The Nigerian economy and monetary policy: Some simple empirics

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Abstract.
The paper sets out to determine the impact of monetary policy on the Nigerian economy during the post-reform period using annual series data (1986 – 2006). Trend discussion of some basic macroeconomic indicators on the Nigerian economy among others reveal that (a) the Central Bank of Nigeria is instrument independents and not goal independent; and (b) fiscal dominance and policy inconsistencies are some constraints that undermine the efficacy of monetary policy. Results from the simple empirics on monetary policy shocks hold it that monetary policy is not completely impotent in influencing economic activities and particularly that monetary policy shocks affected prices more both in the short-run and long-run than other indicators. This paper posits that monetary policy formulation may concentrate more on the use of Treasury bill as an instrument of inflation-targeting in Nigeria.

Introduction.

Interest in the discussion of economic growth and development dates back to the making of economies. There is no doubt about this because growth confers many benefits. A few of the most important ones are: firstly, economic growth raises the general living standard of the population as measured by per capita national income; secondly, economic growth makes many kind of income distribution easier to achieve, thirdly, economic growth enhances the time frame of accomplishing the basic necessities of man, for example shelter, food etc, by a substantial majority of the population. This may even make the society begin to worry about the litter, pollution, etc that accompany growth itself; and finally, rapid growth rates are often cited by countries of the might or right of their economic and political systems or even prestige (Lipsey, 1982; 693). Despite these discourses on benefits of economic growth, the last decades has witnessed a heated debate on the role of monetary policy in the economic growth and development of nations and more precisely, how policy goals could be achieved by the available monetary policy instruments.

The four major goals of macro-policy are: low and stable level of unemployment, satisfactory balance of payments, stable price level and a high rate of growth. These goals are inter-related and three kinds of variables which ultimately focus on how these macro-policy goals could be achieved are the *Intermediate variables* (variables that

policies cannot affect directly and in whose behaviour, the policy-maker do not have direct interest), the *instrument variables* (variables whose behaviour, central authorities can change) such as the rates of taxes and the level of government expenditure (fiscal policy instruments) and the cash reserves of commercial banks (monetary policy instruments), and the *policy variables* (variables in which the policy maker is ultimately interested) in the form of balance of payments, unemployment, the price level and the growth rate whose behaviour the central authorities wish to change[1]. In a simple example, a change in the instrument variable of minimum rediscount rate (MRR) affects an intermediate variable, investment spending, which ultimately affects the policy variables of growth rate. How then does a monetary policy change affect economic growth or economic development? The general objective of this study is to a large extent answer the question in simple empirics by modestly assessing the effects of monetary policy shocks on the Nigerian economy.

The rest of the paper is divided into five sections. Following the introduction in section 1, section 2 discusses the evolution, development and constraints of monetary policy in Nigeria. Section 3 estimates the performance impact assessment of monetary policy changes on economic activities, prices and their reverses using Nigerian data. The final section concludes the paper with some recommendations.

2. Evolution and Development of Monetary Policy in Nigeria

The objectives of monetary policy in Nigeria are much the same as discussed previously (high employment, stable prices, balance of payments equilibrium and rapid growth rate). With the establishment of the Central Bank of Nigeria (CBN) in July 1957, the stage was set for a new era in which monetary policy could be used as instrument of economic

management (Teriba, 1976). The major task of this section is to describe the changing emphasis on these objectives.

2.1. The Formative Years, July 1959 – March 1962

Prior to 1964, it has been argued, that no conscious monetary policies were implemented in Nigeria as operations of the CBN did not start until July 1959. In March 1962 following the launching of the country's Second National Development Plan (1962-1968), the CBN was brought into the limelight of development financing. Monetary issues of concern (since the country was using the currency of the West African Currency Board) were the establishment of a strong financial base and the promotion of domestic financial infrastructures such as the money and capital markets institutions and instruments (Gbosi, 1993:266). Notable actions taken during this period included the issuance of the Nigerian currency, introduction of the first Nigerian money market instrument – the Treasury Bill, establishment of the Nigerian Stock etc. The most active policy instrument during this period was the interest rate. For instance, between April, 1960 and December 1960, the discount rate and treasury rate were individually raised 10 and 13 times respectively. The aim of the Treasury bill was to encourage commercial banks to repatriate short-term funds from London.

2.2. The Period 1962 – 1975

There were two significant actions that characterised the beginning of this era. First is the Amendment Act of 1962 that strengthened the Central Bank for effective monetary policy promotion and second, the adoption of cheap monetary policy aimed at enabling the government to borrow as cheaply as possible for purposes of financing the Second National Development Plan.

During the period 1964-1966, monetary policy was targeted at defending the balance of payments, given the rapid credit expansion experienced in this period, which encouraged increased demand for imports and subsequent drain on foreign reserves. Monetary policy instruments used during this period included fixing the exchange rate and interest rate, control of discount rate moral suasion to reverse the credit expansion.

Owing to the civil war in 1970, the Nigerian economy experienced an inflationary spree. Other factors that fuelled inflation were the unrealistic wage increase awarded by the Adebo and Udoji Commissions in 1971 and 1974 respectively. Consequently, inflation became the most serious problem in Nigeria. The Central Bank to this effect embarked on some direct control measures. This included encouragement of commercial banks to channel a greater and increasing percentage of their credit allocation to productive sectors of the economy (Ajayi and Ojo, 1979). Other measures were targeted at reducing the liquidity of commercial banks and issuance of 'stabilization securities'. Under this scheme, the CBN was given powers to sell or allocate these securities to, or repurchase from any banking institution (Gbosi, 1993).

2.3. The Period 1975-1992: Direct Control Era

This period has been appropriately described as the direct control era. The major objective of monetary policy during this period was to promote rapid and sustainable economic growth. To this end, the CBN imposed quantitative interest rate and credit ceilings on the money deposit of banks and sustained the sectoral credit allocation policy to 'preferred' sectors (agriculture, manufacturing, and residential housing) as against the less 'preferred sectors' like imports and general commerce. This classification as explained by Nnanna (2001:5) enabled the monetary authorities to direct financial

resources at concessionary rates to sectors considered as priority areas. These rates were typically below the CBN–determined minimum rediscount rate (MRR).

The CBN also compelled banks to deposit with it (special deposit) any shortfall in the allocation of credit to the designated preferred sectors. However, this policy of direct control in the allocation of credit to the priority sectors did not meet the prescribed targets and failed to impact positively on investment, output and domestic prices. As further observed by Nnanna (2002: 9), banks' aggregate loans to the productive sector between 1972 and 1985 averaged 40.7 per cent to total credit, about 8.7 percentage points lower than the stipulated target of 49.4 percent.

The period of the 'Control Regime' equally experienced an impaired effectiveness of monetary policy. One major factor often cited was lack of instrument autonomy of the Central Bank as the Ministry of Finance influenced by short-term political considerations largely dictated monetary policy. Empirical evidence as cited in Nnanna (2002) on the works of Fisher (1994) and Ojo (2000) support the goals of Central Banks' autonomy. Instrument autonomy of Central Banks (CBs) is predicated on the strong influence CBs have on monetary management and their ability to achieve monetary policy objectives.

In 1987 the monetary and credit policy measures adopted were designed to facilitate the achievement of the goals of the Structural Adjustment Programme (SAP). The adoption of SAP was as a result of harsh and severe economic difficulties in 1985. The SAP programme was aimed at reforming and dismantling the control regime and enhancement, promotion and use of indirect instruments of monetary controls. This ushered in the current monetary policy framework.

2.4. The Period of Indirect Instrument of Monetary Control (1993-Date)

The era began with selective removal of credit ceilings for banks beginning in September, 1993 followed the promulgation of the CBN Decree 24 and the Banks and Other Financial Institutions Decree (BOFID) 25 of 1991. In 1998 Decree Numbers 37 and 38 of the CBN (Amendment) and BOFID (Amendment) were promulgated. On the aggregate, the CBN Act was amended and granted more discretion and autonomy in the conduct of monetary policy.

The monetary policy framework of indirect controls involved the use of market instruments, particularly the Open Market Operations (OMO) introduced at end of June 1993 and is conducted wholly on Nigerian Treasury Bills (TBs), including Repurchase Agreements (REPOS). The OMO which is complemented by the CBN with the use of reserve requirements are the Cash Reserve Ratio (CRR) and the Liquidity Ratio (LR). The CRR has been progressively increased from 6 percent in 1995 to 12.5 percent in April, 2001. In 2005 there was an upward adjustment of the CRR by a total of 150 basis points and subsequent reduction.

The Minimum Rediscount Rate (MRR) is also used by the CBN to influence the level and direction of other interest rates. The changes in the rate indicate whether the monetary authorities wish to adopt a policy of monetary tightening or otherwise. The rate was 16.5 in December 2002, 15 percent in June 2004, 13 percent in December 2005 and 10 percent in December 2006.

In recent times, the CBN has been committed to ensuring price and exchange rate stability through restrictive monetary policy stance. This it has done with the introduction of the Wholesale Dutch Auction System (WDAS) and non-discountable Special Nigerian Treasury Bills (NTBs). In 2006, the CBN also introduced a new

interest-rate determination scheme which establishes an interest-rate spread of three percentage points and above and below a short-term Monetary Policy Rate (MPR). The MPR fixed at 10 percent in 2006 was reduced and retained at 8.0 percent in August 2007. Consequently, the annual headline inflation rate which averaged 17.9 percent in 2005 stood at 8.4 percent in 2006. Inflation stayed within single-digit of 6.4 percent in the first half of 2007. The exchange rate on the other hand has also faired relatively well. Apart from a drop in the market premium in the first week of June 2006 from N24 to N9.00, the naira exchange rate appreciated from US$1/₦151 in March 2006 to US$1/ ₦126.88 at end-March 2007 and appreciated to US$1/ ₦126.05 at end-June, 2007 (Central Bank of Nigeria Communiqué of the Monetary Policy Committee: *various issues*).

2.5. Constraints of Monetary Policy in Nigeria

Monetary policy framework in Nigeria has been targeted at the enhancement of output and a sustainable price level. Despite the efforts and determination especially on the part of the CBN, some constraining factors still inhibit the efficiency of monetary policy in Nigeria.

First is fiscal dominance. Fiscal expansion results in fiscal deficits. In Nigeria, such deficits in recent years were financed mostly by banking sector credit. This does not only result in crowding-out of the private sector, it also fuels inflation. It is thus difficult to explain a situation where monetary policy is targeted at combating inflation and at the same time, government embarks on budget deficits (via extra budgetary expenditures). In a situation like this, monetary policy becomes impotent.

A second constraining factor is liquidity overhang which is also related to fiscal dominance. Liquidity overhang in Nigeria results from the excessive monetization for

example, excess crude proceeds especially since 2000, the population census in 2006 and pre-election spending in early and mid 2007. Other sources are the fiscal operations of states and local governments whose 'loose' expenditures seriously inhibit the ability of the CBN to control the money supply.

Third, the lack of timely and accurate data needed for effective monetary policy formulation. Although, some improvements are already being recorded in form of large scale computerization of the financial system and the collaborative efforts of the CBN and the rebirth of the National Bureau of Statistics (formerly Federal Office of Statistics) improvement in collection, collation and publication of high frequency, reliable, and micro-level data is still needed.

Fourth, the large informal sector in Nigeria which also implies the existence of a large informal credit market. This has some implications for the transmission mechanism of monetary policy. For instance, the money creation ability of the informal credit market is a constraint on the CBN ability to control money supply in the economy.

Fifth, the preferred payment instrument (cash) in Nigeria. The literature has shown that a system that is driven by cash payments is inefficient and as such distorts the transmission mechanism of monetary policy (Nnanna, 1999).

Last is inconsistency in monetary policy announcements. The recent is the suspension of the proposed currency re-denomination programme. Complementarily to this is the increasing involvement of the Nigerian government in *setting the goals*, while the central bank manages the instrument to achieve the goals. What this implies is that the Central Bank of Nigeria possesses instrument independence (which is still weakened) but not goal independence.

3. Assessment Effects of Monetary Policy Shocks

This section is on the performance assessment of the current monetary policy in Nigeria (1995-2006). Table 1, Figures 1 and 2 provide data on the extent to which actual growth in monetary aggregates, GDP growth rate and inflation; approximate the *ex-ante* policy targets.

3.1. Money and Credit

The post-reform period under review witnessed a substantial growth in money supply. Money supply, M_1 grew rapidly from 16.3 percent in 1995 to 62.2 percent in 2000, while M_2 grew from 19.4 percent in 1995 to 48.1 percent in 2000. These periodical growths were due mostly to factors such as rapid monetization of oil flows and financing of government fiscal deficits through the banking system. For instance, aggregate credit (net) increased from 7.4 to 64.6 percent in 2002, although negative growths were recorded in some of the years in between.

Between 2001 and 2006, growth of M_1 consistently over-ran its target except in 2004 when the outcome 8.5 percent growth was below the 10.8 percent target. Base money, the Central Bank's operating target for monetary policy, which stood at ₦918.9 billion, was far in excess of the end-December 2006 Policy Support Instrument (PSI) target ceiling of ₦820.0 billion.

The provisional data also indicated that broad money (M_2) grew by 30.6 percent, compared with the minimum target of 27.8 percent for fiscal 2006. The rise in money stock during this period is attributable wholly to the significant increase in the foreign assets (net) of the banking system arising from the sustained increase in crude oil prices in the international oil market. Aggregate credit to the domestic economy according to the 2006 Annual Report of the CBN, fell by 65.0 percent. This also reflected wholly in a

substantial fall in credit to the Federal government by 676.2 percent, compared with a programme decline of 40.0 percent fiscal 2006.

Credit to the private sector consistently rose by 26.6 percent as against a programmed decline of 22.0 percent in 2004, while a similar feat was also achieved in 2005, as credit to this same sector (private) increased by 29.3 percent as against the set target of 22.0 percent. Credit to the private sector rose by 28.2 percent, comparing favourably with the target of 30.0 percent.

Generally, fiscal dominance though has relatively been on the decline since 1998, the decline has not been consistent. For example, while a 4.3 percent, 5.5 percent and 2.8 percent declines were recorded in 2001, 2002 and 2003 respectively; increased spending was recorded in 2004 and 2006. This undermines the importance of policy consistency in the efficacy of monetary policy formulation and implementation.

3.2. Domestic Output

The output performance of the economy in recent times has been impressive. Output growth on the average compared favourably with the set targets. Unprecedentedly in the post-reform period, real growth stood at 10.2 percent as against a programmed target of 5.0 percent. Furthermore, the period between 2004 and 2005 witnessed outcomes of growth in real GDP over their set targets. However, the real GDP growth of 5.6 percent in 2006 lagged behind a projected target rate of 7.0 percent during the same period. This may not be too surprising because the output growth process of an economy that is monoculturally driven by one resource (oil) may be a gradual one. In the Nigerian case other factors that have inhibited the rapid growth of the economy are inadequate and decay infrastructure, weak institutions and corruption.

Table 1. Some Indicators of Economic Fundamentals (1995-2006)

Year	CPI	AFEM	TBR	M2	FD	RGDP
1995	72.8	81.2	12.5	19.4	0.1	2.2
1996	29.3	81.2	12	16.8	1.3	3.3
1997	8.5	82	12	16.9	-0.2	3.2
1998	10	84.4	13	23.3	-4.7	2.4
1999	6.6	96.1	19	31	-8.4	2.8
2000	6.9	101.7	13	48.1	-2.9	3.8
2001	18.9	119.9	20.5	27	-4.3	4.6
2002	12.9	121	13.8	21.55	-5.5	3.5
2003	14	129.4	14.5	24.09	-2.8	10.2
2004	15.1	133.5	14.4	12.28	1.5	6.5
2005	17.8	131.7	12	34.61	-1.1	6.2
2006	8.3	127	7.3	30.56	0.6	5.6

CPI = Consumer Price Index; TBR = Treasury Bill Rediscount Rate; M2 = Broad Money Supply; FD = Fiscal Deficit; RGDP = Real GDP

Source: Central Bank of Nigeria, 2006 Statistical Bulletin, Volume 17

3.3. Price

The major objective of monetary policy in Nigeria is the maintenance of macroeconomic and price stability. A single-digit inflation rate (also one of the conditions for the establishment of the second West African Monetary Zone) constitutes the price stability as perceived in the Nigerian context. Persistent single-digit inflation has not been sustainably achieved in Nigeria. For instance, for the 12 year period (1995 to 2006), a single-digit inflation rate, though was achieved only 4 times, recent years' experience (that is since 2004) has been relatively satisfactory. The year-on-year data revealed that the outcome of actual inflationary rate has been favourable compared with the programme targets. This may imply a relative success of monetary policy since 2004. These latter periods of favourable comparison between outcome and target can also be adduced to time-lag effect of the efficacy of monetary policy.

Figure 1 Trend display of some economic fundamentals

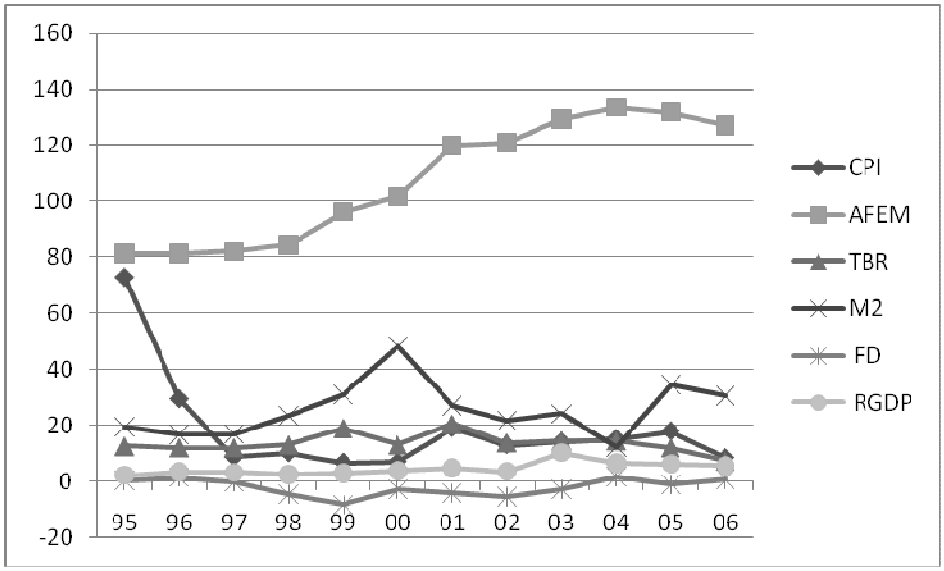
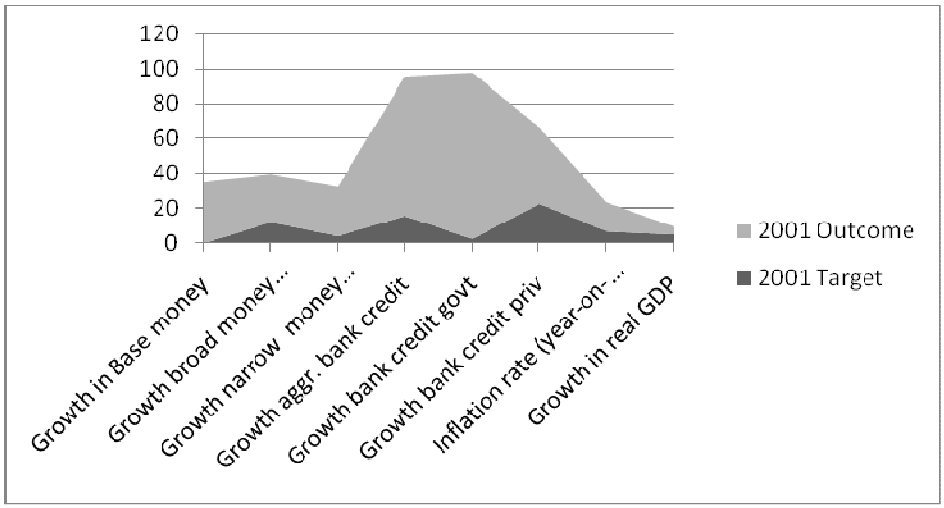
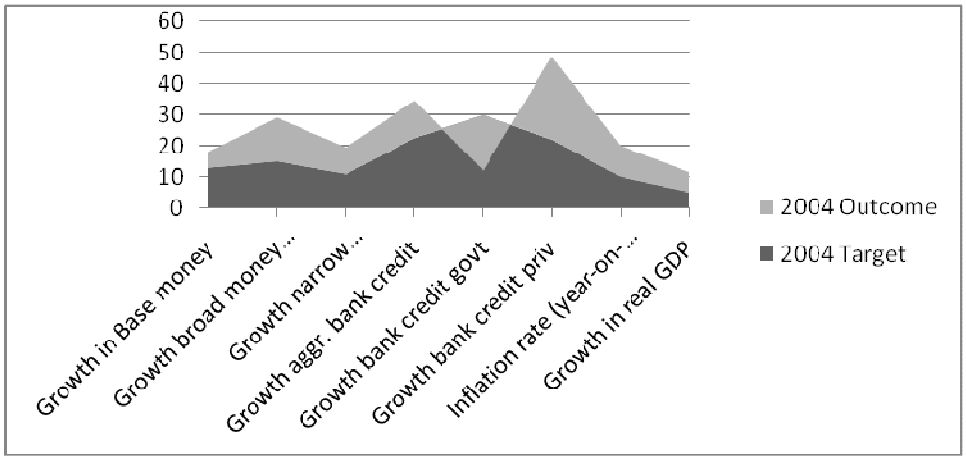
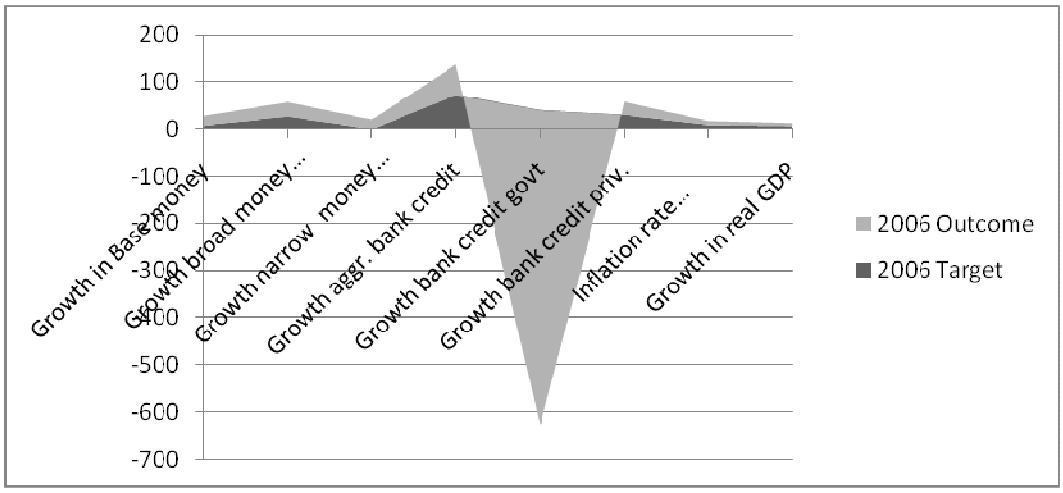


Figure 2 Growth rates of targets and outcome of some of the macroeconomic indicators







3.4. Foreign Exchange

Foreign exchange and exchange rate management in Nigeria has undergone some transformation over the years. It has moved from officially pegged exchange rate system between 1970 and 1985 to a market determined system since 1986.

3.5. The Nigerian Economy and Monetary Policy Shocks: The Simple Empirics.

In the economic literature, most economists would agree, at least in the short run that monetary policy can influence the real economy significantly (Bernanke and Gertler, 1995). Some researchers that have confirmed this assertion by Friedman and Schwartz (1963) that monetary policy is followed by movements in real output that may last for two years are Romer (1989), Bernanke and Blinder (1992) and Bernanke and Gertler

(1995). The sub-section sets to answer the question though not in details; what happens to the economy after a change in monetary policy occurs? This is done by empirically considering the effects of monetary policy shock using Central Bank of Nigeria (CBN) Treasury bill discount rate on some selected economic fundamentals – output (real GDP) and prices (GDP deflator, exchange rate and interest rate spread). The Treasury bill discount rate (in percentage points) is interpreted as an unanticipated tightening of monetary policy.

Following the lead by Bernanke and Gertler (1995), dynamic responses of the selected economic aggregates can be analyzed using the vector autoregression (VAR) technique. The choice of this methodology has been shown and tested by King and Watson (1992), Masha (2002) among others, to provide more meaningful estimates in analysis of dynamic responses. VAR is a system of ordinary least-square regressions, in which each set of variables is regressed on lagged values of both itself and the other variables in the system. In a simple form, VAR is a dynamic method of summarizing relationships among variables and on estimation; a simulation response over time of any of the variables in the group due to its own 'disturbance' or a disturbance on any other variable in the group can be deduced.

The estimated dynamic responses of output, prices and interest rate to a monetary policy shock are presented in Figure 3 and Table 4. Real GDP and GDP deflator are expressed in logarithms. The responses are interpreted as proportions (that is, 0.01 = 1 percent) of baseline levels; and because VAR does not impose exogeneity restriction *ex ante* on the variable, its representation in this study can be expressed as:

$$X_i = \sum_{i=1}^{\rho} \pi X_{t-1} \varepsilon_i \qquad 1$$

where X_i is a vector of monetary policy shock (Treasury bill discount rate and broad money supply) and other economic fundamentals (output, prices and interest rate). ε_i is a Gaussian error term with zero mean and constant variance. Since the purpose of the VAR is to identify the impact of monetary policy shocks, the analysis shall involve testing for the stability of the VAR (whether it can be inverted), the reliability of the impulse response functions (IRF) and the residuals. A variance decomposition analysis will also be explored to enable us identify the importance of the monetary authorities (Central Bank of Nigeria) behaviour (innovations) using CBN intervention rate (treasury bills rate or monetary aggregates) on prices, output and exchange rate.

4. Data Analysis and Empirical Results

4.1. Data

Data for this study were obtained from the Central Bank of Nigeria (2006 *Statistical Bulletin*, Volume 17). The data is annual in nature and spans from 1981 to 2006.

4.1 Stationarity Test:

The variables used for the study were tested for stationarity. One of the most frequently used unit root test is based on the Augmented Dickey-Fuller (ADF) test. The ADF is a parametric approach originally proposed by Dickey and Fuller (1979 and 1981). The results of the stationarity tests at levels and at first difference are presented in Table 2.

As depicted in Table 2, the results of the unit root tests at levels are not stationary. As a result of this, the variables were differenced once in order to further perform the unit root tests on the differenced variables. The results of the unit root tests on the differenced variables equally presented in Table 2 reject the null hypothesis of non-stationarity for all the variables used in the study. It can be concluded therefore that all the variables are integrated of order one.

Table 2: Stationarity Tests of the Variables

	lag	ADF Level (intercept)	ADF Level (Trend & Intercept)	ADF (Intercept)	ADF (Trend & Intercept)
Limdft	0	-0.53857	-1.4997	-4.447*	-4.375*
Lms2	0	0.2397	-2.517	-3.4995**	-3.459***
Lneer	0	-1.52367	-1.2379	-4.4925*	-4.687*
Lrgdp	1	-0.17403	-2.777	-4.5840*	-4.488*
Ltbdr	0	-2.5569	-1.8916	-5.6835*	-5.6100*

Limdft = Price; Lms2 = Money Supply; Lneer = Exchange Rate; Lrgdp = Output; Ltbdr = Treasury Bill Rate. SIC *.01 **.05 .10*
Source: Author's calculations

4.2 Cointegration Analysis

The cointegration results reported in Table 3 indicate the existence of a stable long-run relationship among the macroeconomic variables used in the study. Both the trace test and the maximum Eigenvalue statistics reject the null hypothesis of no cointegration. The trace test and Eigenvalue test reveal that there exist a unique cointegration vector among LIMDFT, LRGDP, LTBDR and LNEER.

Table 3: Johansen-Juselius Maximum Likelihood Cointegration Test
LIMDFT LRGDP LTBDR LNEER

Trace Test				Maximum Eigenvalue test			
Null	Alterative	Statistics	95% Critical Value	Null	Alterative	Statistics	95% Critical Value
r=0	r≥1	97.07	88.80	r=0	r=1	42.729	38.331
r≤1	r=2	54.34	63.876	r≤1	r=2	18.321	32.118

Notes: (a) r stands for the number of cointegrating sectors. The lag structure of VAR is determined by the highest values of the *Alkaike information criterion and Schwartz Bayesian criterion.*
(b) Trace test indicates 1 cointegrating equation at the 0.05 level
(c) Max-eigenvalue test indicates 1 cointegrating equation at the 0.05 level.
Source: Author's calculations.

4.3. Characteristics of the Vector Autoregressive (VAR) Model

In the literature, it has been observed that testing for the existence of cointegration analysis as developed by Johansen (1988) and Johansen and Juselius (1990) is

tantamount to testing for the existence of a long-run relationship which requires a ρth-order structural and dynamic VAR model on the variables under consideration.

For the purpose of the above, we first proceed by setting the appropriate lag-length using some criteria. The Schwarz Information Criterion (SIC) and the Hannan-Quinon Information Criterion (HQ) were applied in the selection of the lag-length. On the basis of these information criteria, a best lag of one year is selected for the model that used treasury rate (Ltbdr) and three years for the model that used broad money supply as monetary policy intervention variable. The VAR lag order selection criteria are reported in Table 4(a and b). In consonance with Box and Jenkins (1970) methodology, the diagnostic checking list is presented in Table 5. The VAR residual normality test using the Jarque-Bera test show that the VAR is normal; while the Lagrange Multiplier (LM) test for VAR residual serial correlation LM tests revealed absence of autocorrelation. The VAR satisfies the stability condition as no root lies outside the unit circle as indicated by the inverse roots of AR characteristic polynomial (shown in Figures 3 and 4) for both the treasury rate and broad money supply (used as monetary policy interaction variable) respectively. Consequently, given the various battery of tests, the analyses are extended by determining the response of each variable to various monetary policy intervention shocks. The discussions of such results are presented in the next sub-section below.

Table 4a. VAR Lag Order Selection Criteria
Variables: LIMDFT LRGDP LNEER RIR LTBDR

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-177.7303	NA	5.476568	15.88959	16.13644	15.95163
1	-95.71710	122.2369*	0.040936*	10.93192	12.413008*	11.30441*
2	-70.97605	25.81675	0.060188	10.95444	13.66975	11.63733
3	-41.66863	17.83930	0.138378	10.57988*	14.52943	11.57318

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion
Source: Author's calculations

Table 4b. VAR Lag Order Selection Criteria
Variables: LIMDFT LRGDP LNEER RIR LMS2

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-165.2008	NA	1.842199	14.80007	15.04692	14.86215
1	-62.90331	161.2224*	0.002360	8.078549	9.559628	8.451036
2	-33.35487	30.83316	0.002284	7.683023	10.39834	8.365925
3	16.32702	30.24115	0.000893*	5.536781*	9.486325*	6.530081*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion
Source: Author's calculations

Table 5. Diagnostic Checking List

Statistic	LTBDR Model	LMS2 Model
VAR Residual Jacque-Bera (Normality Test)	17.19551 (0.0701)	12.26506 (0.2677)
VAR Residual LM serial correlation	Lag1= 11.71026 (0.9887)	Lag1= 29.97821 (0.2251) Lag2= 27.89382 (0.3128) Lag3= 29.45454 (0.2454)

( ) probability values
Source: Author's calculations

4.4 Response to Shocks

The Impulse Response (IR) of the Cholesky decomposition is represented by the plots in Figures 5 and 6. The IR graph shows the response of each variable from shocks to the underlying fundamental shocks (μ's).

For Figure 5 the column and row of interest are the third column and the third row since they depict the response of the variables to the monetary variable as well as the response of the monetary variable in the system. An increase in monetary aggregates M_2 leads to an increase in prices, an appreciation of the exchange rate from its negative contemporaneous start and a decrease in output. The spike response of prices is worthy of

note while that of the exchange rate changes is somewhat sluggish compared to the response to prices. The exchange rate response is almost zero after its depreciation in the first period and zero in the second period. This suggests that monetary policy shock via use of monetary aggregates did not significantly affect exchange rate in the long-run. In relation to prices, monetary policy shock (using money supply) may not have affected prices both in the short-run and the long-run.

In relation to monetary policy impact on output, the graph suggests that an increase in M_2 leads to a fall in output up to two periods and thereafter it increases beyond zero. However, the positive response after periods 2 is sluggish. What this may imply is that monetary policy does not affect output in the short-run, while in the long-run it marginally does (see Shostak, 2004).

The response of money to shocks other than itself is phenomenal in several ways. First, it appears that money though responds to itself, the degree of response to output shock is higher after 2 periods. Secondly, money response to price shock is almost zero; although it increases marginally in the long-run and thirdly, money response to exchange rate increases is negative. This may indicate that a fixed money growth rate in Nigeria was not followed over this period.

For Graphs in Figure 6, the column and row of interest are the third column and third row given that they depict the response of the variables to the monetary variable changes (treasury bills rate) as well as the response of the monetary policy variable to the variables in the system. An increase in the Treasury bill rediscount rate leads to an increase in prices, output and a depreciation of the exchange rate. The response of output is somewhat inert compared to the response of prices.

The above results have some economic implications for the formulation of monetary policy. Firstly, price response to monetary policy shock is more after 3 periods, suggesting that monetary policy does affect prices more in the long-run. Secondly, the sluggish and low positive response of output to shock in treasury bill rate particularly after 2 periods suggests that monetary policy affects output more in the short-run than in the long-run.

As regards exchange rate response, its depreciation initially worsens up to (roughly) 3 periods before it starts improving. The improvement experienced by periods 10 (though still negative) may suggests that monetary policy does affect exchange rate in the long-run. This is another way of depicting the J-curve phenomenon if judged via monetary policy management.

The Treasury bill rediscount rate as it appears does not significantly respond to shocks other than the shock to itself. In short, its own self response reflects a decline (fall) and in the long-run it is almost zero. The responses of Treasury bill rate to prices, output and exchange rate shocks almost zero's out in the long-run. These may suggest that tight monetary policy rule would have been followed during the period under review.

5. Summary and Conclusion

The paper sets out to determine the impact of monetary policy changes on the Nigerian economy during the post-reform era. The discourse was carried out in two stages. First the trend review some basic macroeconomic indicators and the second, a discussion of the estimated results based on simple empirics of the monetary policy shocks. A review of the monetary sector vis-à-vis economic activities revealed that; (a) the Central Bank of Nigeria at the moment is instrument independent and not goal

independent; (b) fiscal dominance and policy inconsistencies are some constraints that have undermined the efficacy of monetary policy formulation and implementation; (c) national output growth is mono-culturally driven by only one resource (oil); while inadequate and decay of infrastructure, weak institutions and corruption among others are the bane of economic growth in Nigeria; (d) inflation level has been relatively low and stable since 1996. This may have been due to some of the successes of monetary policy recorded in the past three years.

In the discussion of results from the simple empirics on monetary policy shocks, the Treasury bill rediscount rate and broad money supply were used as instruments of monetary policy. Dynamic impulse response functions based on the vector autoregressive (VAR) technique were analyzed. It is evident from the results that monetary policy shock via the use of monetary aggregates did not significantly affect exchange rate in long-run. In relation to prices, monetary policy shock (using money supply) affected prices both in the short-run and the long-run; while it does not affect output in the short-run. An increase in the Treasury bill rediscount rate led to an increase in prices, output and a depreciation of the exchange rate. The response of output to Treasury bill shock was inert when compared to the response of prices. Treasury bill rate for instance, seems to respond more to exchange rate changes than other variables. The responses of prices, output and exchange rate to monetary policy shock irrespective of the instrument (money or treasury bill rediscount rate) thus follow the same pattern of behaviour.

The above allow us to conclude that monetary policy is not totally impotent and may impact more on economic activities in the long-run than in the short-run in Nigeria. Monetary policy formulation may then concentrate more on the use of Treasury bill as an

indirect instrument of inflation targeting than the management of monetary aggregates in Nigeria. Although it has been recognised that fiscal dominance, policy inconsistency, etc inhibit monetary policy efficacy in Nigeria, conscientious efforts in the building of strong institutions, infrastructure, transparency and diversification of the economy are necessary for the growth of the Nigerian economy.

Figure 3. Model with LRTDB

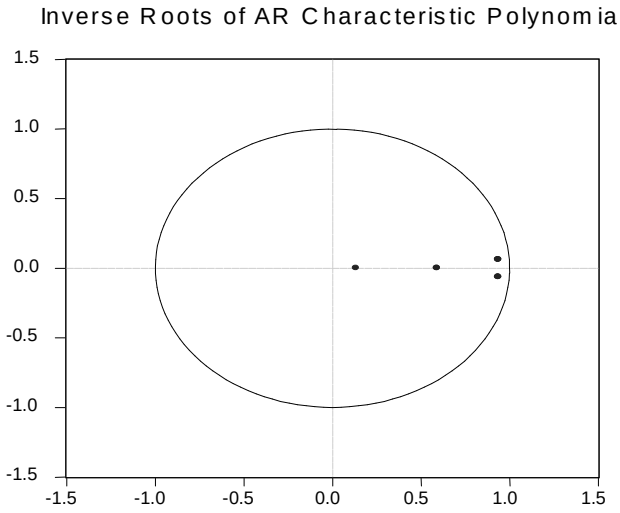


Figure 4. Model with LMS2

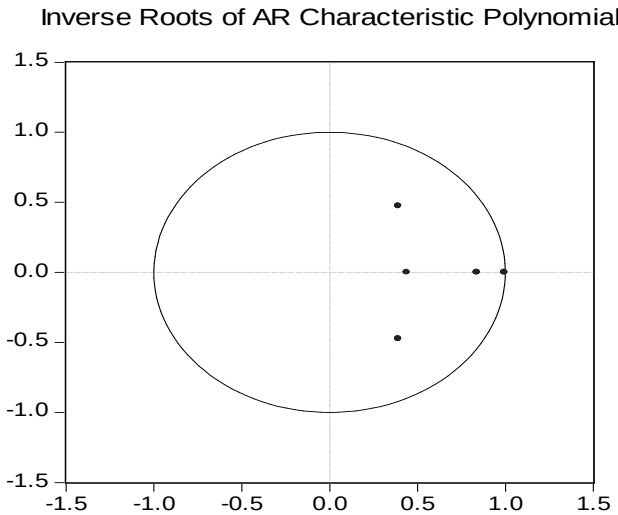


Figure 5. Broad Money Supply Model

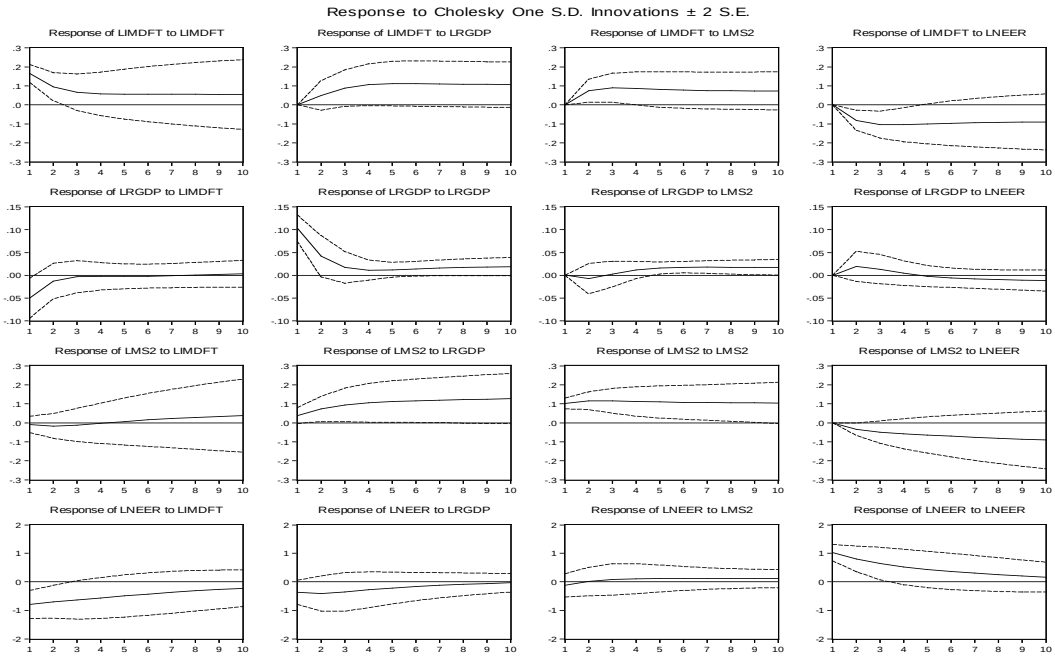
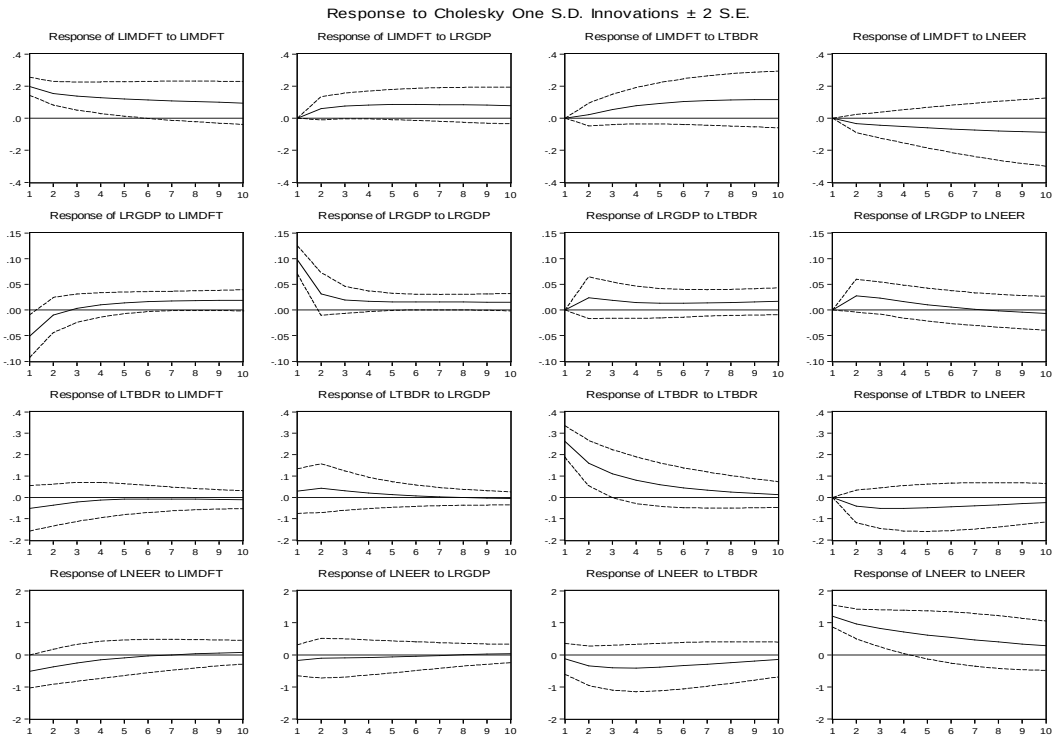


Figure 6. Treasury Bill Rate Model



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