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RESEARCH ARTICLE

AN ANALYSIS OF THE MONETARY POLICY TRANSMISSION MECHANISM IN NIGERIA

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ABSTRACT

This paper examines the analysis of the transmission mechanism of monetary policy in Nigeria. To achieve the broad objective of this paper, the vector auto-regression approach is employed as estimation technique. From the empirical result, it is revealed that an increase in the interest rate tends to be accompanied by a reduction in inflation and an increase in exchange rate but show insignificant impact on the level of production. The study finally suggests that monetary authority in Nigeria should endeavour to undertake structural reforms aiming at addressing the weakness in the financial sector, then effort should also be but in place in ensuring that commercial banks in Nigeria follow central bank of Nigeria directives for financial intermediation in our economy.

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INTRODUCTION

The monetary transmission mechanism describes the ways by which monetary policy impact aggregate demand and prices by influencing the investment and consumption decisions of firms households and financial intermediaries. The monetary policy decisions of the central bank do not operate in isolation, they steer economic activities in the economy through monetary transmission channels (such as interest rate, bank lending, balance sheet, asset prices, exchange rate and expectation channels). It is worth noting that, the effectiveness of any of these channels depends on the magnitude and speed at which these channels transmit monetary impulses and also depends on factors such as the economic regulation, legal and financial structure of the economy. Thus, the success of a monetary policy strategy largely, depends on a comprehensive undertaking of how these channels work and the relationship between operating instruments of monetary policy and the ultimate goals (Buigut, 2009). The monetary policy transmission process is complex and involves a number of strategies. However, these stage were being summarized by Fauru, (2006) in to six stages. First, a change in the central banks lending rate is transmitted to the private bank to bank interbank market. Second, the private bank to bank interbank market transmits the change to other market interest rates. Third, changes in market interest rates are transmitted to asset prices exchange rates and expectation are then transmitted to

aggregate demand. Fifth, changes in aggregate demand are transmitted to money supply. Sixth, changes in money supply are finally transmitted to prices. The remainder of the paper proceeds as follows: section 2 presents brief theoretical and conceptual foundations, section 3 outlines the research method; section 4 presents an analysis and interpretation of results while section 5 concludes the paper.

SECTION II

Theoretical issues and literature review

Channels of Monetary Transmission Mechanism

The Interest Rate Channel

As cited by Leviet Hung (2010), expansionary monetary policy (increasing money supply - M) causes the real interest rate (ir) to fall, which means that the cost of capital is lowered. The fall in real interest rate induces businesses to increase spending on investments spending and consumers to increase their housing and durable expenditures, which are also considered investment. This increase in investment spending (I) leads in turn to an increase in aggregate demand and a rise in output (Y). This process is illustrated in the following schematic:

$M \uparrow \Rightarrow \downarrow \Rightarrow \uparrow \Rightarrow \uparrow$

The Exchange Rate Channel

According to Mishkin (2006), an increase in money supply (M) causes the domestic real interest rate (ir) to fall. Therefore,

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assets which are denominated in domestic currency are less attractive than assets denominated in foreign currency, resulting in a depreciation of domestic currency (E). The depreciation of the domestic currency makes domestic goods relatively cheaper than foreign goods, thereby causing net export (NX) and output to rise. This is demonstrated in the following schematic:

$$M \uparrow \Rightarrow \downarrow \Rightarrow \downarrow \Rightarrow \uparrow \Rightarrow \uparrow$$

Other Asset Price Channels

These channels operate mainly through two effects: Tobin's q theory of investment and wealth effects on consumption (Mishkin, 1995). According to Tobin (1969), q is defined as the market value of a firm divided by the replacement cost of capital. If q is high, the replacement cost of capital is low compared with the market value of the firm. This enables the firm to buy more plant and equipment with their now higher-value equity. Thus, investment spending increases. Conversely, if q is low, then the market value of the firm is also low in comparison with the replacement cost of capital and the firm will not purchase investment goods. Thus, investment decreases. In the monetarist view, this effect is explained by the fact that if money supply decreases, the public has less money and wants to try to decrease their spending. One way to do this is to reduce the amount of money invested in the stock market, thus depressing the demand for and the price of equities (Pe). Combining this with Tobin's q effect, this channel is expressed in the following schematic:

$$M \downarrow \Rightarrow \downarrow \Rightarrow \downarrow \Rightarrow \downarrow \Rightarrow \downarrow$$

The wealth effect on consumption is based on the life-cycle model of Modigliani (1971). In his model, consumers determine their consumption spending by considering their lifetime resources, including human capital, real capital, and financial wealth. Common stocks are a major component of consumers' financial wealth. When stock prices decrease, consumers' wealth also decreases and they spend less on consumption. Because a contractionary monetary policy can result in lower stock price, the process is seen in the following schematic: wealth consumption e

$$M \downarrow \Rightarrow P_e \downarrow \Rightarrow \text{wealth} \downarrow \Rightarrow \text{consumption} \downarrow \Rightarrow \downarrow$$

The Credit Channel

This channel mainly involves with the agency problems arising from asymmetric information and costly enforcement of contracts in the financial market. The credit channel operates via two main channels, that are the bank lending channel and the balance-sheet channel (Mishkin, 1995). 4

A decrease in money supply leads to a decrease in bank deposits, which further decreases the volume of money that banks have to loan out. This, in turn, decreases investment and, ultimately, aggregate demand. This channel allows monetary policy to operate without interest rate, meaning that decreasing interest rates may not be sufficient to increase investment. However, it is worth noting that, with financial innovation, the significance of this channel has been doubted

(Mishkin, 1995). The schematic for the bank lending channel is as follows:

$$M \downarrow \Rightarrow \text{bank deposit} \downarrow \Rightarrow \text{bank loans} \downarrow \Rightarrow \downarrow \Rightarrow \downarrow$$

The balance-sheet channel operates through the net worth of firms, with the effects of adverse selection and moral hazard. A decrease in the firm's net worth means that lenders can rely on lower collateral for their loans, which raises the problem of adverse selection and reduce lending for investment spending. Lower net worth also results in the problem of moral hazard because business owners have a lower equity stake in the firm and, therefore, have incentive to take part in risky projects. As a result, lending and investment spending decreases (Mishkin, 1995). The ways monetary policy affect firms' balance-sheets are as follows:

$$M \downarrow \Rightarrow P_e \downarrow \Rightarrow \text{adverse selection \& moral hazard} \uparrow \Rightarrow \text{lending} \downarrow \Rightarrow I \downarrow \Rightarrow \downarrow$$

A tightened monetary policy leads to a decrease in the prices of equities (Pe), raising the problems of adverse selection and moral hazard. As a result, lending for investment spending decreases.

$$M \downarrow \Rightarrow i \uparrow \Rightarrow \text{cashflow} \downarrow \Rightarrow \text{adverse selection \& moral hazard} \uparrow \Rightarrow \text{lending} \downarrow \Rightarrow I \downarrow \Rightarrow Y \downarrow$$

Contractionary monetary policy increases the interest rate, which in turn increases the problems of adverse selection and moral hazard. Similar to a tightened monetary policy, when a contractionary policy is implemented, lending and investment spending decrease.

Administration of Monetary policy in Nigeria

Monetary policy for consideration by the President is proposed by the CBN through a memorandum usually titled, monetary and credit policy proposals which is or a particular fiscal year. The memorandum, an input of all the policy departments of the CBN is coordinated by the research department. The input takes into account the views and suggestions of financial system operators, the views and suggestions of financial system operators, the business community, and other interested members of the public. It also considers the prevailing economic conditions, prospects and the policy objectives that appear most appropriate to pursue in the immediate future. The memorandum is initially considered by the committee of Governors, the highest management body for the day-to-day administration of the CBN. It is finally discussed, amended, if need by, and approved by the board of directors of the CBN. Thereafter, it is transmitted by the Governor of the CBN to the President for consideration and approval. The president after due consultation with other organs of government, takes a decision on which proposals to accept and announces them in the budget. It is pertinent to add here that in the current Nigerian setting, the success of monetary policy hinges crucially on the extent to which the budgetary programme of the federal government can be harmonized with the goals of monetary policy Odozi, (1992). This is due to the crucial role of the government in the economy and for this reason the government has continued to be the largest sources of liquidity growth in the system.

However, after the budget announcement, the accepted proposals are subsequently outline for banks and other financial institutions by the CBN, in the form of a monetary policy circular for compliance. Penalties for non-compliance with specified guidelines are also indicated in the circular. As a monitoring device, the CBN conducts periodic and special examinations of the books of all licensed banks which are also required to submit returns on their operations to the CBN. The examinations and returns from the financial institutions as well as current economic developments enable the CBN to assess compliance with the monetary policy circular, and to determine the need for change in the circular. Routine amendments to the circular are undertaken by the CBN, while fundamental changes must be discussed with the President.

Monetary Policy Episodes in Nigeria

Policy Period Key Elements of Policy Management

1. Period of Direct Control (Pre-SAP) "Direct monetary control prevailed throughout the period prior to the adoption of the structural adjustment programme;
 - * *Key ingredients of the policy framework include: sectoral credit allocation, credit ceilings and cash reserve requirements, administrative fixing of interest and exchange rates and imposition of special deposits;*
 - * *Monetary targets were hardly ever realized;*
 - * *Strategy created distortions in resource allocation*
2. Period of Indirect Monetary Framework - Short-term (1986 - 2001) "Use of market instruments in monetary management;
 - * Adoption of monetary targets and instruments over a one-year period for the 1986 - 2001 period;
 - * Nigerian treasury bills (NTBs) was the main instrument Open market operations during the period;
 - * Complementary instruments included the adoption liquidity ratio, cash reserve requirements, discount window operations, mandatory sales of NTBs, 200% cover of forex demand at the AFEM with NTBs etc.
 - * Proactive adjustment of MRR in trying to manage liquidity conditions helped in the deregulation of interest rate policy
3. Period of Indirect Monetary Framework - Medium-term (2002 - 2006) " Rather than one year, a two year period was now in place for monetary targets and instruments;
 - * The adoption of the time frame is predicated on some guess of a transmission time lag of about 24 months within which monetary policy is expected to affect its ultimate objective;
 - * Policy was subject to bi-annual reviews;
 - * The main instruments of monetary policy management include open market operations, reserve requirements, discount window operations, foreign exchange market intervention as well as the movement of public sector deposits in and out of commercial banks;
 - * Consolidation and recapitalization of banks was introduced to strengthen the financial sector and consolidate the gains of policy;
 - * In 2004/5 new measures were introduced. These include: tight exchange rate band of plus/minus 3 per cent, two week maintenance period of cash reserve in addition to movement of public sector funds
4. Post-Banking Consolidation (2006 – till date) " Following persistence of excess liquidity in spite of all the above a review became necessary and include: zero tolerance on ways and means advances, gradual run-down of CBN

holding of TBs, aggressive liquidity mop-up operations-frequent OMO sales supported by discount window operations, unremunerated reserve requirements, increased coordination between the Bank and the fiscal authorities, restructuring of debt instruments into longer tenor debts, increased deregulation of forex market etc.

From the explanations in the schedule above, the dissatisfaction with the ability of monetary policy strategy at each stage to achieve its target objectives of price stability and minimal inflation has led to the adoption of other tactics which eventually yielded equally futile outcomes. The reason for this is primarily ascribable to the fact that the root causes of instability in prices are not addressed by these policies but are rather aggravated by them. Based on historical experience the fiscal dominance that has resulted in excessive money creation is a consequence of the pervasive corruption in the system which unfortunately is exogenously determined and controlled. It is primarily the cause of excess liquidity in the system as illegally and corruptly leaked government funds are best laundered in cash. No doubt however that the poor banking habits is a factor yet in a highly inflationary environment it pays to some extent to hold money in very liquid forms preferably in cash. CBN's regular interventions on the other hand only create hiccups within the larger system which rather than orchestrate stability in prices only does the contrary. Perhaps it needs be explained again that the value of money is dependent on the demand and supply of money. There may be an expectation element which is a secondary factor that may affect the value of money but it is never a strong factor in the absence of the primary causative element: money. Resort to inflation targeting is equally a no solution. (see my essay titled 'Inflation targeting or mis-targeting in Nigeria') Let us look at the implications of these years of monetary management when output expansions are not appropriately taken into consideration.

Objectives of the Monetary Policy

The aims and objectives of monetary policy have not always been the same as they are today. The goal and policy have changed with our increasing knowledge of how the economic performs. While it is generally agreed that monetary policy may be designed to deal with four broad objectives, namely; price stability, a desirable rate of economic growth, high rate of employment and balance of payments equilibrium in practice one finds more often than not that these objectives conflict intractably. This, the aim of monetary management involve difficult tradeoffs among conflicting objectives in other to maximize the overall benefits to the society in the process of formulating monetary management policy. It is of paramount importance specify the focus of policy otherwise, it will be impossible to evaluate performance. However, it is possible to determine the main focus of policy at any given point in time depending upon the prevailing economic and financial conditions. The objectives may also not be mutually exclusive. For instance, stimulating economic growth with a view of increasing the level of employment may increase output of good and services and consequently lead to relative price stability in the longrun.

Monetary Policy Instruments

Monetary policy instruments in Nigeria consist of direct and indirect techniques. However, until September, 1992, Nigeria

applied only the direct techniques of monetary control which involved directly regulating interest rate. Fixing of credit ceilings and allocation of credit to sectors, administratively, managed interest rate and credit ceilings sought to influence the growth of domestic credit is made available to the real sector of the economy, agriculture and industry. However, main tools that CBN uses to implement policy include the following

Open Market Operations (OMO): This is by far the main active monetary instrument most frequently used by the CBN to manage liquidity. The Omos were conducted through sale and purchase of government securities using repurchase agreement with commercial banks.

Reserve Requirements: Commercial banks are required to maintain a daily proportion of their liabilities in cash. However, in Nigeria, this is not an active instrument.

Other instrument: These include, the discount rate, moral suasion, special deposit, selective credit control and stabilization securities.

Methodological Review

For several decades, the empirical investigation of the channels through which the effects of monetary policy are transmitted to the real sector was conducted based on the IS-LM model. However, the widespread dissatisfaction with the theoretical incompatibility of the IS-LM model with empirical results led to the search for a more appropriate theoretical framework and modeling technique. However, given the lack of consensus about the workings of the monetary policy transmission mechanism, several methodological techniques have been adopted in the literature to estimate the effect of monetary policy on domestic price, output, domestic credit, wages, money and exchange rate using different monetary policy instruments (Rasheed, 2002). Some of the modeling techniques adopted includes the Ordinary Least Square (OLS) in the evaluation and estimation of the transmission mechanism model. Despite the innumerable advantages associated with the OLS as regards the 'BLUE' property and the simplicity thereof, it has failed to capture the effect of monetary policy on the real sector in particular and the economy in general. Beyond that, Gujarati (2004) has criticized the sole application of the OLS to the estimation of econometric models as it can only establish a linear relationship.

The models in this category include Fanelli and Paruolo (1999), Garcia et al., (2003) and Allen and Robinson (2004). Other studies adopted the Vector Autoregressive (VAR) model and structural VAR model in their estimation. Sims (1992) estimated separate VARs for Germany, France, the United Kingdom and the United States using monthly data. The study included the following variables in the model: industrial production, consumer prices, and short term interest rate as measure of monetary policy, a measure of money supply, an exchange rate index and an index of commodity prices. According to Sims (1992), output has a hump shaped response to monetary policy shocks. He observed that the interest rates variables potentially affected other variables contemporaneously while the interest rate variable is not

affected by innovations in any of the other variables. The results were similar for all the countries studied. Bernarke and Blinder (1992) studied the credit channel of the U.S, using the federal funds rate, unemployment rate, logarithm of Consumer Price Index (CPI), deposits, loans and securities. The identifying assumption was similar to that of Sims (1992) – monetary policy is predetermined. They found that both the conventional money demand and the credit mechanisms operate; and after two years, the entire long run impact of the decline in deposits is reflected in loans. Therefore, they concluded that their finding support the operation of a credit channel. However, Rossiler (1995); Miron, Raner and Weil (1995) suggest that the interest rate spreads are alternative focuses on monetary aggregates under the credit channel because not all financial assets are perfect substitutes (Claassen, 1997) and not all economic agents are identical. Christiano et al (1994) adopted the United State quarterly data to test the effect of monetary policy shocks.

They adopted similar identifying assumptions as Sims (1992) and explicitly included commodity prices to avoid the price puzzle. The variables used include real GDP, the GDP deflator, commodity price, federal fund rate, non borrowed reserves, total reserves and net funds raised through financial markets, their results confirmed that the initial effects of a positive shock to the federal funds rate is to increase net funds raised by the business firms for almost a year and it declined thereafter. Dale and Halden (1995); and Carpenter (1996) extended Bernanke and Blinder (1992) study. But they used similar estimation methods; they examined a small sectoral (household and corporate) VAR model of the United Kingdom economy. Their results indicated that there is a significant sectoral difference among the channels of monetary transmission. Their results were consistent with Gartler and Gilchrist (1993). Another approach adopted for the study of the credit channel was provided by Kashap, Stein, and Wilcox (1993). They establish a simple model that explains that two necessary conditions must be satisfied if monetary policy is to impact on aggregate demand through a distinct lending channel. The condition include: First, loans and commercial papers must be imperfect substitutes to bank assets. Hence, banks cannot just reduce commercial papers in order to keep the supply of loans unchanged.

Second, loans and commercial paper must be imperfect substitutes to corporate liabilities. Their empirical evidence concludes that both conditions were satisfied. A corollary to the above conditions is that there must be imperfect price adjustments in order to allow the monetary policy to affect real activity. Anti-Ego (2006) studied alternative domestic monetary policy strategies in Uganda. The study used base money growth changes in the treasury bill rate, inflation, and output growth to estimate a VAR with two alternate orderings, one reflecting a reactive and another a proactive monetary policy stance. The study covered a period of 1982 to 1997. Using Granger Causality tests, the found that the Treasury bill rate has not been important for movement in prices. His results concluded that inflation mainly explained its own movements in the first five quarters after which base money becomes important explaining about 30% of the variations in the reactive ordering and about 40% of the variations using the proactive orderings.

Model Specification

In specifying the model for this study, we use six variables SVAR model. The VAR model assumes that the Nigerian Economy is indicted by a structural form equation as follows:

$$B(L)y_t = U_t \dots\dots\dots(1)$$

Where B(L) is a matrix polynomial in the lag operator L, such that $B(L) = B_0 - B_1L - B_2L^2$. B_0 is a non-singular matrix normalized to have ones on the diagonal and summarizes the contemporaneous relationship between the variables in the model contained in the vector y_t . y_t is $N \times X_1$ vector of endogenous variables which includes {RGDP, CPI, M_t , RR, EXR}, u_t is an $N \times X_1$ vector of structure disturbances with 0 mean and $var(u_t) = \theta$ (where θ denotes a diagonal matrix) we assume that the structural disturbances are mutually uncorrelated.

Associated with this structural model is the reduced form VAR which is estimated as $A(L)y_t = \varepsilon_t \dots\dots\dots(2)$

Where A(L) is a matrix polynomial is the lag operator L, ε_t is a vector of the VAR residuals with 0 mean and $Var(\varepsilon_t) = \Sigma$. The relationship between the components of equations (1) and (2) are stated as follows:

$$A(L) = B_0^{-1} - B(L) \dots\dots\dots (3)$$

and

$$\varepsilon_t = B_0^{-1} U_t \dots\dots\dots(4)$$

By normalizing $N \times X_1$ diagonal element of B_0 to ones (i.e. unity) we need at least

$n[(n-1)^{1/2}]$ restrictions on B_0 to achieve identification.

There are several ways of specifying the restrictions to achieve identification of the structural parameters. This paper uses a generalized method with non-recursive structures also defined as SVAR, which impose restrictions only on contemporaneous structural parameters (Kim and Roubini, 2000) as cited by Majeed, (2014). What really informed the choice of SVAR method as against the commonly used cholesky decomposition is that the identification approach of the latter assumed only recursive method. In SVAR, all variables respond instantaneously to shocks as provided by recursive VAR. Results from previous works showed that many variables exhibit delay in their response to shocks due to financial deepening. (Ebourne, 2008).

Variables Definition

- RGDP = Real Gross Domestic Product
- CPI = Composite Consumer Price Index
- M_t = Money Supply
- RR = Short term Interest Rate
- EXR_t = Exchange rate

Identification Scheme One: Recursive VAR

The first identification scheme is the standard approach that imposes a recursive structure of the VAR, with the ordering of

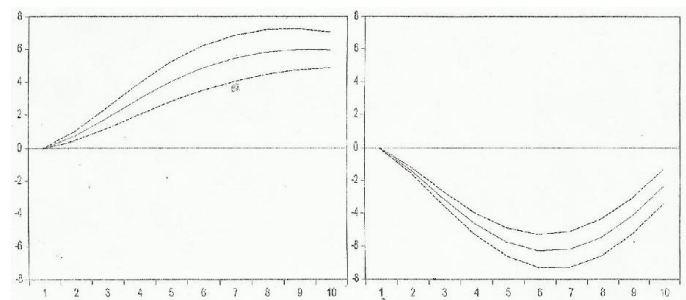
variables given by (5) intuitively, it assumes that prices (CPI) have no immediate effects on output (GDP), money stock (m) has no immediate effect on price, monetary policy shock has no immediate effect on the monetary policy. Technically, this amount to estimating the reduced form, then computing the cholesky factorization of the reduced-form errors and the structural disturbance is given by

GDP_{gt}	1	0	0	0	0	GDP_{gt}
CPI_{gt}	F_{21}	1	0	0	0	U_tCPI
M_{gt}	F_{31}	F_{32}	1	0	0	U_tM
RR	F_{41}	F_{42}	F_{43}	1	0	U_tS
EXR	F_{51}	F_{52}	F_{53}	F_{54}	1	U_tEXR

Where UGDP, UCPI, UM, RR and EXR are the structural disturbances on the endogenous variables respectively and EGDP, ECPI, EM, RR and EXR are the reduced form residuals that describe the unanticipated movements of each regress or respectively. The first two rows in the above equation relate to real gross domestic product and composite consumer price index represent the product market equilibrium of the domestic economy. It assumes that money stock, short term interest rate, and nominal exchange rate are not affected by production and composite consumer price index contemporaneously. The third equation can be interpreted as a short-run money demand equation, with money demand allowed to respond contemporaneously to shocks to output, prices and short term interest rates. The fourth equation can be interpreted as the monetary policy reaction function, which responds contemporaneous to money demand and the exchange rate, but does not respond immediately to contemporaneous output and price shocks because data on output and prices is usually only available with a lag. The last equation suggests that the nominal exchange rate responds immediately to all other variables.

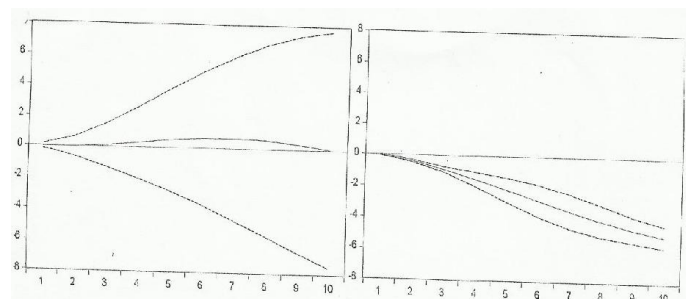
SECTION IV

RESULTS AND DISCUSSION



A: RGRGDP response to M2

B: RGRGDP -- CPI



C: RGRGDP response to RR

D: RGRGDP response to EXR

Impulse Response Functions

Impulse response function (IRF) represents the dynamic response of a variable overtime to a given shock. The below figure I reviews its responses of Real Gross Domestic Product, composite consumer price index, short run interest rate, money stock and nominal exchange rate to shock respectively. From the above figure I, it shows that the effect of a monetary policy shock on Gross Domestic Product appears to be insignificant. The impact is not statistically different from zero, given that the horizontal axis is broadly within the 95 percent confidence. However, a monetary shock has a significant and persistent impact on prices. Also, the nominal exchange rate response strongly to a monetary shock, an unexpected and temporary rise in the short-term interest rate tends to be accompanied by nominal appreciation.

Table 1. Variance Decomposition of GRGDP

Period	S.E	CPI	M	RR	EXR
3	1.923454	12.62456	30.45623	3.00146	3.00036
6	9.34624	14.44324	23.46245	7.00044	4.00046
9	13.21345	20.46724	15.44233	9.60464	6.00004
12	16.44332	26.44332	13.4223	8.000645	8.000645

Source: Author Composition

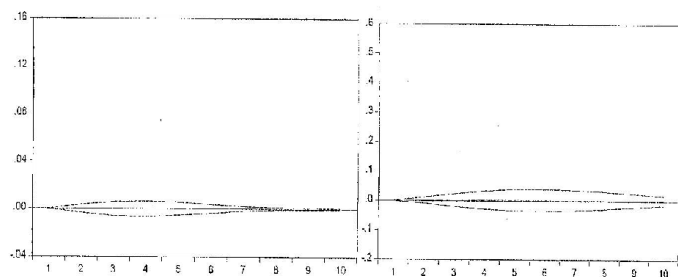
The variance decomposition in the above table

Clarifies the contribution of each of the explanatory variables shock to real growth rate of Gross Domestic Product. The table shows that the monetary shock accounts for one third of the fluctuations in prices and a half of the fluctuations in the nominal exchange rate, while around a tenth of the fluctuations in output can be attributed to the monetary shock. Hence, consistent with the impulse response analysis, a monetary shock has significant impact on prices and the nominal exchange rate, while output is relatively sluggish vis-à-vis the monetary policy shock.

Variance Composition of each Explanatory Variables and Contributions from Real Growth of Gross Domestic Product

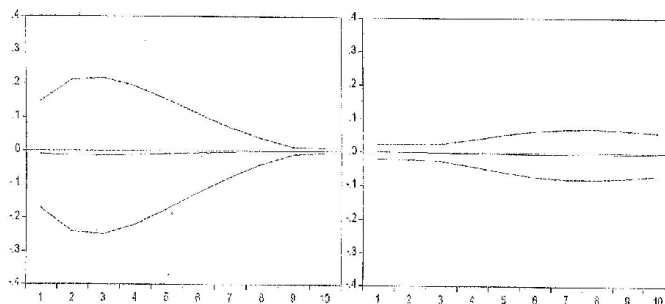
It is required to ascertain whether the growth rate of Gross Domestic Product affect the explanatory variables. From the above figure 2, the findings indicates that the variables only show very significant response to the real Gross Domestic Product.

Response of Monetary Policy transmission mechanism real growth rate of gross domestic product shocks.



A: M2y response to RGRGDP

B: C.P.I response to RGRGDP



C: RR response to RGRGDP

D: EXR response to RGRGDP

Concluding Remarks

This paper examines the transmission mechanism of monetary policy using structural vector auto regression framework. From empirical findings, an exogenous, unexpected and temporary rise in interest rate tends to be followed on output appreciation and fallings prices, with impact on output being insignificant. The slow response of output to a monetary policy shock is that Nigeria financial system is weak, thereby hampering the monetary transmission to the real sector. For the relative effectiveness of monetary policy in Nigeria, the variables that are implicitly or explicitly related to the interest rate and exchange rate channels should be targeted in order to stimulate sectoral structural economic growth.

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