			
Instruments	**Operational Target**	**Intermediate Target**	**Ultimate Target**
Main Instrument: Open Market Operations (OMO) Discount Window Operation o MRR/MPR Reserve Requirements o *Cash reserve ratio* o *Liquidity ratio* Moral Suasion	Interest Rate (Money market) *Banks reserves* *Currency in Circulation*	Money Supply Bank Lending o *Credit* Short-term Interest Rates o *Inter-bank* o *Lending* o *Deposits* Exchange rate	Primary: Inflation (price stability) Secondary: o Output Growth o Balance of Payments

3.3 Monetary Policy Process

The conduct of monetary policy in Nigeria involves three stages, namely policy formulation, implementation and review. Using financial programming techniques, monetary policy formulation entails setting monetary targets (such as intermediate and operating targets) consistent with the assumed targets for output growth, inflation rate and external reserves. In quantifying the appropriate magnitudes of the instruments required to reach the targets, comprehensive review of recent macroeconomic performance, as well as, the current issues are undertaken. The programme is based on the assumption of a stable relationship between monetary variables (such as money and domestic credit), which the Bank can control, as well as real variables (such as real output and prices) though not under the direct control of the CBN.

The Management of the CBN had the sole responsibility for monetary policy formulation and implementation prior to 1999 when with its autonomy, the Bank established the Monetary Policy Committee (MPC) to deliberate on the outcomes of monetary and other economic policies and take appropriate decision. The Committee has now been formerly constituted by law with the enactment of the Central Bank of Nigeria Act, 2007. The statutory responsibility of the MPC in Nigeria is to take monetary policy decisions based on the outcomes of monetary and economic assessments. This is in line with the global trend which focuses on the primary objective of implementing monetary policy efficiently.

Other institutional arrangements at the CBN to support the Bank's monetary policy function include: the Monetary Policy Technical Committee (MPTC), the Monetary Policy Implementation Committee (MPIC), the Fiscal Liquidity Assessment Committee (FLAC) and, the Liquidity Forecasting Committee (LFC). These committees through their functions complement each other to ensure that monetary policy is conducted efficiently and effectively. The committees meet through a well synchronized schedule of meetings.

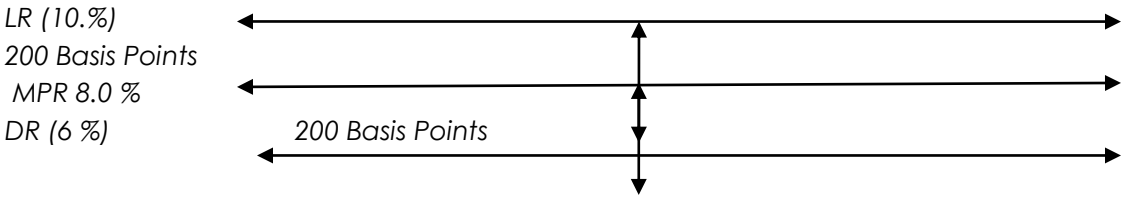
3.3.1 Monetary Policy Implementation Framework (2006-Date)

The CBN has overtime recognized that continuous reassessment and evaluation of its monetary policy framework is required to enable it respond to the ever changing economic and financial environment it operates. Consequently, in 2006, the Bank introduced a new framework for monetary policy implementation in 2006 which centered on an interest rate corridor approach and essentially shifted the focus of the bank from managing reserves to managing the overnight inter-bank rates, with the hope that this would affect inflation and other policy objectives via the money supply. Thus, the Bank established a Standing Facility (SF) where it lends overnight to banks with deficits at a fixed rate and pays banks

with surplus a fixed interest rate on their deposits or reserves they would like to keep with the Central Bank. Both the lending and the deposit rates are expected to, respectively, form the benchmark for rates in the inter-bank market. The spread between the lower and upper boundaries (deposit and lending rates) provide cost incentives for banks to deal among themselves rather than with the CBN. Under the new monetary policy implementation framework, reserve money remained the operating target, complemented by the overnight interbank interest rate with the advent of MPR.

The Monetary Policy Rate (MPR) is the nominal anchor for monetary policy in Nigeria and influences the level and direction of other interest rates in the domestic market. The MPR signals the monetary policy stance of the CBN to market operators, hence guiding the way the CBN policy rate influences credit availability, as a lender-of-last resort to DMBs. Unlike OMO, the direct impact of varying the MPR is on the cost of credit as against OMO's impact on the reserves of the DMBs.

Figure 2: Operating Band for Overnight Interest Rate



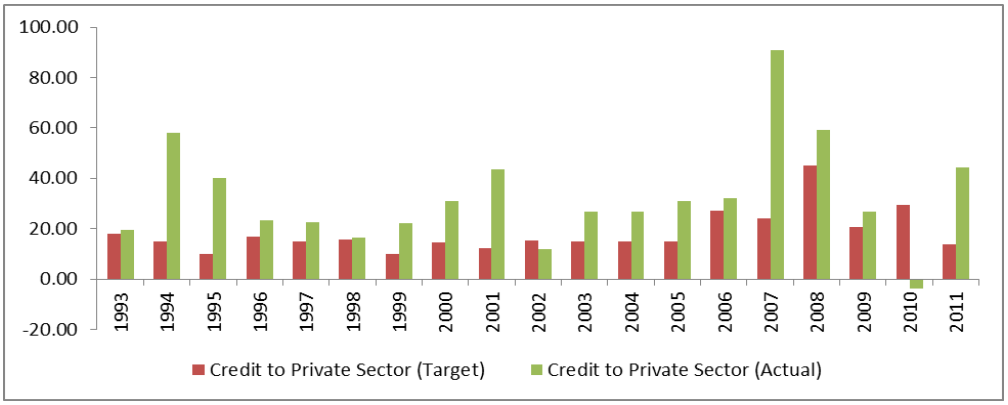
The major goals of monetary policy in the period 1993 -1995 were to boost the rate of growth of output [real gross domestic product (GDP)], moderate inflation, as well as build the level of foreign reserves. Through the period, the set credit expansion target to the economy averaged 9.6 per cent. While credit to the government was expected to grow at the rate of 5.6 per cent, credit to the private sector was to grow by an average of 24.4 per cent.

Table 2: Monetary Policy Outcomes (1993 - 2011)

Year	Growth Rates (%)							Exchange Rate (N/US$ 1.00)	External Reserves (US$' Million)
	Broad Money Supply (M2)	Narrow Money Supply (M1)	Net Domestic Credit	Credit to Private Sector	Credit to Govt	Real GDP	Inflation		
1993	53.76	56.32	64.06	19.42	103.23	1.56	61.26	22.05	1,429.59
1994	34.50	42.64	56.46	58.13	55.60	0.78	76.76	21.89	9,009.11
1995	19.41	18.90	8.03	39.97	-8.72	2.15	51.59	21.89	1,611.11
1996	16.18	12.93	-21.77	23.30	-58.00	4.13	14.31	21.89	3,403.91
1997	16.04	18.09	-1.40	22.60	-58.03	2.89	10.21	21.89	7,222.22
1998	22.32	18.60	40.07	16.61	201.81	2.82	11.91	21.89	7,107.50
1999	33.12	23.39	23.32	22.18	26.36	1.19	0.22	92.69	5,424.60
2000	48.07	62.24	-25.32	30.93	-170.13	4.89	14.53	102.11	9,386.10
2001	27.00	28.06	79.87	43.46	95.16	4.72	16.49	111.94	10,267.10
2002	21.55	15.86	56.59	11.79	6,320.55	4.63	12.17	120.97	7,681.10
2003	24.11	29.52	35.70	26.81	58.43	9.57	23.81	129.36	7,467.78
2004	14.02	8.58	11.99	26.61	-17.94	6.58	10.01	133.50	16,955.02
2005	24.35	29.66	14.51	30.82	-36.99	6.51	11.57	132.15	28,279.06
2006	43.09	32.18	-69.13	32.06	-732.81	6.03	8.55	128.65	42,298.11
2007	44.24	36.64	276.40	90.76	-22.30	6.45	6.56	125.83	51,333.15
2008	57.78	55.87	84.20	59.38	-31.21	5.98	15.06	118.57	53,000.36
2009	17.60	3.29	59.88	26.80	25.92	6.96	13.93	148.88	42,382.49
2010	6.91	11.05	10.00	-3.81	51.27	7.98	11.80	150.30	32,339.25
2011	15.43	21.54	57.16	44.28	55.71	7.43	10.30	153.86	32,639.78

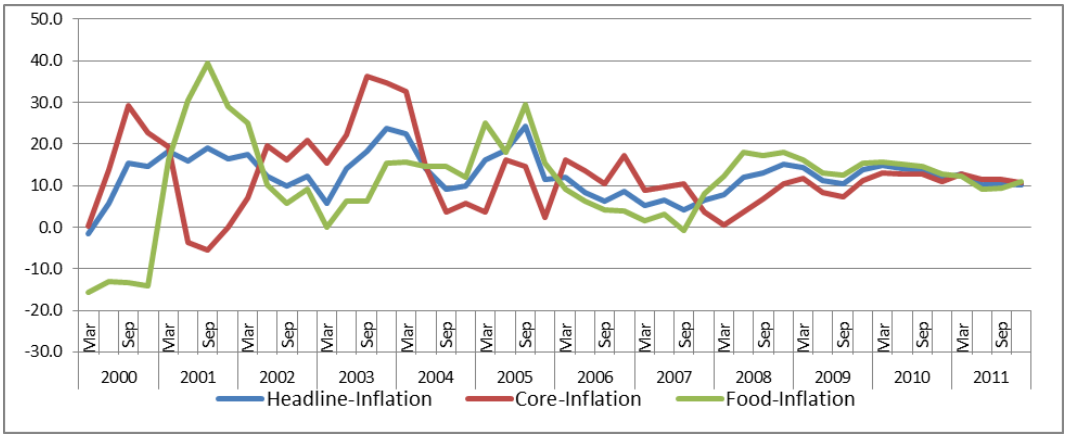
Overall, between 1993 and 2011, the performance of monetary policy witnessed a mixed outcome.

Figure 3: Actual and Target Credit to Private Sector (1993 - 2011)



Against expectations, the outcomes of macroeconomic policy underperformed in some years due to the high growth in monetary aggregates, which were consistently above their targets despite the use of both conventional and unconventional monetary policy tightening measures.

Figure 4: Headline, Core and Food Inflation (January 2000 - December 2011)



An assessment of the above graph showing different measures of inflation, revealed moderation in volatility and increased convergence amongst the measures, further revealing an improved performance of monetary policy in recent times.

Figure 5: Monthly Market Rates

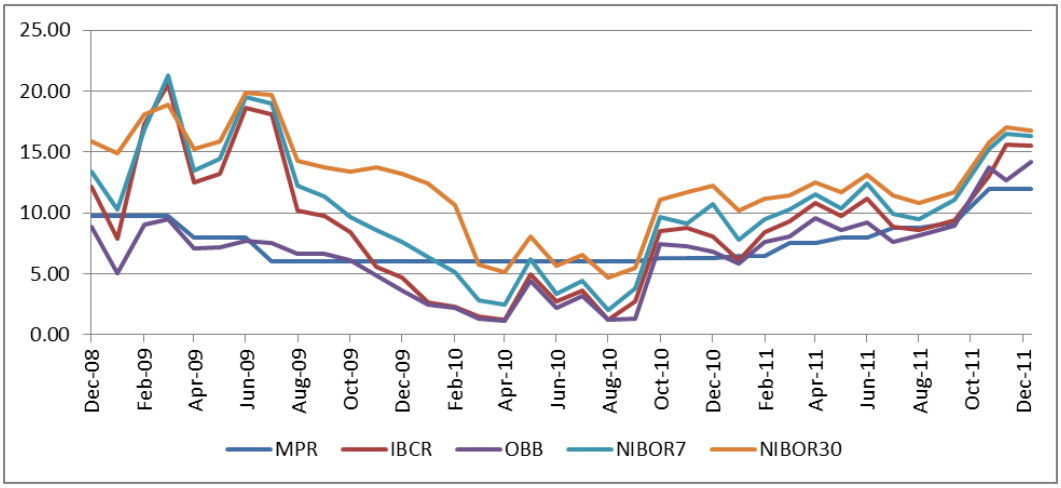
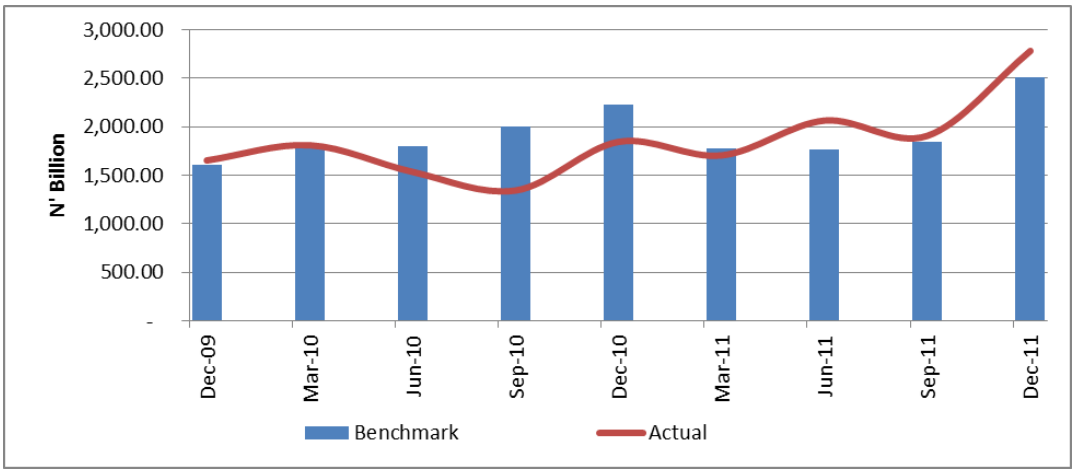


Figure 6: Reserve Money Benchmark & Actual (December 2009 - December 2011)



3.3.2 Monetary Policy Challenges

The implementation of the various monetary policy frameworks in Nigeria is not without daunting challenges, especially the herculean task of determining the appropriate monetary policy framework to achieve monetary policy objectives at given times. Some of the concerns of the monetary authority is to ensure that monetary policy actions impact on the real economy through efficient monetary policy mechanism. CBN is, thus, faced with the issue of fashioning out the appropriate monetary policy framework given the complexities of the economy under which it operates at any given time. Some of the challenges that face monetary policy implementation include the paucity of high frequency and quality data, the difficulty of achieving a good mix and balance between conflicting multiple objectives of monetary and government policies, the distortionary effect of fiscal dominance that exacerbate liquidity surfeit in the system and the nascent and predominantly cash-based payments system. Other critical challenges that face monetary policy implementation in Nigeria include the spate of policy changes, the difficulty of balancing the achievement of the goal of financial stability and macroeconomic stability, structural rigidities and bottlenecks like infrastructural deficiencies, the prevalence of oligopolistic banking sector where a few banks control the liquidity and dictate the pace of market activities, and the high dependence of the economy on oil receipts, which makes it vulnerable to external shocks and, thus, affects monetary policy objectives adversely.

Chapter Four

4.0 Methodology

4.1 Data Requirements

The data used in this study were obtained from three main sources, namely: the National Bureau of Statistics (NBS), the Central Bank of Nigeria (CBN) and Organization of Petroleum Exporting Countries (OPEC). The quarterly data used for the estimation and simulation in the model span 1990 – 2011.

The use of quarterly series is based on two crucial factors. Firstly, sufficient degrees of freedom relating to number of observations is critical, especially when estimating the over-parameterized models. The Nigerian case is such that annual data series hardly date back beyond 1970. Secondly, for monetary policy purposes, annual data results could hardly hold sway for a model conceived to track economic developments, which invariably, affect the financial and external sectors. In the study, nominal data sets are used for estimation and in-sample simulations.

4.2 Analytical Framework

The model adopted the summarized version of the balance sheet of the Central Bank, Deposit Money Banks and the non-bank private sector. Within this context the model attempts to explain the major items by a number of behavioural equations, empirical relationships, definitions and identities.

4.2.1 Monetary Survey

Generally, the monetary survey is a combination of both the CBN and DMBs balance sheets as shown below:

Table 3: CBN Balance Sheet

CBN Balance sheet	
Assets	**Liabilities**
Foreign Assets	**Reserve Money**
Claims on Federal government	o Currency in Circulation (CIC)
o Nigerian Treasury Bills (NTBs)	o Banks Reserve
o Nigerian Converted Bonds	▪ Reserve requirement
o Development stock	▪ Other Deposits
o Treasury Certificates	**Private Sector Deposits**
Claims on States and Local Government	**Short-term foreign liabilities**
Claims on Non-Financial Public Enterprises	o Non-resident deposits
Claims on Non-Financial Private sector	o Liabilities to foreign Monetary Authorities
Claims on Deposit Money Banks.	**Long-term liabilities**
Claims on other financial Institutions (OFIs)	**Federal Government Deposits**
o Development Banks	**Capital Accounts**
o Other claims on OFIs	o Capital
Unclassified Assets	o Reserves
	Unclassified Liabilities

Table 4: Nigeria DMBs Balance Sheet

Nigerian DMBs Balance sheet	
Assets	**Liabilities**
Foreign Assets	**Demand Deposit**
Reserves	**Time & Savings Deposits**
o Required reserve	**Foreign Currency Deposits**
o Excess reserves	**Money Market Instruments**
Claims on Federal Government	o Certificate of Deposit
o Nigerian Treasury Bills (NTBs)	o Promissory notes
o Nigerian Converted Bonds	o Other Instruments
o Treasury Certificates	**Bonds**
Claims on States and Local Government	**Foreign Liabilities**
Claims on other private sector	**Government Deposits**
o Commercial Paper	**Credit from Central Bank**
o Bankers Acceptance	**Capital Accounts**
Claims on Financial Institutions	**Unclassified Liabilities**
Unclassified Assets	o Inter-bank liabilities
o Domestic Inter-Bank claims	o Other liabilities
o Other Assets	

Table 5: Monetary Survey

Monetary Survey	
Assets	**Liabilities**
Net Foreign Assets (NFA)	**Narrow money (M_1)**
Net Domestic Assets (NDA)	○ Currency outside Bank (COB)
○ Net Domestic Credit (NDC)	○ Demand Deposit (DD)
• Net claims on Government (CG)	**Quasi-Money (QM)**
• Claims on the private sector (CP)	○ Time and savings deposit
○ **Other Assets Net (OAN)**	○ Foreign currency deposit

The monetary survey shows the combined assets and liabilities of the banking system with respect to non-bank residents and non-residents. On the liability side, the monetary survey contains the overall liquidity generated by the banking system or the stock of money. This consists of Narrow measure of money and quasi- money.

M_2 = Narrow Money (M_1) + Quasi-Money (QM)

On the assets side, M_2 is the combination of the net foreign assets and net domestic assets.

M_2 = Net foreign asset (NFA) + Net domestic assets (NDA)

Net foreign assets constitute the foreign exchange holdings of the CBN and the deposit money banks, after netting out the claims of foreigners (CBN, 2011). This can be mathematically expressed as:

NFA = Foreign Assets – Foreign Liabilities

Net domestic assets are made up of net domestic credit and other assets (net) of the banking system.

NDA = Net domestic credit + other asset net
NDC + OAN
M_2 = NFA + NDC + OAN

4.2.2 Broad Money

Broad money is a broader measure of money supply, in terms of its composition and refers to the total value of money in the economy, in addition to the components of narrow money; broad money includes the savings and time

deposits with the deposit money banks. Broad money supply is often denoted as M_2 in Nigeria.
Thus, Broad Money = Narrow Money (M_1) + Quasi-Money (QM)

$$M_2 \qquad M_1 \qquad QM$$
$$\{COB + DD\} \quad + \quad \{SD + TD + FCD\}$$
$$M_2 \quad = \quad COB + DD + SD + TD + FCD$$

Excess liquidity is the amount of liquidity over and above the optimum level of liquidity, determined by the levels of output and prices.

4.2.3 Narrow Money

Narrow money is made up of currencies, (that is paper notes and coins in circulation) and demand deposits. It is often denoted by M_1. It is regarded as liquid component of money supply. Narrow money consists of currency outside banks (COB) plus demand deposits.

Narrow Money (M_1) = Currency Outside Bank (COB) + Demand Deposits (DD)

4.2.4 Quasi-Money

This is the summation of savings and time deposits with the deposit money banks. In 2000, foreign-currency deposits (fcd) were included in the monetary measures.
Quasi Money (QM) = Savings Deposit (SD) + Time Deposit (TD) + Foreign Currency Deposit (FCD)

4.2.5 Net Foreign Asset (NFA)

Net foreign assets is derived by netting out the foreign liabilities from the foreign assets. It is decomposed broadly into the NFA of the CBN and the deposit money banks, after netting out the claims of foreigners. Changes in NFA reflect developments in the balance of payments. A deficit in the balance of payments would lead to a decrease in foreign asset holdings and ultimately the money stock. A surplus in the balance of payments produces the opposite effect.

4.2.6 Other Assets Net

This is a residual item equal to the difference between miscellaneous assets and miscellaneous liabilities.

4.2.7 Base Money

Base money, also referred to as high-powered or reserve money (RM), comprises certain liabilities of the CBN and includes currency with the non-bank public and

total bank reserves. The main sources of monetary base are the net foreign assets of the CBN, net claims on government, claims on deposit money banks, and other assets (net) of the CBN (CBN, 2011). This can be expressed mathematically as:

Reserve Money (RM) = reserves of DMBs (R) + currency with the non-bank public (CIC)

$$RM = R + CIC$$

The monetary base can be controlled by the central bank and it is directly influenced by monetary policy actions, even though other economic variables are used as guides. Moreover, reliable data on the sources of base money are readily available from the balance sheets of the central bank. Thus, monetary management is therefore, based on up-to-date information on the components of the base money. Liquidity management becomes easy as it is possible to use open market operations (OMO) to influence movements to achieve desired change in the monetary base. In Nigeria, base money is the operating target of monetary policy, while M_2 is the intermediate target under the monetary targeting framework. The sources of base money are: the net foreign assets, net claims on government, claims on deposit money banks and other assets (net) of the CBN.

4.2.8 Bank Reserves

Bank reserves are made up of the required and excess reserve. Thus:

$$BR = RR + ER$$

Required reserves refer to the proportion of total deposit liabilities which the DMBs are statutorily required to keep as cash in vaults and deposits with the CBN. These are held to protect depositors from any unforeseen liquidity shocks to the DMBs.

4.2.9 Required Reserve

Deposit money banks are normally required to hold certain percentage of their deposit liabilities in liquid form or cash deposits with the central bank. These percentages are referred to as liquidity ratio and the cash reserve ratio, respectively. The liquidity ratio defines the volume of liquid assets in the total deposit liabilities of a given bank and it is a prudential requirement aimed at protecting the bank's customers. The cash reserve ratio, on the other hand, is the amount of liquid cash, which the deposit money bank keeps with the central bank out of its total deposit liabilities. The reserve requirements ratio are a potent tools used by central banks to influence the supply of money. A slight change in

any or both may produce significant effect on the money multiplier. A change in these ratios affects the credit-creating ability of the DMBs.

4.2.10 Claims on Government

These are direct loans to government plus government securities held by the monetary authorities.

4.2.11 Claims on Deposit Money Banks

These include direct credits to DMBs and bills of exchange accepted for discount by the central bank. The central bank interest rate on either kind of loan to banks is called the discount rate.

4.2.12 Money Multiplier

This is simply the ratio of money stock to reserve money.

$$mm = \frac{M_1}{RM} = \frac{CIC + DD}{CIC + R}$$

Dividing the numerator and the denominator by DD (demand deposit), we have

$$mm = \frac{\frac{CIC}{DD} + \frac{DD}{DD}}{\frac{CIC}{DD} + \frac{R}{DD}}$$

If the currency to deposit ratio is denoted with c, and the reserve to deposit ratio is denoted with r, we have

$$mm = \frac{c+1}{c+r}$$

4.3 Model Specification

Modelling the monetary/financial sector with a framework that incorporates both the demand and supply side has, in recent times, been criticised due to perceived instability in the velocity of demand for money in an economy. Although the debate on money demand in Nigeria is inconclusive, it is an acknowledged fact that currency outside banks is relatively high. Therefore, market equilibrium is achieved through the adjustment of the interbank call rate. This approach was considered appealing because it provides a link not only to the impact of external effects on the money supply but also brings to the fore the

impact on money supply of the fiscal operations of government. In addition, an important element of the approach is to underscore the role of private demand in the demand for money and demonstrate how the real sector can also affect financial and monetary stability.

The supply approach relies on the neo-classical identity of money supply as the sum of balance sheet of the banking system. The balance sheet consists of net foreign assets, net domestic credit and other assets (net). Other assets (net) are assumed to be a residual in the money supply identity. Following the literature, the most pervasive determinant of the different components of money supply is money market interest rates. The size of government in Nigeria and the consequent relevance of fiscal deficits in the determination of money supply are also captured in the equations.

4.3.1 Money Supply

The overarching objective of monetary policy has remained the achievement of stable price, stable financial environment consistent with the optimal growth and development in the long run. Consequently, the decisions of monetary authority are guided by prevailing economic conditions such as inflation, balance of payment position, public debt, output growth, general growth of credit to the economy and foreign reserves position. In line with international best practices, the growth in monetary aggregate in the economy, consistent with the development objectives, are often set by the government even though these targets are not sacrosanct.

4.3.2 Net Foreign Assets

Net foreign assets (NFA) of the banking system are the net position of the current account balance (CAB) plus the net capital inflow from the rest of the world to the economy. It is the channel through which international transactions impacts are transmitted to the domestic economic conditions. The CAB is determined by the interactions of the structural relationships in the domestic economy, capital account position is exogenously determined outside the model. Theoretically NFA is driven by the first lag of money supply (M_2), external reserves (RES), nominal exchange rate (NER), and change in net domestic credit (ΔNDC).

$$\Delta \mathrm{NFA} = \phi_{0,1} + \phi_{1,1}\mathrm{M}_{2t-1} + \phi_{2,1}\mathrm{RES} + \phi_{3,1}\mathrm{NER} + \phi_{4,1}\Delta\mathrm{NDC} + \mu_1 \quad (15)$$

4.3.3 Net Domestic Credit

A typical monetary survey of the economy consists of assets and liabilities sides. On the asset side, the net domestic credit (NDC) comprises the major component of total monetary assets. Domestic credit is broadly categorised into

credit to the private and government sectors. Following the literature, the determinants of credit to the domestic economy are modelled to include change in net foreign assets (ΔNFA), change of total government expenditure (ΔTGE), change of total deposit liabilities (ΔTDL) and the lag of the change in net domestic credit (ΔNDC).

$$\Delta\text{NDC} = \phi_{0,2} + \phi_{1,2}\Delta\text{NFA} + \phi_{2,2}\Delta TGE + \phi_{3,2}\Delta TDL + \phi_{4,2}\Delta NDC_{t-1} + \mu_2 \quad (16)$$

4.3.4 Credit to Government

Credit to government, a component of net domestic credit, comes primarily from the domestic banking sector. In Nigeria, the public sector's recourse to banking sector credit has a long history. However, outcomes from financing from either DMBs or the CBN differ significantly. For example, CBN financing is posited in the literature to be more inflationary than DMB financing. Though credit to government in the model is supposed to be disaggregated according to the source - deposit money banks (DMBs) and the CBN, however, credit to government by the CBN was not endogenised because of the near zero deficit financing of government activities by the CBN since December 2005.

The deposit money banks (DMBs) are actively involved in providing credit to federal government. Over time, sub national governments, with less access to CBN credit, rely more on credit from the DMBs, often competing with credit to the private sector. DMBs credit to government by DMBs (C_{gdmb}) is determined by the first difference of total deposit liabilities of the DMBs (TDL), treasury bill rate (TBR), and total government expenditure (TGE), the first lag of Credit to government by DMBs, the lag of the change of Credit to the private sector (CPS) and the fourth lag of the 12 - month deposit rate.

$$\text{Cgdmb} = \phi_{0,4} + \phi_{1,4}\text{TDL} + \phi_{2,4}\text{TBR} + \phi_{3,4}\Delta\text{CPS}_{t-1} + \phi_{4,4}\text{TGE} + \phi_{5,4}Cgdmb(-1) + \phi_{6,4}12DR_{t-4} + \mu_4 \quad (18)$$

4.3.5 Credit to the Private Sector

Credit to the private sector (CPS) consists of all forms of loans and advances extended by the DMBs to households and businesses as well as other forms of debt instruments incurred. Although economic agents access credit facilities for varied reasons, loans and advances and overdrafts apparently form the quantum of the credit instruments that households and businesses employ. Theoretically, the demand for credit in an economy is specified as being a function of cash reserve ratio (CRR), Consumer Price Index (CPI), credit to government by the DMBs (C_{gdmb}) and total deposit liabilities of DMBs (TDL).

$$\text{CPS} = \phi_{0,3} + \phi_{1,3} CRR + \phi_{2,3}\text{CPI} + \phi_{3,3}\text{C}_{\text{gdmb}} + \phi_{4,3}\text{TDL} + \mu_3 \quad (17)$$

4.3.6 Money Demand

Economic theory hypothesises that the demand for money is a function of changes in output and interest rates. In particular, the drivers include the real aggregate output (private consumption, fixed investment and government expenditure), inflation rate (measuring the alternative cost of holding money balances), all share price index (an indicator of the yield on substitute assets) and interest rate.

Total money stock (M_2) consists of currency in circulation, demand deposit, time deposits and other deposits. This paper disaggregates the demand for money function into its components including currency in circulation, demand deposits, and other deposits including time deposits.

4.3.7 Demand Deposits

Demand deposit in the model is a function of the lag of non-agricultural output, the second quarter lag of the 3 – month deposit rate, the third lag of treasury bill rate, the fourth quarter lag of the Consumer Price Index, and the first lag of demand deposits.

$$\text{DD} = \chi_{0,5} + \chi_{1,5}\text{Yn}_{agric_{t-2}} + \chi_{2,5}\text{TBR}_{t-4} + \chi_{4,5}\text{DD}_{t-3} + \chi_{5,5}\text{CPI}_{t-1} + \mu_7 \quad (19)$$

4.3.8 Currency-in-Circulation

Currency in circulation is further decomposed into currency outside bank and vault cash. Chick (1977) has argued for the specification of the demand for money in nominal form. Consequently, currency in circulation is specified in the model as a function of non-agricultural output (Yn_{agric}), consumer price index (CPI) and the average of interest rates (ARATE).

$$\text{CIC} = \gamma_{0,6} + \gamma_{1,6}\text{CPI} + \gamma_{2,6}\text{ARATE} + \gamma_{3,6}\text{Yn}_{\text{agric}} + \mu_8 \quad (20)$$

4.3.9 Other Deposits

Other deposits (OD) of the bank in the model is explained by the money supply (M2) level, total nominal domestic output (Y) as well as the first lag of other deposits (OD). In the same vein, the demand for nominal time deposit (TD) is specified as a function of non-agricultural output (Ynagric), inflation rate (INF), the relative returns on investment represented by the 12-months deposit rate

(12DR) the first lag of total deposits (TD) and the average rate of interest rate (ARATE). The estimated equations (9) and (10) are expressed as

$$OD=\varpi_{0,7}+\varpi_{1,7}M_2+\varpi_{2,7}Y_n+\varpi_{3,7}OD_{t-1}+\mu_9 \quad (21)$$

$$TD=\psi_{0,8}+\psi_{1,8}Yn_{agric_{t-1}}+\psi_{2,8}CPI+\psi_{3,8}12DR+\psi_{4,8}ARATE+\psi_{5,8}TD_{t-1}+\mu_{10} \quad (22)$$

The demand side is closed by summing up the components

4.3.10 Interest Rate

The movements in money supply and interest rate are highly interdependent as the growth in monetary aggregates affects interest rate while in turn interest rate influences money supply. In a deregulated economy, interest rate is a potent tool for policy makers. Traditional determinant of interest rate is the inflation rate which measures the compensation for the lender, government policy, government borrowing from the financial system, existing political and social environment as well as domestic productivity of capital. In an open economy with high capital mobility, movements in international interest rate also influence domestic rate as portfolio investors seek to take advantage of higher interest yielding instruments and the government's quest to protect the exchange rate of the domestic currency.

Interest rate, thus, significantly affect the macroeconomy in several aspects. For instance, an increase in interest rate dampens aggregate demand, exacerbates inflationary pressures, and decelerates capital spending, investment, output and employment. In addition, higher domestic interest rate worsens the current account position of the balance of payments in the face of capital inflows, deterioration in domestic exchange rate, and the decline in the demand for locally produced goods, as well as increase in national debt depending on the source of financing fiscal deficits. In this model, interest rate is specified as a function of its past level, inflation, 3-month deposit rate, monetary policy rate and money supply.

$$PLR = \phi_{0,9}+\phi_{1,9}PLR_{t-1}+\phi_{2,9}\Delta CPI+\phi_{3,9}3DR+\phi_{4,9}MPR+\phi_{5,9}M_2+\mu_6 \quad (23)$$

4.3.11 Treasury Bill Rate

The treasury bill rate, which is the rate at which bills are discounted at the market is the most competitive and representative rate aside from the deposit rate in the money market. It is quoted in various maturities ranging from 90 days, 180 days

and 360 days corresponding to the 3-month, 6-month and 12-month deposit rates. It actually determines the portfolio preferences of the investing public. Treasury bill rate is explained by the average of interest rates, the fourth quarter lag of total government expenditure and the lagged dependent variable while the average interest rate and the lag of the 3-month deposit rate are assumed to be the determinants of the 3-month deposit rate as expressed in equations (12) and (13), respectively.

$$\mathrm{TBR}=\sigma_{0,10}+\sigma_{1,10}\mathrm{ARATE}+\sigma_{2,10}\mathrm{TBR}_{t-1}+\sigma_{3,10}\mathrm{TGE}_{t-4}+\mu_{12} \quad (24)$$

$$3\mathrm{DR}=\tau_{0,11}+\tau_{1,11}ARATE+\tau_{2,11}3\mathrm{DR}_{t-1}+\mu_{13} \quad (25)$$

4.3.12 Interbank Call Rate

This is the rate at which the bank rediscounts bills of exchange and other eligible instruments. In unsophisticated or rudimentary markets like those in the emerging economies, the interbank call rate (ICR) is employed by the central bank in the extension of credit to the borrowers in the economy. In Nigeria, there exist multiplicities of rates which are moderately stable over time. Interbank call rate in the model is postulated to be explained by money demand pressure created by the gap between M_2 and Md and the level of ICR at the previous period. This is expressed as

$$\mathrm{IBCR}=\theta_{0,12}+\theta_{1,12}(\mathrm{Md}-\mathrm{M}_2)+\theta_{2,12}\mathrm{IBCR}_{t-1}+\mu_{11} \quad (26)$$

4.3.13 Identities

INF = (CPI - CPI (-4)) / CPI (-4) * 100 (27)

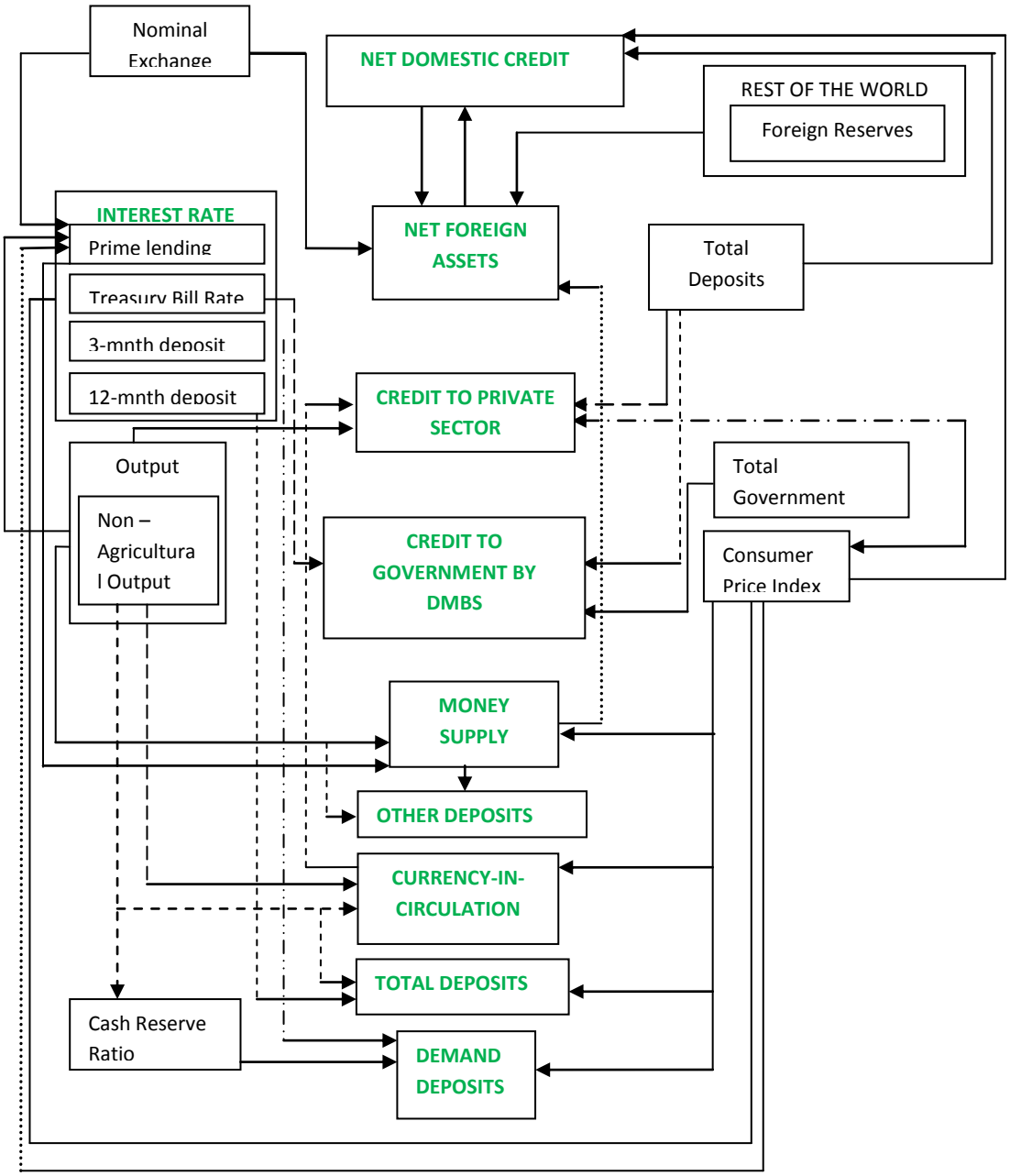
MD = CIC + DD + OD + TD (28)

M2 = NFA + NDC + OANF (29)

ARATE = (PLR + MDR_3 + MDR_12F + TBR + IBCR) / 5 (30)

$$\mathrm{MD}=\mathrm{MS} \quad (31)$$

Figure 7: Flowchart of Monetary and Financial Block



Chapter Five

5.0 Model Estimation, Interpretation and Appraisal

5.1 Model Estimation and Interpretation

The Monetary sector consists of 13 equations namely: net domestic credit, net foreign assets, credit to the private sector, DMBs credit to government, demand deposits, currency in circulation, total deposit liabilities, treasury bill rate, monthly deposit rate (3-months), inter-bank call rate and prime lending rate. The first eight equations reflect money supply, while the following five describe relevant market interest rates that are endogenous in the model. The first two equations add up to make the money supply identity while 'other assets net' is the residual in this classification and so is not modeled. The money demand equation on the other hand is based on identified classical determinants of money demand in the economy. The specification draws extensively from previous studies on money demand in Nigeria.

5.1.1 Net Domestic Credit

Net Domestic Credit (NDC) is a summation of credit to the private sector and credit to the government. Changes to NDC reflect the expansion in credit to the private sector as well as claims on the Federal Government. NDC specified in autoregressive form, changes as net foreign assets, fiscal operations of government and total deposit liabilities of the banking system evolve. NFA which is made of the gross foreign reserves is mostly influenced by developments in the external sector, particularly changes in crude oil prices, credit conditions in international financial markets and the domestic foreign exchange market. Hence, from a causal point of view, changes in foreign reserves reflected in the NFA affects domestic credit conditions. The estimates reveal that a percentage point change in the growth of NFA would moderate the rate of credit growth in the domestic economy by about 0.39 percentage points. The size of government fiscal operations specified as change in government expenditure in the model has a positive correlation with NDC since liquidity conditions influence ability of lenders to advance credit in the economy. Similarly, available funds in the banking system have a significant level of correlation with growth in the domestic credit conditions given the coefficient for total deposit liabilities. The Durbin-Watson statistics indicates the absence of serial correlation in the model.

Table 6: OLS Estimation - Net Domestic Credit (NDC)

Dependent Variable: LOG(NDC)-LOG(NDC(-1))
Sample (adjusted): 1990:3 2011:4
Included observations: 86 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(NFA)-LOG(NFA(-1))	-0.399267	0.106453	-3.750635	0.0003
LOG(TGE)-LOG(TGE(-1))	0.400576	0.254526	1.573814	0.1194
LOG(TDL)-LOG(TDL(-1))	0.740967	0.213863	3.464687	0.0008
LOG(NDC(-1))-LOG(NDC(-2))	0.190225	0.096126	1.978904	0.0512
Adjusted R-squared	0.171267	Durbin-Watson stat		2.062486

5.1.2 Net Foreign Assets

Net Foreign Assets (NFA) is the total value of foreign assets held by the monetary authority and deposit money banks, less their foreign liabilities. Based on available studies and an extensive understanding of the Nigerian economy, factors that influence developments in net foreign assets employed in the model. Developments in the external sector play a significant role in changes to NFA. Nevertheless, domestic monetary outcomes have been observed to influence considerably changes to the NFA. The explanatory variables in the specified model include money supply, external reserves, net domestic credit and nominal exchange rate. The inclusion of reserves was considered appropriate given that the larger proportion of the country's international reserves is managed by the Central Bank of Nigeria. The model parameters show that, net foreign assets are highly reliant on developments to domestic credit. Even though a number of other determinants were significant in determining trends in NFA, the proportion of change in net domestic assets emanating from one quarter change of net foreign assets is nearly one for three. Stability of the nominal exchange rate and the growth in broad money influences the variability in net foreign assets. Reserves as a significant backup source for net foreign assets as shown by the coefficient estimates is consistent with the history of both implicit and explicit policy defense of the exchange rate using reserves.

In effect, net foreign assets go up or down alongside movements in reserves used to defend the naira. In addition, as net foreign assets are expressed in local currency terms, depreciation of the exchange rate implies higher values for the assets held in foreign currencies. The exchange rate channel translate to a 8.0

per cent elasticity of exchange rate depreciation on accumulation of net foreign assets, while a percentage change in reserves leads to a 0.08 per cent change in net foreign assets growth.

Table 7: OLS Estimation - Net Foreign Assets

Dependent Variable: LOG(NFA)-LOG(NFA(-1))
Sample (adjusted): 1990Q2 2011Q4
Included observations: 87 after adjustments

	Coefficient	Std. Error	t-Statistic	Prob.
LOG(M2)	-0.098991	0.043928	-2.253497	0.0269
LOG(RES)	0.076116	0.038811	1.961185	0.0533
LOG(NDC)-LOG(NDC(-1))	-0.303656	0.096468	-3.147738	0.0023
LOG(NER)	0.075400	0.053322	1.414034	0.1611
C	0.448211	0.267814	1.673592	0.0980
Adjusted R-squared	0.125472	Durbin-Watson stat		2.020335

5.1.3 Credit to the Private Sector

As highlighted earlier, there is a relatively weak link between financial aggregates and real sector variables. Determinants of credit to the private sector include credit to government from DMBs, total deposit liabilities, consumer price index and cash reserve requirements (CRR). The model shows that credit to government crowds out credit to the private sector. Such crowding out is highly significant contemporaneously with a probability value of .002 percent. Given the fact that the only other significant variable affecting credit to the private sector are total deposit liabilities of DMBs and consumer prices, this is hardly surprising. First, the stock of credit is defined by liabilities and DMBs often are faced with the choice of lending to government on gilt-edge securities as against the highly exposed private sector. In practice, the DMBs would usually opt to lend to government. This crowding out effect usually impacts indirectly through rising interest rates and preference for short term lending. In the case of an interest rate hike, public institutions very easily outstrip private investors on access to credit. Unusually, income and the maximum lending rate do not matter for credit to the private sector. This is a misnomer that rent rather than productivity defines who gets credit. Likewise, lending rates, though high, do not influence access to credit. Access to credit is defined by factors that even precede negotiations of appropriate interest rates between deposit money banks and user agents in the economy. Credit to the private sector reacts to credit to government and to

deposit liabilities of the DMBs while credit to government from the DMBs is affected by treasury bills rate, total government expenditure and total deposit liabilities of DMBs.

Table 8: OLS Estimation - Credit to Government by DMBs

Dependent Variable: LOG(CGDMB)
Sample (adjusted): 1990:2 2011:4
Included observations: 87 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(TDL(-1))	-0.119711	0.297232	-0.402754	0.6882
TBR	0.032245	0.016942	1.903268	0.0606
ARATE	-0.029702	0.018959	-1.566643	0.1211
LOG(CPS(-1))	0.501460	0.243403	2.060199	0.0426
LOG(TGE)	-0.206251	0.147966	-1.393912	0.1672
LOG(CGDMB(-1))	0.787386	0.085100	9.252492	0.0000
Adjusted R-squared	0.973925	Durbin-Watson stat		2.311134

5.1.4 DMBs Credit to the Government

DMBs total deposit liabilities, treasury bills rate, total government expenditure and an autoregressive first-quarter lag of both credit to the private sector as well as DMBs credit to the government are included in the model. The final equation indicated that all the explanatory variables were correctly signed and significant – some more so than others though. A percentage increase in total deposit liabilities of the DMBs leads to a corresponding increase of 0.44 per cent in DMBs credit to government reflecting the level of high government patronage of the DMBs, which confirms the belief that the government is "the crowding out" the private sector in the financial market. The parsimonious model is shown in Table 5.9. Similarly, changing treasury bills rate leads to changes in credit to government. As should be expected, total government expenditure defines the quantum of credit to government. Credit increases correspondingly with government expenditures and size or inter-temporal flow of revenue.

Different test statistics for the model confirm the robustness of the estimates. The model explains about 97 per cent of the variations in DMB credit to government.

Table 9: OLS Estimation - Credit to the Private Sector (CPS)

Dependent Variable: LOG(CPS)
Sample: 1990:1 2011:4
Included observations: 88

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(CGDMB)	-0.117270	0.036743	-3.191653	0.0020
LOG(TDL)	1.073788	0.027618	38.87956	0.0000
LOG(CPI)	0.104024	0.028773	3.615345	0.0005
CRR	-0.008909	0.003819	-2.332563	0.0221
Adjusted R-squared	0.994087	Durbin-Watson stat		0.841601

5.1.5 Consumer Price Index

The dynamics of inflation in Nigeria reveal that consumer prices are influenced by exogenous factors which are related to the structure of the Nigerian economy as well as contemporaneous and backward looking behaviour of economic agents. The CPI has been rebased severally to reflect changes to living patterns on the Nigeria Living Standard Survey (NLSS), while due consideration is given to ensure that the indices are regularly re-valued to reflect economic realities. Headline CPI is driven mainly by developments to food and farm produce and other volatile items. The estimated equation indicates that CPI is a highly autoregressive process.

Table 10: OLS Estimation - Consumer Price Index (CPI)

Dependent Variable: LOG(CPI)
Sample (adjusted): 1990:2 2011:4
Included observations: 87 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(CGDMB)	0.016204	0.003671	4.414643	0.0000
LOG(CPI(-1))	0.955908	0.011912	80.24905	0.0000
Adjusted R-squared	0.998010	Durbin-Watson stat		1.281236

5.1.6 Demand Deposits

Demand deposit is a major component of narrow money. In Nigeria, public sector deposits form a considerable part of demand deposit. The estimated model reveals that non – agricultural output which is driven mainly by retail and wholesale trade, services and industry has significant impact on demand deposits. In addition, CPI and treasury-bill rate are closely correlated with demand deposits. The model coefficient indicates that deposit rates though significant in the model has little explanatory power on whether people save or not. Secondly, the specification shows that there is a disincentive to hold money in the banking system when prices rise.

Table 11: OLS Estimation - Demand Deposits (DD)

Dependent Variable: LOG(DD)
Method: Least Squares
Sample (adjusted): 1991Q1 2011Q4
Included observations: 84 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.920535	0.591922	-3.244574	0.0017
LOG(DD(-3))	0.839384	0.046244	18.15117	0.0000
LOG(CPI(-1))	-0.237325	0.071981	-3.297055	0.0015
LOG(NNAYR(-2))	0.359380	0.082978	4.331025	0.0000
TBR(-4)	0.009639	0.004050	2.380289	0.0197
Adjusted R-squared	0.992354	Durbin-Watson stat		1.215556

5.1.7 Currency– in–Circulation

Currency in circulation (CIC) refers to all notes and coins held outside the central bank. Long-run determinants of currency demand include scaling variable such as GDP or private consumption, exchange rate, interest rate, inflation, seasonal dummies.

Increase in CIC has a negative impact on the bank reserves and vice versa. The estimation of CIC is carried out taking into consideration various other factors. The pace of economic activities reflected in non-agricultural output impacts significantly on the demand for currency. A percentage increase in non-agricultural output explains about 0.78 per cent of developments in currency in circulation. Consumer prices impact the quantum of CIC in the economy

Table 12: OLS Estimation – Currency-in-Circulation (CIC)

Dependent Variable: LOG(CIC)
Sample: 1990Q1 2011Q4
Included observations: 88

	Coefficient	Std. Error	t-Statistic	Prob.
LOG(NNAYR)	0.780313	0.015531	50.24299	0.0000
LOG(CPI)	0.303608	0.040886	7.425647	0.0000
ARATE	0.048876	0.005424	9.011165	0.0000
Adjusted R-squared	0.982608	Durbin-Watson stat		1.008225

5.1.8 Other Deposits

The specification for other deposits includes an autoregressive lag of other deposits, money supply and nominal non-oil GDP. The results reveal that there is a very significant relationship between money supply and the build-up in other deposits in the banking system. The regression estimates confirms the prior negative relationship non-oil GDP and other deposits.

Table 13: OLS Estimation - Other Deposits (OD)

Dependent Variable: LOG(OD)
Sample (adjusted): 1990Q2 2011Q4
Included observations: 87 after adjustments

	Coefficient	Std. Error	t-Statistic	Prob.
LOG(M2)	0.930230	0.069993	13.29040	0.0000
LOG(NNGDP)	-0.040562	0.022235	-1.824229	0.0717
LOG(OD(-1))	0.157233	0.066891	2.350600	0.0211
C	-1.171958	0.122703	-9.551176	0.0000
Adjusted R-squared	0.999195	Durbin-Watson stat		1.182970

5.1.9 Total Deposits

The consistent effect of total deposit liabilities of DMBs in all segments of net domestic credit (to private and government sectors) largely supports a

longstanding emphasis of the Central Bank on the liabilities and assets health of the DMBs – a consideration that largely underpinned the banking consolidation programme of 2004 through 2005.

Table 14: OLS Estimation - Total Deposits (TD)

Dependent Variable: LOG(TD)
Sample (adjusted): 1990Q2 2011Q4
Included observations: 87 after adjustments

	Coefficient	Std. Error	t-Statistic	Prob.
LOG(NNAYR(-1))	0.083311	0.032634	2.552912	0.0125
LOG(CPI)	0.043703	0.038270	1.141965	0.2568
LOG(TD(-1))	0.899525	0.037935	23.71224	0.0000
MDR_12	0.010819	0.009560	1.131661	0.2611
ARATE	-0.008410	0.009274	-0.906789	0.3672
Adjusted R-squared	0.994148	Durbin-Watson stat		2.450018

5.1.10 Treasury Bill Rate

The final estimation of the Treasury bill rate included the average of the interest rates, annual lag of total government expenditure and the first quarter lag of the treasury bill rate. The signs of the explanatory variables are in line with apriori expectation, except for that of the annual total government expenditure. The estimation, therefore, shows that an increase in the first quarter lag of treasury bill rate or the average of interest rates would result to an increase in the contemporaneous rates. The opposite can be said for the annual lag of total government expenditure.

Table 15: OLS Estimation - Treasury Bill Rate (TBR)

Dependent Variable: TBR
Sample (adjusted): 1991Q1 2011Q4
Included observations: 84 after adjustments

	Coefficient	Std. Error	t-Statistic	Prob.
TBR(-1)	0.407456	0.074957	5.435844	0.0000
ARATE	0.669578	0.088593	7.557935	0.0000
LOG(TGE(-4))	-0.185682	0.052463	-3.539266	0.0007
Adjusted R-squared	0.875503	Durbin-Watson stat		1.030786

5.1.11 Monthly Deposit Rate (3 months)

The predictors of the 3-month deposit rate are average of interest rates and the first quarter lag of the 3-months deposit rate. Both explanatory variables conformed to a priori expectations of direct relationship, therefore indicating that an increase in either of the predictors would bring out a positive reactive response by the 3-month deposit rate

Table 16: OLS Estimation - 3 - Month Deposit Rate (3DR)

Dependent Variable: MDR_3
Sample (adjusted): 1990Q2 2011Q4
Included observations: 87 after adjustments

	Coefficient	Std. Error	t-Statistic	Prob.
ARATE	0.470000	0.053200	8.834586	0.0000
MDR_3(-1)	0.458948	0.059908	7.660883	0.0000
Adjusted R-squared	0.908435	Durbin-Watson stat		1.082416

5.1.12 Interbank Call Rate

As earlier discussed, the inter-bank call rate refers to the interest rate amongst banks that depicts the degree of availability of liquidity in the economy. The variable was then, endogienized as a function of money supply gap and first quarter lag of itself. Results from our estimation show that the independent variables possessed the right signs and were significant at 5.0 per cent and 1.0 per cent respectively.

Table 17: OLS Estimation - Interbank Call Rate (IBCR)

Dependent Variable: IBCR
Sample (adjusted): 1990Q2 2011Q4
Included observations: 87 after adjustments

	Coefficient	Std. Error	t-Statistic	Prob.
LOG(MD)-LOG(M2)	5.172571	2.585299	2.000763	0.0486
IBCR(-1)	0.893497	0.046441	19.23932	0.0000
Adjusted R-squared	0.721402	Durbin-Watson stat		1.844659

5.1.13 Prime Lending Rate

The study posited prime lending rate as a function of inflation rate, 3-month deposit rate, monetary policy rate, money supply and an autoregressive version of the prime lending rate. From the results, the regressors were found to be significant with the proper signs therefore, implying that an increase in any of the independent variables will bring out an increase in the prime lending rate.

Table 18: OLS Estimation - Prime Lending Rate

Dependent Variable: PLR
Sample (adjusted): 1991Q1 2011Q4
Included observations: 84 after adjustments

	Coefficient	Std. Error	t-Statistic	Prob.
LOG(CPI)-LOG(CPI(-4))	2.611314	1.208776	2.160296	0.0338
MDR_3	0.273158	0.062912	4.341899	0.0000
MPR	0.271412	0.054928	4.941207	0.0000
LOG(M2)	0.266829	0.044901	5.942623	0.0000
PLR(-1)	0.425941	0.057993	7.344686	0.0000
Adjusted R-squared	0.879880	Durbin-Watson stat		1.543995

Chapter Six

6.0 Model Simulation and Scenarios Analysis

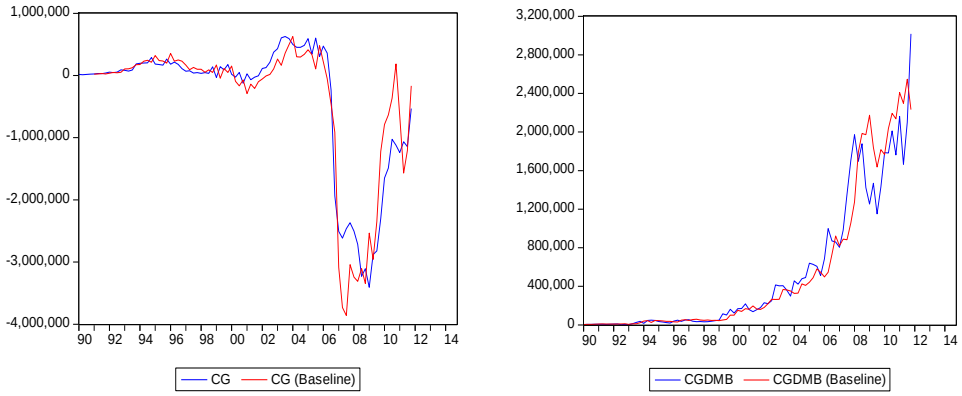
In order to evaluate the performance of the model, both in-sample (ex-post) and out-of sample (ex ante) simulations were carried out.

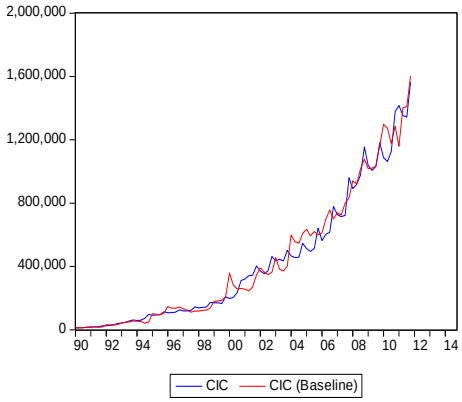
6.1 In-sample Simulation

A simulation of endogenous and exogenous variables within-sample (ex-post) is conducted to test the model's reliability in forecasting the movement of the endogenous variables. It should be stressed that data quality to a large extent, the block structure of the model (linkages of behavioural models) and the significance of economic interpretations of parameters, determine model performance.

A brief inspection of the charts in Figure 8 shows how well the model tracks the endogenous variables in terms of the time path and turning points realistically, implying the model performs reasonably well as reflection of the behaviour of the variables of interest, as well as their suitability and reliability for policy simulation and forecasting.

Figure 8: Actual and Simulated Values of Endogenous Variables

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400,000
0
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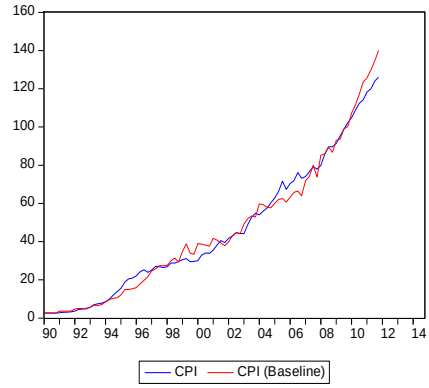
CIC (Baseline)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40
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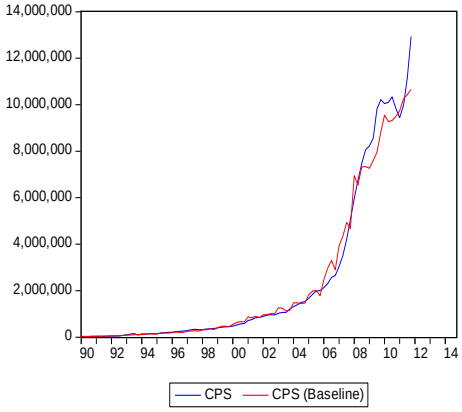
CPI
CPI (Baseline)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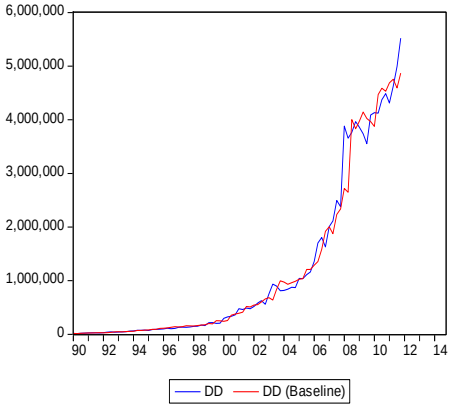
CPS (Baseline)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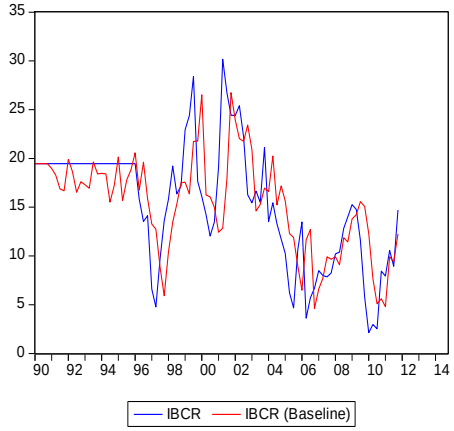
DD
DD (Baseline)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10
5
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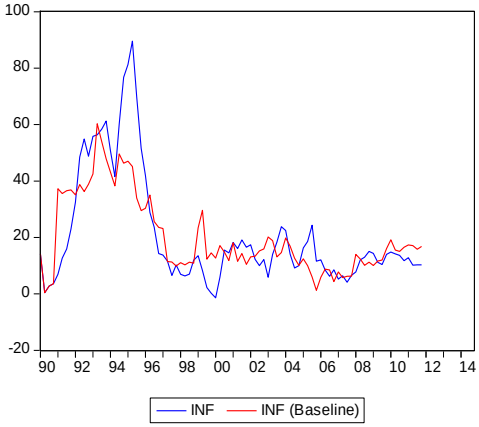
IBCR
IBCR (Baseline)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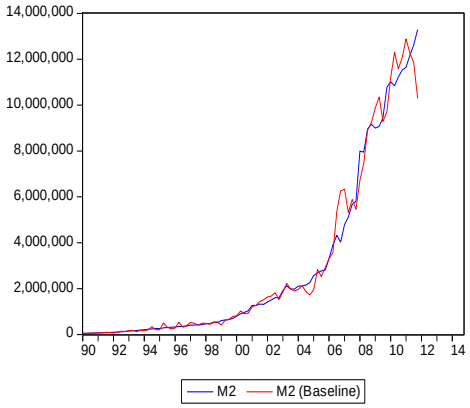
INF (Baseline)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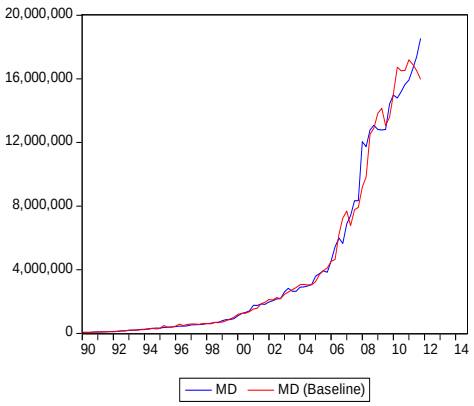
M2
M2 (Baseline)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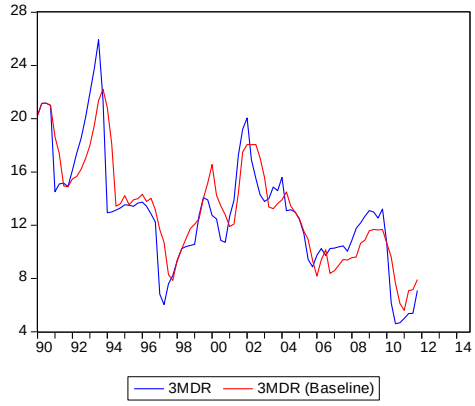
MD (Baseline)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12
8
4
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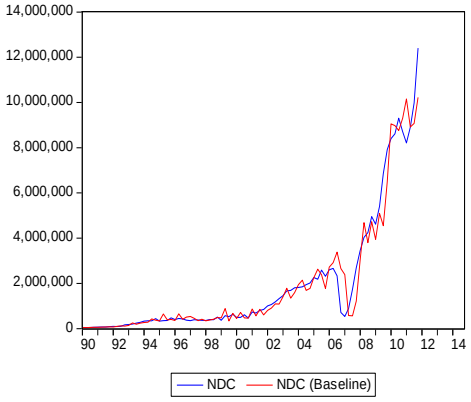
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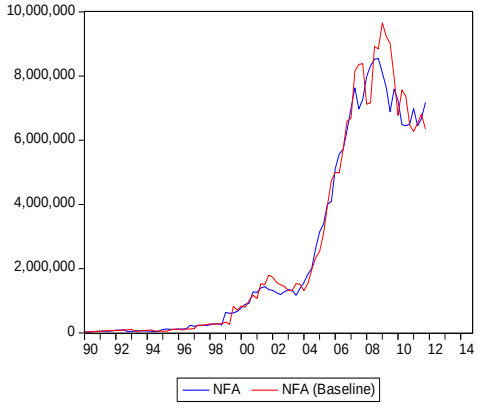
NDC
NDC (Baseline)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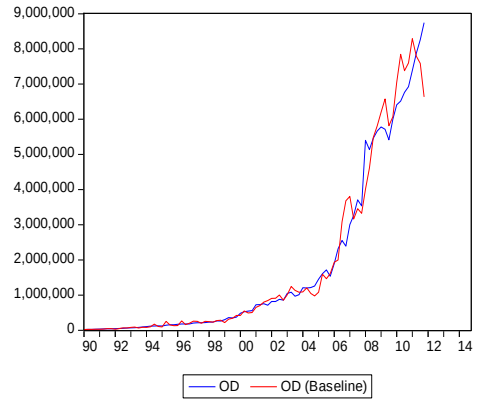
NFA (Baseline)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1,000,000
0
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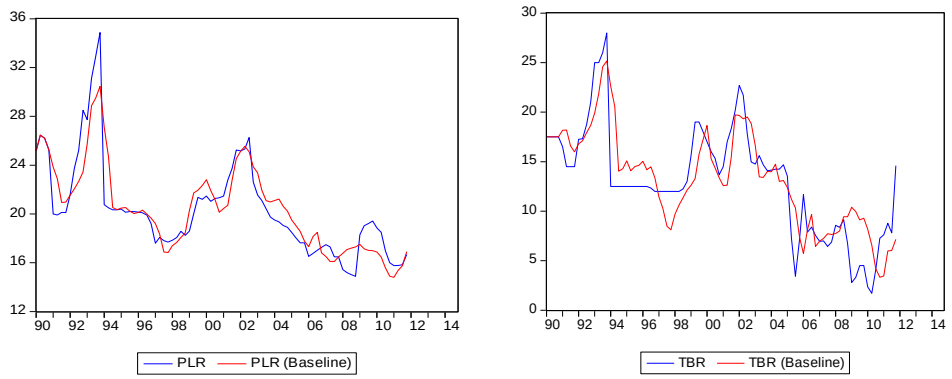
OD
OD (Baseline)



6.2 Out-of-Sample Simulation and Scenarios Analysis

With the good tracking of the endogenous equations observed from the in-sample simulation, out-of-sample simulation of possible outcomes of changes in some identified variables is carried out. Selected variables are shocked and their impact traced given the interrelationship and inter-linkages.

The baseline simulation assumes that the present condition will continue, while the alternative scenarios are premised on the assumptions that the present situation will change based on the changes in the economy. Some of the issues for which some alternative scenarios are considered include:

- The response of selected monetary sector variables to a reduction monetary policy rate and cash reserve requirement by 200 basis points, respectively.
- The effect of depreciation in nominal exchange rate on selected macroeconomic variables.
- The response of selected monetary sector variables to changes in total government expenditure (increase and decrease).

6.2.1 Baseline Scenarios

In the baseline scenarios, we assume that all the policy variables will remain unchanged for the period under forecast.

6.2.2 Alternative Scenarios

- Scenario 01:- A decrease in monetary policy rate (MPR) by 200 basis points
- Scenario 02:-A reduction in MPR and CRR by 200 basis points, respectively.

- Scenario 03:- A depreciation in the exchange rate from N155/$ to N158/$.
- Scenario 04:- A decrease in total government expenditure by 10 per cent.
- Scenario 05:- An increase in total government expenditure by 10 per cent.

Scenarios 01 – A decline in Monetary Policy Rate of 200 Basis Points

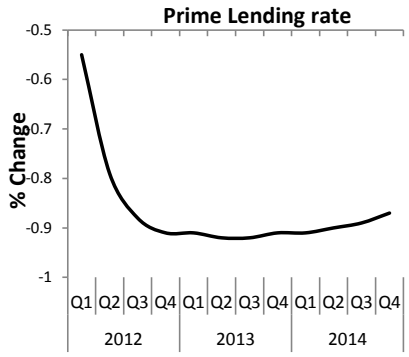
The out-of-sample simulation of a 200 basis points reduction in the monetary policy rate shows that the monetary easing would lead to a reversal of the inflation deceleration path to slightly tip upward before declining again. The result suggests a humped-shaped response of inflation to an anticipated monetary policy shock. The easing reduces the prime lending rate and other rates such as the 3-month deposit and TB rates constraining demand deposits, and hence the demand for money. Deposit money banks credit to the private sector declines and is compensated by a jump in credit to government obviously reflecting the crowding out syndrome that has characterized the economy in the past. With currency in circulation declining, it is an indication that the public is probably revealing preference for long term instruments such as time deposits and are finding, alternative investment havens such as the real estate and government bonds attractive to apply their held monies as well as alternative payments methods for transactions.

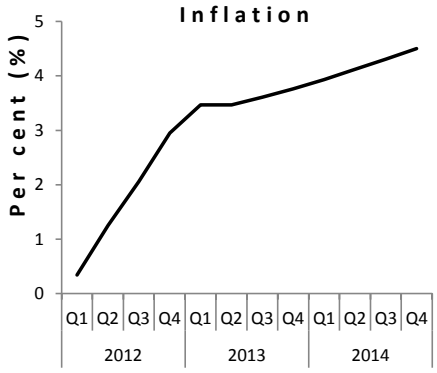
Table 19: Scenarios 01 – A Decline in Monetary Policy Rate of 200 Basis Points

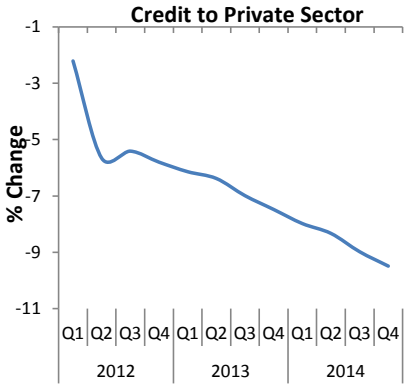
		Prime Lending Rate		Treasury Bill Rate		3-month Deposit Rate		Inflation		Time Deposits		Money Demand	
obs		*Baseline*	*%Change*	*Baseline*	*%Change*	*Baseline*	*%Change*	*Baseline*	*%Change*	*Baseline*	*%Change*	*Baseline*	*%Change*
2012	Q1	17.36	-0.55	11.01	-0.10	8.6	-0.1	9.624	0.34	2705508	0.13	19491200	-0.03
	Q2	17.86	-0.79	9.47	-0.19	9.3	-0.1	10.634	1.25	2716126	0.36	19910550	-0.02
	Q3	18.11	-0.88	8.76	-0.25	9.5	-0.2	9.332	2.06	2728272	0.63	20220590	0.01
	Q4	18.26	-0.91	8.47	-0.29	9.6	-0.2	9.785	2.95	2747004	0.92	20475170	0.05
2013	Q1	18.31	-0.91	8.24	-0.32	9.6	-0.2	8.677	3.47	2762526	1.23	21273630	0.09
	Q2	18.31	-0.92	8.11	-0.33	9.6	-0.2	8.149	3.47	2784994	1.55	21725660	0.14
	Q3	18.29	-0.92	8.01	-0.33	9.5	-0.3	7.556	3.61	2806536	1.87	22164810	0.20
	Q4	18.25	-0.91	7.97	-0.33	9.5	-0.3	7.022	3.76	2832184	2.20	22494990	0.27
2014	Q1	18.22	-0.91	7.85	-0.33	9.4	-0.3	6.523	3.93	2853651	2.54	23361140	0.34
	Q2	18.19	-0.90	7.78	-0.32	9.4	-0.2	6.055	4.12	2879825	2.89	23848950	0.42
	Q3	18.15	-0.89	7.71	-0.31	9.3	-0.2	5.619	4.31	2903660	3.24	24313320	0.51
	Q4	18.12	-0.87	7.68	-0.30	9.3	-0.2	5.210	4.50	2929653	3.60	24662130	0.61

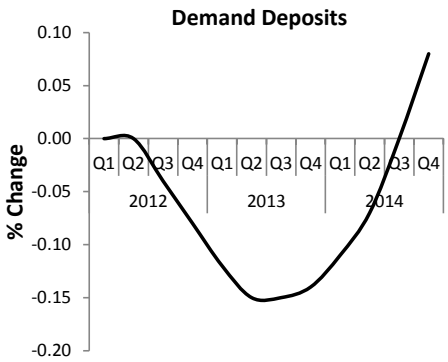
		Credit to Government DMBs		Credit to Private Sector		Demand Deposits	
obs		*Baseline*	*% Change*	*Baseline*	*% Change*	*Baseline*	*% Change*
2012	Q1	3074293	21.28	10716870	-2.21	5588489	0.00
	Q2	2264239	65.99	11388290	-5.66	5723895	0.00
	Q3	2290139	63.39	11729500	-5.41	5823132	-0.04
	Q4	2193482	70.46	11987040	-5.80	5992509	-0.08
2013	Q1	2119760	77.02	12681060	-6.14	6202154	-0.12
	Q2	2102713	82.18	12976800	-6.38	6430829	-0.15
	Q3	2018340	94.24	13402070	-6.99	6660626	-0.15
	Q4	1966739	104.77	13642220	-7.48	6893015	-0.14
2014	Q1	1911604	116.33	14346640	-7.98	7134509	-0.11
	Q2	1903019	125.52	14641000	-8.33	7380776	-0.07
	Q3	1836865	141.97	15069370	-8.98	7620809	0.00
	Q4	1795464	156.36	15309710	-9.49	7859650	0.08

Figure 9: Scenarios 01 – A decline in Monetary Policy Rate of 200 Basis Points









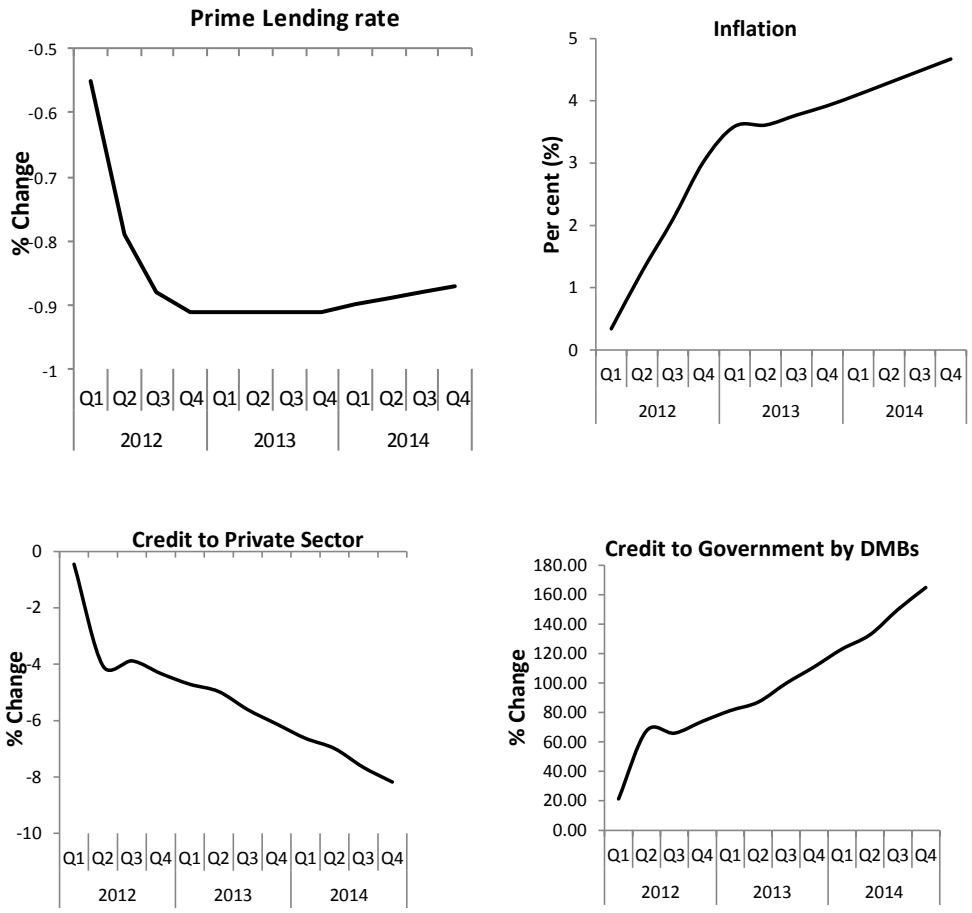
Scenario 02 - A decline of MPR and CRR by 200 basis points

A decline in the baseline of MPR from 12.0 per cent to 10.0 per cent and CRR from 8.0 per cent to 6.0 per cent showed mixed result for currency in circulation (CIC) while it has negative impact on credit to private sector (CPS) and prime lending rate (PLR). However, credit to government by DMBs (CGDMBs), interbank call rate (IBCR) and inflation responded positively. The result evidently indicated a significant crowding out effect on the private sector with CPS declining by 0.5 per cent in 2012Q1 to 8.2 per cent in 2014Q4. In line with theory, the effects of the shocks culminated in inflation rising by 3.0 per cent in 2012Q4, increases to 4.7 per cent in 2014Q4. The shocks also have a dampening effect on the prime lending during the period of analysis (table).

Table 20: Scenario 02 - A decline of MPR and CRR by 200 basis points

		CGDMB		CIC		CPS		IBCR		INF		PLR	
Obs\Var		Baseline	%Change	Baseline	%Change	Baseline	%Change	Baseline	Change	Baseline	Change	Baseline	Change
2012	Q1	3,724,029.00	21.28	1,707,838.00	-0.61	10,481,980.00	-0.45	14.61	0.00	9.97	0.34	17.37	-0.55
	Q2	3,752,982.00	67.48	1,734,848.00	-0.74	10,745,510.00	-4.06	14.52	0.00	11.90	1.26	17.89	-0.79
	Q3	3,738,887.00	65.94	1,770,310.00	-0.71	11,095,730.00	-3.88	14.43	0.00	11.44	2.10	18.18	-0.88
	Q4	3,740,509.00	73.94	1,839,235.00	-0.56	11,290,770.00	-4.33	14.43	0.00	12.81	3.03	18.36	-0.91
2013	Q1	3,758,998.00	81.26	1,880,851.00	-0.34	11,899,850.00	-4.71	14.37	0.01	12.27	3.59	18.44	-0.91
	Q2	3,842,836.00	87.03	1,911,240.00	-0.10	12,144,830.00	-4.97	14.34	0.01	11.76	3.61	18.46	-0.91
	Q3	3,937,718.00	99.79	1,946,870.00	0.19	12,458,680.00	-5.61	14.34	0.02	11.32	3.77	18.45	-0.91
	Q4	4,049,225.00	110.91	2,014,451.00	0.50	12,614,490.00	-6.12	14.42	0.03	10.95	3.92	18.43	-0.91
2014	Q1	4,161,476.00	123.05	2,056,353.00	0.84	13,192,940.00	-6.63	14.45	0.05	10.63	4.10	18.41	-0.90
	Q2	4,321,861.00	132.71	2,087,088.00	1.20	13,411,140.00	-6.99	14.50	0.07	10.35	4.29	18.38	-0.89
	Q3	4,478,359.00	149.83	2,123,745.00	1.59	13,704,630.00	-7.66	14.56	0.09	10.10	4.48	18.36	-0.88

Figure 10: Scenario 02 - A decline MPR and CRR by 200 basis points



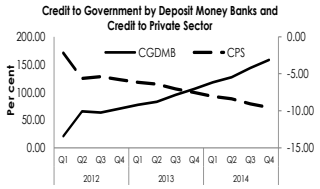
Scenario 03 – Nominal exchange rate (NER) depreciates (reaching the ceiling, ₦158/$)

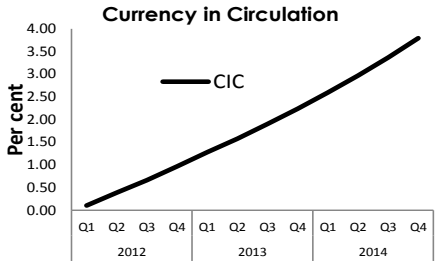
The result of the out-of-sample forecast indicated that a depreciation in nominal exchange rate to the ceiling (₦158/$) helps to boost export which brings in more foreign earnings and lead to increased output and inflation. From the findings, inflation increases by 2.1, 2.9, 3.6 and 4.5 percentage points in 2012Q3, 2012Q4, 2013Q2 and 2014Q4, respectively. The shock also pushed the currency in circulation up by 0.1 per cent in 2012Q1 through 1.3 per cent in 2013Q1 to 3.8 per cent in 2014Q4.The model also showed that there was a crowding out effect on the private sector.

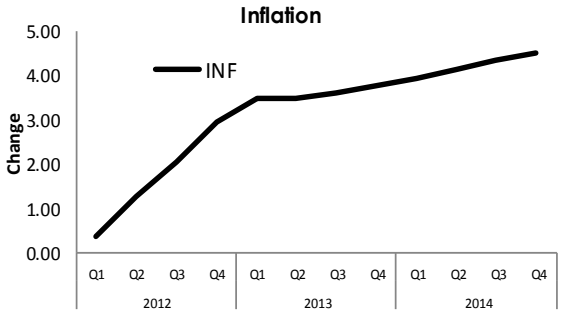
Table 21: Nominal exchange rate (NER) depreciates (reaching the ceiling, N158/$)

		CGDMB		CIC		CPS		IBCR		INF		PLR	
Obs\Var		Baseline	%Change	Baseline	%Change	Baseline	%Change	Baseline	%Change	Baseline	%Change	Baseline	Change
2012	Q1	3074293	21.13	1706034	0.11	10716870	-2.19	14.61	0.00	9.62414	0.34	17.36	0.05
	Q2	2264239	65.75	1728153	0.39	11388290	-5.64	14.52	0.00	10.63379	1.24	17.86	0.19
	Q3	2290139	63.26	1758605	0.66	11729500	-5.40	14.42	0.01	9.33231	2.05	18.11	0.37
	Q4	2193482	70.53	1821615	0.97	11987040	-5.81	14.42	0.01	9.784792	2.94	18.26	0.56
2013	Q1	2119760	77.33	1857139	1.28	12681060	-6.16	14.35	0.02	8.677148	3.47	18.31	0.73
	Q2	2102713	82.75	1881600	1.58	12976800	-6.41	14.32	0.03	8.149364	3.48	18.31	0.82
	Q3	2018340	95.10	1910703	1.90	13402070	-7.04	14.30	0.04	7.556008	3.62	18.29	0.89
	Q4	1966739	105.88	1970565	2.24	13642220	-7.53	14.37	0.06	7.021725	3.78	18.25	0.96
2014	Q1	1911604	117.69	2004634	2.60	14346640	-8.04	14.38	0.08	6.52341	3.96	18.22	1.03
	Q2	1903019	127.10	2027363	2.97	14641000	-8.40	14.42	0.10	6.055378	4.15	18.19	1.10
	Q3	1836865	143.80	2055105	3.37	15069370	-9.06	14.45	0.12	5.61944	4.35	18.15	1.17
	Q4	1795464	158.42	2112877	3.80	15309710	-9.57	14.57	0.15	5.209686	4.54	18.12	1.25

Figure 11: Nominal exchange rate (NER) depreciates (reaching the ceiling, N158/$)







Scenarios 04 – A 10 per cent decline in the total government expenditure

From scenario 04, a reduction in government expenditure reduces the money stock. The impact is felt immediately on the total money stock, as it reduces by 4% in the first quarter. Similarly, credit to the private sector which is a component

of money supply followed the same pattern. The decline in government expenditure results in a decline in time deposit and other deposit.

The liquidity squeeze in the economy as a result of the reduction in government spending increases the cost of borrowing. The cost of borrowing between the banks as depicted by the inter-bank rate increased steadily from 0.11 percentage point to 1.19 percentage point in the forecast period. Similarly, prime lending and 3-months deposit rate increased during the forecast period.

Figure 12: A 10 per cent decline in the total government expenditure

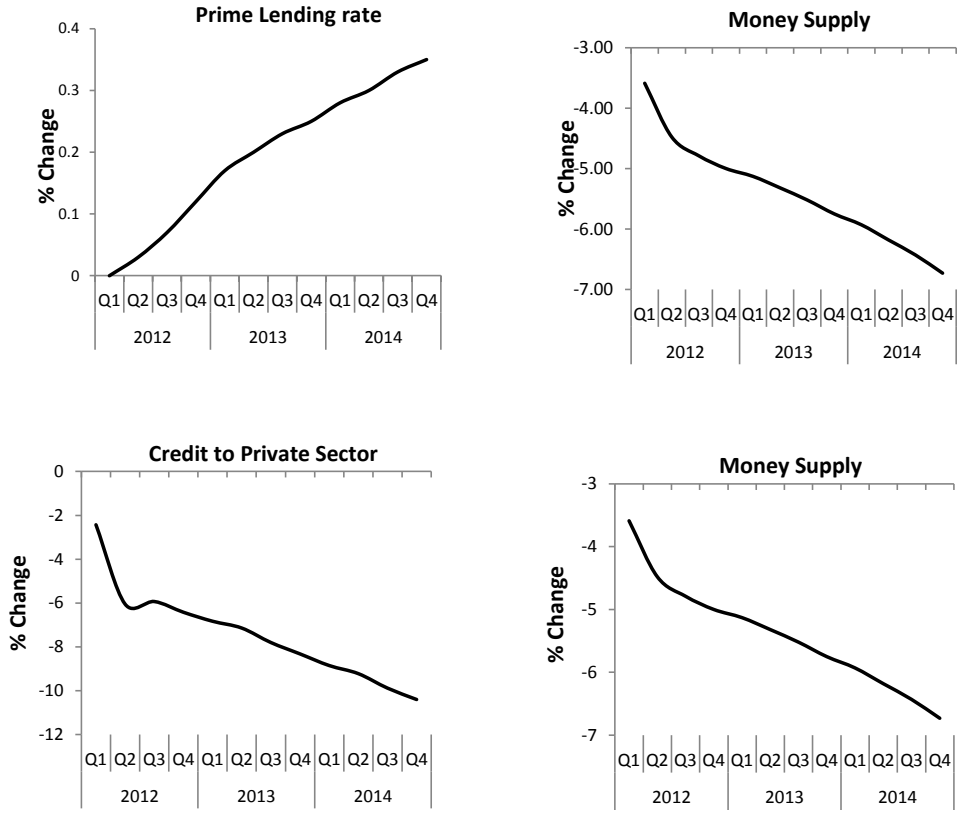


Table 22: A 10 per cent decline in the Total Government Expenditure

		Credit to Private Sector		Demand Deposit		Inter-Bank credit		Money Supply		3-Months Deposit rate		Net Domestic Credit		Other Deposits		Prime Lending rate	
	obs	Baseline	Change	Baseline	Change	Baseline	Change	Baseline	Change	Baseline	Change	Baseline	Change	Baseline	Change	Baseline	Change
	Q1	1005067.90	0.00	4132896.50	0.00	2.13	0.00	11023312.97	0.00	10.63	0.00	8401200.10	0.00	6410504.07	0.00	18.86	0.00
	Q2	1010281.7.50	0.00	4122577.80	0.00	2.98	0.00	10845498.10	0.00	6.17	0.00	8612940.00	0.00	6516044.44	0.00	18.49	0.00
	Q3	1033611.4.80	0.00	4375026.60	0.00	2.52	0.00	11224789.80	0.00	4.60	0.00	9309837.50	0.00	6761338.82	0.00	16.98	0.00
2010	Q4	9830344.10	0.00	4488974.80	0.00	8.44	0.00	11525530.40	0.00	4.68	0.00	8708545.50	0.00	6925748.83	0.00	16.00	0.00
	Q1	9446946.30	0.00	4311833.10	0.00	7.95	0.00	11653623.80	0.00	4.99	0.00	8206788.30	0.00	738256.167	0.00	15.76	0.00
	Q2	9973208.00	0.00	4626111.40	0.00	10.57	0.00	12177393.50	0.00	5.37	0.00	8908459.30	0.00	7874289.29	0.00	15.78	0.00
	Q3	1112601.5.40	0.00	4992707.00	0.00	8.94	0.00	12620897.30	0.00	5.38	0.00	9981560.40	0.00	8260206.24	0.00	15.84	0.00
2011	Q4	1293434.133	0.00	5523577.57	0.00	14.72	0.00	13300339.22	0.00	7.09	0.00	12403176.49	0.00	8747782.17	0.00	16.69	0.00
	Q1	1071.6870.00	-2.43	5588489.00	0.00	14.61	0.11	14688040.00	-3.59	8.62	0.01	1358881.0.00	-4.85	949.1168.00	-3.35	17.36	0.00
	Q2	1138.8290.00	-6.05	5723895.00	0.00	14.52	0.21	14997510.00	-4.48	9.27	0.04	1417.2870.00	-6.06	9742378.00	-4.69	17.86	0.03
	Q3	1172.9500.00	-5.93	5823132.00	0.01	14.42	0.32	15290200.00	-4.79	9.52	0.07	1468.1830.00	-6.52	9910582.00	-5.18	18.11	0.07
2012	Q4	1198.7040.00	-6.42	5992509.00	0.02	14.42	0.42	15231030.00	-5.00	9.64	0.11	1500.8270.00	-6.84	9914044.00	-5.45	18.26	0.12
	Q1	1268.1060.00	-6.83	6202.154.00	0.05	14.35	0.51	16015580.00	-5.13	9.62	0.15	1573921.0.00	-7.13	1045.181.0.00	-5.62	18.31	0.17
	Q2	1297.6800.00	-7.14	6430829.00	0.11	14.32	0.61	16266210.00	-5.32	9.58	0.19	1621.6700.00	-7.42	10628230.00	-5.82	18.31	0.20
	Q3	1340.2070.00	-7.80	6660626.00	0.19	14.30	0.70	16567610.00	-5.52	9.53	0.23	1670.4740.00	-7.72	10786940.00	-6.03	18.29	0.23
2013	Q4	1364.2220.00	-8.32	6893015.00	0.29	14.37	0.79	16522520.00	-5.75	9.51	0.26	1702.5550.00	-8.03	10799220.00	-6.28	18.25	0.25
	Q1	1434.6640.00	-8.85	7134509.00	0.41	14.38	0.89	17342560.00	-5.93	9.43	0.30	1776761.0.00	-8.35	11368350.00	-6.49	18.22	0.28
	Q2	1464.1000.00	-9.22	7380776.00	0.55	14.42	0.98	17618180.00	-6.18	9.38	0.33	1825218.0.00	-8.68	11560980.00	-6.75	18.19	0.30
	Q3	1506.9370.00	-9.88	7620809.00	0.71	14.45	1.08	17943330.00	-6.43	9.32	0.37	1874961.0.00	-9.02	11733750.00	-7.03	18.15	0.33
2014	Q4	1530971.0.00	-10.40	7859650.00	0.89	14.57	1.19	17914230.00	-6.73	9.30	0.41	1907.7260.00	-9.38	11759950.00	-7.35	18.12	0.35

Scenarios 05 – A 10 per cent increase in the Total Government Expenditure

From table 11, a 10 per cent increase in government expenditure stimulates steady increases in money supply, time and other deposits. Money supply increased by 1.56 per cent to 4.06 per cent, over the forecast period.

Increase in money supply which is not accompanied by commensurate expansion in money demand, results in money market disequilibrium. This positive supply gap exerts a downward pressure on the call rate, thus, lowering the rate over the forecast period. Similarly, the prime lending and deposit rates followed the same downward trend.

Figure 13: A 10 per cent increase in the Total Government Expenditure

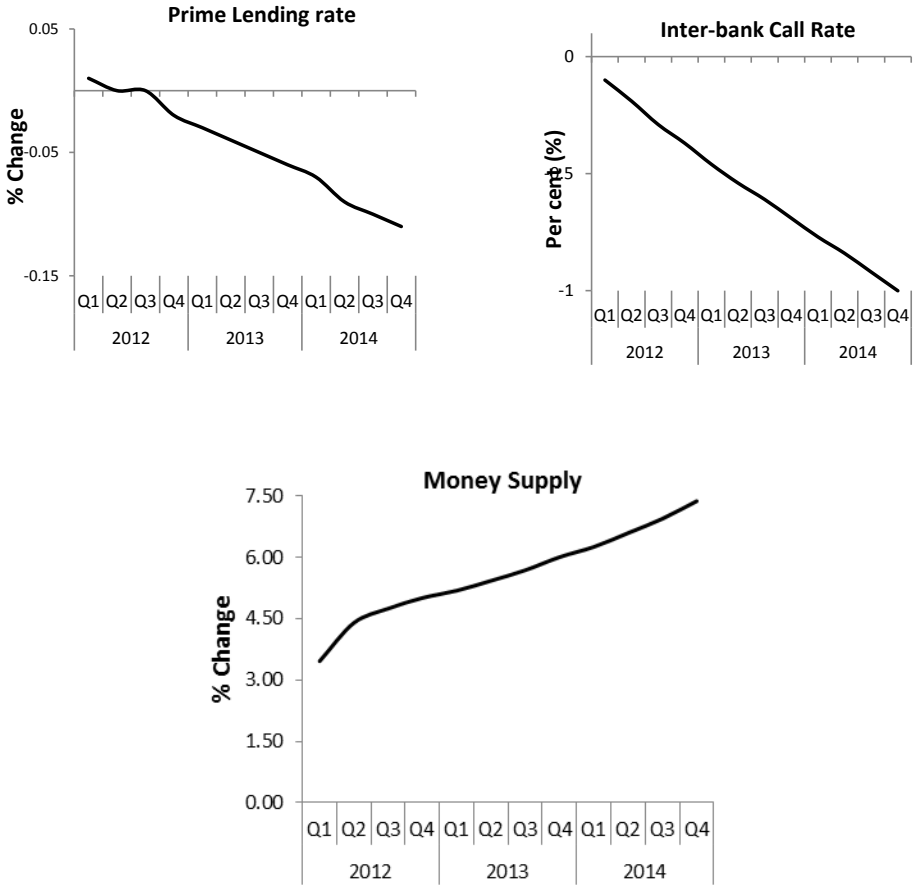


Table 23: A 10 per cent increase in the Total Government Expenditure

		Inter-Bank credit		Money Supply		Money Demand		3-Months Deposit rate		Net Domestic Credit		Other Deposits		Prime Lending rate		Time Deposit	
	obs	Baseline	Change	Baseline	Change	Baseline	Change	Baseline	Change	Baseline	Change	Baseline	Change	Baseline	Change	Baseline	Change
	Q1	7.95	0.00	11653623.80	0.00	15921397.08	0.00	4.99	0.00	8206788.30	0.00	7382561.67	0.00	15.76	0.00	2810623.31	0.00
	Q2	10.57	0.00	12177393.50	0.00	16639103.68	0.00	5.37	0.00	8908459.30	0.00	7874289.29	0.00	15.78	0.00	2784720.39	0.00
	Q3	8.94	0.00	12620897.30	0.00	17388502.30	0.00	5.38	0.00	9981560.40	0.00	8260206.24	0.00	15.84	0.00	2792617.12	0.00
2011	Q4	14.72	0.00	13300339.22	0.00	18542100.55	0.00	7.09	0.00	12403176.49	0.00	8747782.17	0.00	16.69	0.00	2704981.08	0.00
	Q1	14.61	-0.10	14688040.00	3.46	19491200.00	1.56	8.62	-0.01	13588810.00	4.60	9491168.00	3.22	17.36	0.01	2705508.00	0.02
	Q2	14.52	-0.19	14997510.00	4.40	19910550.00	2.25	9.27	-0.03	14172870.00	5.83	9742378.00	4.61	17.86	0.00	2716126.00	0.07
	Q3	14.42	-0.29	15290200.00	4.75	20220590.00	2.53	9.52	-0.05	14681830.00	6.32	9910582.00	5.15	18.11	0.00	2728272.00	0.15
2012	Q4	14.42	-0.37	15231030.00	5.01	20475170.00	2.67	9.64	-0.08	15008270.00	6.66	9914044.00	5.49	18.26	-0.02	2747004.00	0.26
	Q1	14.35	-0.46	16015580.00	5.19	21273630.00	2.82	9.62	-0.10	15739210.00	6.98	10451810.00	5.70	18.31	-0.03	2762526.00	0.40
	Q2	14.32	-0.54	16266210.00	5.43	21725660.00	2.95	9.58	-0.13	16216700.00	7.30	10628230.00	5.97	18.31	-0.04	2784994.00	0.56
	Q3	14.30	-0.61	16567610.00	5.69	22164810.00	3.09	9.53	-0.15	16704740.00	7.64	10786940.00	6.25	18.29	-0.05	2806536.00	0.75
2013	Q4	14.37	-0.69	16522520.00	6.01	22494990.00	3.23	9.51	-0.18	17025550.00	7.99	10799220.00	6.59	18.25	-0.06	2832184.00	0.96
	Q1	14.38	-0.77	17342560.00	6.26	23361140.00	3.44	9.43	-0.20	17767610.00	8.37	11368350.00	6.87	18.22	-0.07	2853651.00	1.19
	Q2	14.42	-0.84	17618180.00	6.60	23848950.00	3.64	9.38	-0.23	18252180.00	8.76	11560980.00	7.24	18.19	-0.09	2879825.00	1.43
	Q3	14.45	-0.92	17943330.00	6.95	24313320.00	3.84	9.32	-0.25	18749610.00	9.17	11733750.00	7.63	18.15	-0.10	2903660.00	1.69
2014	Q4	14.57	-1.00	17914230.00	7.38	24662130.00	4.06	9.30	-0.28	19077260.00	9.61	11759950.00	8.09	18.12	-0.11	2929653.00	1.97

6.2.3 Policy Implication of Findings

- A glimpse into the finding on an anticipated reduction in monetary policy rate by 200 basis points showed that the DMBs would prefer lending to the public sector. Consequently, monetary policy design elements should incorporate incentive mechanisms that would encourage the flow of more credit to the private sector relative to the public sector. Care must be taken to avoid the second round effects on inflation of government spending financed by the banking system when the central bank eases the monetary policy rate. Aside inflation, credit to the private sector suffers in the face of dominant public sector and therefore require consistent and efficient programmes to address the issue of price stickiness and private sector financing gaps.

- The finding of a decline in the MPR and CRR by 200 basis points apiece showed mixed result for currency in circulation (CIC) while it has negative impact on credit to private sector (CPS) and prime lending rate (PLR). However, credit to government by DMBs (CGDMBs), interbank call rate (IBCR) and inflation responded positively. This finding suggest that once economic agents have made necessary adjustment to a positive monetary policy shock, a surprise action by the central bank minimally change direction. In that regard, the timing of monetary policy action must be consistent with the long-term policy objectives of the central bank so as to avoid issues of dynamic inconsistency and economic agents misunderstanding the intent of the monetary authority.

- Given the relative preference for long-term investment instruments, deepening the long-term segment of the market to complement other tools of monetary policy implementation provides an effective response to subdue inflationary pressures and enhance financial intermediation.

- Also, simulation of a reduction in government expenditure reduced the money stock. The impact was felt immediately on the total money stock, as it reduced by 4% in the first quarter. The result re-emphasized the liquidity effect and challenges of the fiscal operations of government on monetary policy implementation. Fiscal-monetary policy coordination should be strengthened in order to realize optimal growth benefits.

- The out-of-sample forecast following a depreciation in nominal exchange rate to ₦158/$ indicated a boost to export, enhanced foreign earnings and increased output. However, with possible overheating and inflation tipping up by 2.1, 2.9, 3.6 and 4.5 percentage points in 2012Q3, 2012Q4, 2013Q2 and 2014Q4, respectively, complementary actions are required to stem risks to inflation.

Chapter Seven

7.0 Summary, Conclusions and Direction for Further Study

7.1 Summary and Conclusion

The study attempts to developed a monetary sector model which would guide monetary authority in formulating policies, facilitate the understanding of the inter-linkages among the variables in the sector and the macroeconomy, as well as provide forecasts on key macroeconomic indicators through simulation of alternative policy shocks. The model adequately captured the dynamics among the key variables in the monetary sector of the Nigerian economy.

The model adopted quarterly data from 1990 – 2011 and comprised eleven (11) behavioural equations and four (4) identities. The behavioural equations are net domestic credit, net foreign assets, credit to the private sector, DMBs credit to government, demand deposits, other deposits, currency-in-circulation, total deposit liabilities, treasury bill rate, monthly deposit rate (3-months), interbank call rate, prime lending rate and consumer price index. The four identities used are inflation, money demand, money supply and average rate. The ordinary least square (OLS) technique was used for the estimation. Both in-sample and out-of-sample forecasts were undertaken. The graphs indicated that the model tracks the time paths and turning points of the endogenous variables reasonably well, suggesting its suitability for policy simulation.

The results of the dynamic simulation indicated that the simulated data reproduce most of the turning points of the time series in the actual data well. Further, the dynamic simulation of the model produced satisfactory results, as they showed that the economic variables behaved according to a priori expectations. Alternative scenarios were conducted using four policy shocks, namely monetary policy rate, cash reserve ratio, nominal exchange rate and government expenditure.

The model revealed that reduction in the monetary policy rate led to a reversal in the deceleration of inflation and slightly tiped upward before declining again. The easing had a dampening effect on the prime lending rate and other rates constraining demand deposits, and hence the demand for money. The crowding out effect that characterized the Nigerian economy in the past manifested during the course of the simulation. This calls for the need by the monetary authority to direct credit to private investment through its policy instruments, in order to accelerate growth in the economy. The decline in currency-in-circulation

reflects the switch by citizens to the usage of electronic products and preference for long-term investments such as the real estate and government bonds. The simulation indicated that a reduction in government expenditure reduces the money stock, supporting effective and prudent fiscal management, which helps in achieving the goal of price stability in the conduct of monetary policy.

7.2 Directions for Future Study

Future studies in the following areas will give more insight into the workings of the monetary sector model:

- Incorporating recent developments in the monetary sector, particularly the role of the Asset Management Corporation of Nigeria (AMCON).

- Explore opportunity for the application of monthly data to better capture dynamics in the monetary sector and enhance availability of up-to-date information for policy makers.

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Appendix 1

	Notation	Definition	Type	Unit
1	ARATE	Interest Rate Average	Identity	per cent
2	Cg	credit to government	Endogenous	million naira
3	Cgcbn	CBN credit to government	Endogenous	million naira
4	Cgdmb	DMBs Credit to the government	Endogenous	million naira
5	CIC	Currency in Circulation	Endogenous	million naira
6	CPI	Consumer price index	Endogenous	Index
7	Cps	Credit to the private sector	Endogenous	million naira
8	CRR	Cash Reserve Ration	Exogenous	per cent
9	DD	Demand Deposits	Endogenous	million naira
10	IBCR	Inter-bank Call Rate	Endogenous	per cent
11	INF	Inflation	Identity	per cent
12	M2	Money Supply	Identity	million naira
13	MD	Demand for Money	Identity	million naira
14	MPR	Monetary policy rate	Exogenous	per cent
15	NDC	Net domestic credit	Endogenous	million naira
16	NER	Nominal exchange rate	Exogenous	per cent
17	NFA	Net foreign assets	Endogenous	million naira
18	NNAYR	Non – Agricultural Output	Exogenous	million naira
19	NNGDP	Nominal Non-Oil Gross Domestic Product	Exogenous	million naira
20	OAN	Other assets (net)	Exogenous	million naira
21	OD	Other Deposits	Endogenous	million naira
22	PLR	Prime Lending Rate	Endogenous	per cent
23	RES	External reserves	Exogenous	million naira
24	TBR	Treasury bill rate	Endogenous	per cent
25	TD	Total Deposits	Endogenous	million naira
26	TDL	DMBs total deposit liabilities	Exogenous	million naira

27	TGE	Total Government Expenditure	Exogenous	million naira
28	3DR	3-Month Deposit Rate	Endogenous	per cent
29	12DR	12 – Month Deposit Rate	Exogenous	per cent

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