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Monetary Policy Framework and Pass-Through in Nigeria: A Missing Ring

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Abstract

In this paper we focus on current developments in the credit view in order to assess the results of the past decade's research and its legacy for macroeconomics and monetary policy. This share the idea that a key ring that can also links monetary policy to economic activity is its power to induce changes in banks' assets (i.e. total credit to the economy), rather than in banks' liabilities (i.e. money balances in the economy) contrary to the traditional "money view" that has predominated in macroeconomics during the past half-century .We expound the main models of the "credit channels" of monetary transmission, using quarterly time series data from 1986:1 to 2010:4 within a Vector Autoregressive (VAR) model. Drawing from impulse and forecast error variance decomposition our results suggest a potential connection between credit conditions through investment to aggregate demand. The study indicates that there is a close relationship between the bank credit and the aggregate demand, which suggests a stronger monetary transmission system via credit channels and investment multiplier in Nigeria. Note that whether the credit transmission mechanism has stronger effects than the money transmission mechanism remains for further empirical matter in Nigeria.

Key Words: Monetary Policy, Credit Channel, VAR, Nigeria

1. Introduction

Monetary policy framework comprises the rule and action adopted by the central bank to achieve its full employment objective, domestic and financial stability, normal operation of foreign payments primarily and the price stability objective. Changes in monetary policy are triggered by domestic and external stocks that can imperil the attainment of policy objectives. Central banks implement policy changes by resetting their policy instrument, usually a short-term interest rate or a monetary or bank credit of aggregate. These instruments affect the aggregate demand through various pass-through effects and ultimately affect policy goals. Thus, a useful way to understand the workings of monetary policy is to focus on the pass-through affects which central bank actions impact on the rest of the economy.

The identified channels of monetary policy transmission mechanism in the literature include: interest rate; exchange rate; other asset prices including bonds, stock market and real estate prices; expectation and credit. Considerable research has examined interest and exchange rate channels in the transmission of monetary policy in developing countries without focusing on relative importance of the bank and credit channels despite the fact that financial markets in the vast majority of these economies is dominated by a single type of institution—the commercial bank (Argenor and Montiel, 2008. P. 18).

The credit channel, in fact, is a rather heterogenous collection of views on the monetary transmission mechanism, which date far back in history, but share the idea that the key ring that links monetary policy to economic activity is its power to induce changes in *banks' assets* (i.e. total credit to the economy), rather than in banks' liabilities (i.e. money balances in the economy) as assumed by the traditional "*money view"* that has predominated in macroeconomics during the past half-century (Fiorentini and Tamborini, n.d).

Investigating the relative importance of the credit channels is useful for various reasons. First, understanding which financial aggregates are impacted by monetary policy would improve our understanding of the link between the financial and the real sectors of the economy. More so, better understanding of the transmission mechanism of the credit channel would help monetary authorities and analysts interpret movements in financial aggregates. In this paper we focus on the theoretical and empirical developments in the credit view in order to assess the results of the last decade's research and its legacy for macroeconomics and monetary policy. Also, examine how monetary policy affect the role which bank credit plays in the transformation of monetary policy impulses to aggregate demand in Nigeria. Understanding the credit channels is thus critical and the outcome of this study is expected to guide policy choices for more effective monetary management framework in Nigeria.

The next section presents the monetary policy implementation framework in Nigeria. Literature review and theoretical framework are in section 3. Section 4 is the methodology and analysis, while the final section 5 presents some conclusions and possible extensions.

2.1 Evaluation of Monetary Policy in Nigeria Between 1986 and 2010.

The implementation of the structural adjustment programme (SAP) in 1986 and de-regulation of financial sector in Nigeria offered a lot of policy change in monetary policy development in Nigeria. The deregulation brought an establishment of exchange markets in 1986. In 1987, there was a removal of interest rate, unification of foreign exchange markets and liberalization of bank licensing. The third high inflation episode started in the last quarter of 1987 and accelerated through 1988 to 1989. This episode is related to the fiscal expansion that accompanied the 1988 budget. In 1989, banks were permitted to pay interest on demand deposits, ban on credit extension based on foreign exchange deposits. In 1990, a uniform accounting standards was introduced for banks while a stabilization security to mop up excess liquidity was also introduced. In 1991, inflation fell reaching one of its lowest points in 1991

i.e 13% (CBN, 2009). There was an embargo on bank licensing while the administration of interest rate was introduced.

Central Bank was also empowered to regulate and supervise all financial institutions in the economy. In 1992, privatization of government-owned banks commenced, credit control was removed in 1993, indirect monetary instrument were introduced while in 1994, re-imposition of interest and exchange rate controls were made. In 1997, the minimum paid up capital of merchant and commercial bank was further raised to a uniform level of N500million. In 2001, universal banking system was introduced. In 2005, CBN compelled all commercial banks to raise their capital base from N2billion toN25billion. In 2006, the CBN introduced a new monetary policy implementation framework (Monetary Policy Rate (MPR) to replace the minimum Re-discount Rate (MRR). The various policies initiated were to bring about stability in the macroeconomic variables. Overall, the CBN's amended Act granted the Bank more discretion and autonomy in the conduct of monetary policy. Consequently, the focus of monetary policy during this period shifted significantly from growth and developmental objectives to price stability. The operational framework for indirect monetary policy management involved the use of market (indirect) instruments to regulate the growth of major monetary aggregates. Under this framework, only the operating variables, the monetary base or its components are targeted, while the market is left to determine the interest rates and allocate credit. Essentially, the regime involves an econometric exercise, which estimates (ex ante) the optimal monetary stock, which is deemed consistent with the assumed targets for GDP growth, the inflation rate and external reserves. Thereafter, market instruments are used to limit banks' reserve balances as well as their credit creating capacity.

2.2. Instruments of Monetary Policy

The major instrument of indirect monetary control in Nigeria is the Open Market Operations (OMO). To date this instrument has been complemented by reserve requirements, CBN securities, as well as moral suasion.

2.2.1. Open Market Operations

The OMO was introduced at the end of June 1993 and is conducted wholly on Nigerian Treasury Bills (NTBs), including repurchase agreements (repos). The OMO entails the sale or purchase of eligible bills or securities in the open market by the CBN for the purpose of influencing deposit money, banks' reserve balances, the level of base money and consequently the overall level of monetary and financial conditions. In this transaction, banks subscribing to the offer, through the discount houses, draw on their reserve balances at the CBN thereby reducing the overall liquidity of the banking system and the banks' ability to create money via credit. In implementing the OMO, the Research Department of the CBN advises the trading desk at the Banking Operations Department, also of the CBN, on the level of excess or shortfall in bank reserves. Thereafter, the trading desk decides on the type, rate and tenor of the securities to be offered and notifies the discount houses 48 hours ahead of the bid date. The highest bid price (lowest discount rate quoted) for sales and the lowest price offered (highest discount offer) for purchases, with the desired size or volume, is then accepted by the CBN.

2.2.2. Reserve Requirement

The CBN complements the use of OMO with a reserve requirement. In this connection, the reserve requirement is an instrument for liquidity management and for prudential regulation. The reserve requirements are the Cash Reserve Ratio (CRR) and the Liquidity Ratio (LR). While the former is defined as a proportion of the total demand, savings and time deposits which banks are expected to keep as deposits with the CBN, the latter refers to the proportion of banks' liquid assets to their total deposit liabilities. The CRR and

liquidity ratio have been progressively increased or decreased depending on the complementary role the monetary authority tends to achieve.

2.2.3. Discount Window Operations

The CBN discount window facilities were established strictly in line with the "lender of last resort" role, that the Bank is expected to play. Accordingly, it has continued to provide loans of a short-term nature (overnight) to banks in need of liquidity. The facilities are collateralised by the borrowing institution's holding of government debt instruments and any other instrument approved by the CBN and subject to a maximum quota. The Minimum Rediscount Rate (MRR) is the nominal anchor, which influences the level and direction of other interest rates in the domestic money market. Its movements are generally intended to signal to market operators the monetary policy stance of the CBN.

2.2.4. Moral Suasion

The CBN adopts this approach as a means of establishing two-way communication with the banks, thereby creating a better environment for the effectiveness of monetary policy. The main avenue of contact is the Bankers' Committee, which meets two-monthly. This dialogue with banks was further expanded in November 2000 to include other stakeholders comprising key government officials, financial market operators, academics, etc, under the umbrella of the Monetary Policy Forum. The objective of the Forum is to enhance the transparency of the Bank's monetary policy-making process.

3. Theoretical Framework and Literature Review

Monetary policy is rooted in the works of Irving fisher (see Diamond, 2003. P. 49) within the quantity theory of money and equation of exchange. Accordingly money has no effect on economic aggregates but price. The role of money however got further role from (Keynes,1930 P. 90) and other Cambridge economists who proposed that money has indirect effect on other economic variables by influencing the interest rate which affects investment and cash holding of economic agents (Onyeiwu, 2012). Friedman, (1968. P. 1-17) posits that inflation is always and everywhere a monetary phenomenon. This implies that increase in money supply can reduce unemployment but can also create inflation so the monetary authorities should increase money supply with caution.

The above view places emphasis on the changes in the monetary aggregate affecting the output via interest rate; exchange rate and other asset prices including bonds, stock market and real estate prices without explicit reference to credit channel despite the role of deposit money bank in credit creation. Specifically there are two implicit assumptions in the above model: The first is the adoption of IS-LM model which lumped all non-money assets into bonds. Using Walrasian Law therefore, the bond market is in equilibrium, implying that the credit market is largely ignored in the standard IS-LM model and is restricted to a single portfolio equation (Brunner and Meltzer, 1988). The second assumption of the money view is that all markets are perfect. All of the borrowers are homogenous from the view point of the lenders. Thus, the banks cannot discriminate between the characteristics of different borrowers. Hence, price is the only factor to clear the markets or to equilibrate the markets. Consequently, the presence of endogenous credit rationing is also ruled out by the second assumption (Bernanke and Blinder, 1988).

Bernanke and Gertler (1995) describe two possible linkages of the credit channel theory. The first one is the balance-sheet channel which places emphasis on the impact of changes in monetary policy on the borrower's balance-sheet. The second linkage is the bank lending channel which focuses on the possible effect of monetary policy actions on the supply of loans by the banking system (Walsh and Wilcox, 1995; Bernanke, 1993a and 1993b).

Schematically, the monetary policy effects can be summarised as follows:

$M \downarrow \Rightarrow$ Bank deposit $\downarrow \Rightarrow$ Bank loan $\downarrow \Rightarrow I \downarrow \Rightarrow Y \downarrow$

Thus, contractionary monetary policy leads to a fall in bank reserves and bank deposits, subsequently these results in a decline in bank loans, in turn leading to a decline in investment spending and a fall in output.

By setting up this particular assumption therefore, the LM curve can be then derived from a set of portfolio-balance conditions on the two-asset world: money and credit ("bonds"). To derive the credit curve or "commodities and credit" (CC) curve, the demand for loans can be given in equation (1):

$$L^d = L(\underset{-}{\sigma}, \underset{+}{i}, \underset{+}{y}) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 1$$

where σ is the interest rate on loans, i is the interest rate on bonds, y is the income to capture the transactional demand for credit, and the signs indicate the relationship of each variable with respect to the loans demand.

To understand the genesis of loan supply, consider a simplified bank balance sheet (whch ignores net worth) with assets: reserves, R; bonds, B^b; loans, L^S and liabilities: deposits, D. Since reserves consist of required reserves, τD , plus excess reserves, E, the banks' adding-up constraint is:

$$B^b + L^s + E = D(1-\tau) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 2$$

Assuming that desired portfolio proportions depend on rates of return on the available assets (zero for excess reserves), we have $L^s = \lambda(\underset{-}{\sigma}, \underset{+}{i})D(1-\tau)$, with similar equations for the shares of B^b and E. Thus the condition for clearing the loan market is

$$L^d = L^s = L(\sigma, i, y) = \lambda(\sigma, i)D(1-\tau) \ldots\ldots\ldots\ldots\ldots\ldots 3$$

The money market is described by a conventional LM curve. Suppose banks hold excess reserves equal to $\varepsilon(i)D(1-\tau)$. Then the supply of deposits is equal to bank reserves, R, times the money multiplier,

$$m(i) = \left[\varepsilon(i)(1-\tau) + \tau\right]^{-1} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 4$$

The demand for deposits arises from the transactions motive and depends on the interest rate, income, and total wealth, which is constant and therefore suppressed: $D(i, y)$.

Equating the two gives

$$D(\underset{-}{i}, \underset{+}{y}) = m\left(\underset{+}{i}\right)R \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 6$$

Implicitly, $D(i, y)$ and $L(\sigma, i, y)$ define the nonbank public's demand function for bonds since money demand plus bond demand minus loan demand must equal total financial wealth. To solve for the aggregate demand curve, Bernanke and Blinder (1988) use the following generic IS curve, written generically as

$$y = Y(\underset{-}{i}, \underset{-}{\sigma}) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 7$$

Using equations (6) to replace $D(1-\tau)$ on the right hand side of (1) by $(1-\tau)m(i)R$. Then (1) can be solved for p as a function of i, y, and R:

$$\sigma = \phi\left(\underset{+}{i}, \underset{+}{y}, R\right) \text{ .....8}$$

Finally, substitute (4) into (3) to get

$$y = Y\left(i, \phi\left(i, y, R\right)\right), \text{.....9}$$

the so-called "commodities and credit" (CC) curve in deference to Patinkin(1956) as in Bernanke and Blinder's term.

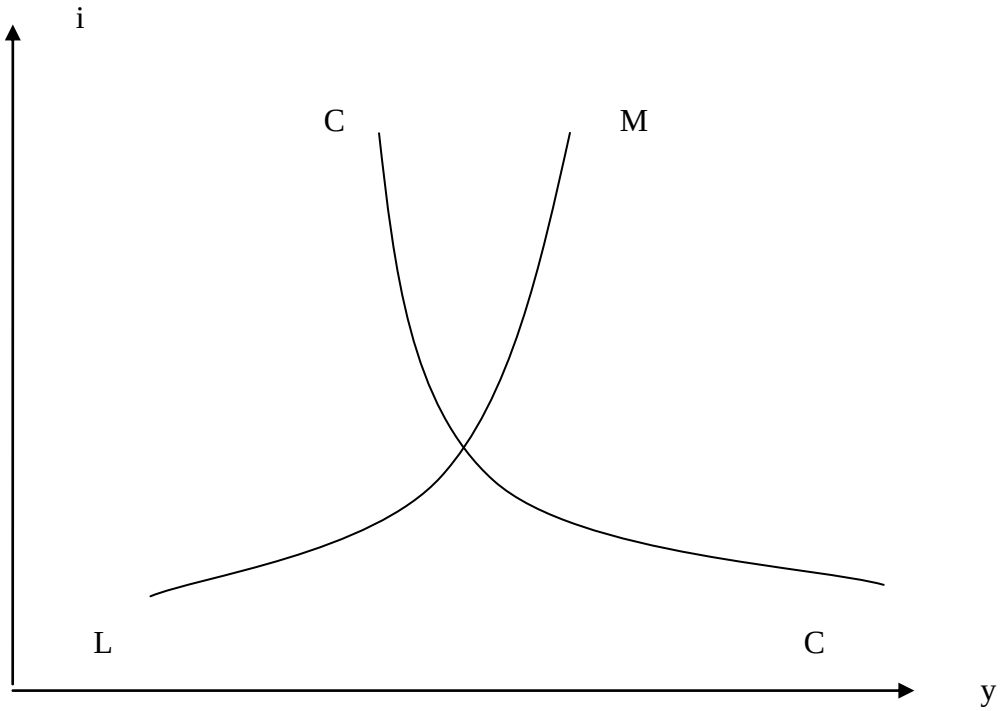


Fig 3.1 Show the relationship between LM curve and credit curve

Figure 3.1 shows both the CC and LM curves in a (*i*, *y*) space. It is easy to see that the CC curve is negatively sloped like an IS curve, and for much the same reasons. However, it is shifted by monetary policy (R) and by credit-market shocks that affect either the L (.) or A (.) functions, while the IS curve is not. The CC and LM curves are shown together in Figure 3.1.

Thus, it could be possible for the transmission mechanism process to exist through the credit rationing channel. The empirical work of Bernanke (1986) used the contemporaneous structural vector autoregression approach (SVAR) for the USA; quarterly data 1953:I - 1984:IV seasonally adjusted, using real GNP, the GNP price deflator, real defence spending, the M1 money stock, the monetary base, B; the credit variables, C, is the sum of commercial bank loans, mortgages held by S&L, and mortgages plus 'other loans' held by mutual savings banks; the nominal interest rate, R is the 3-month treasury bill rate. Two conclusions were highlighted; First, it appears that credit shocks are important for output; and second, however money and credit are approximately equal important forces in the monetary transmission mechanism. With the same USA, quarterly data but from 1974:I - 1985:IV Bernanke and Blinder (1988) employed Instrumental Variables (IV); of logarithmic partial adjustment model. The results of estimation show that the money demand shocks became much more important relative to credit-demand shocks in the 1980's. However their result shows no strong evidence to reject the role of credit-demand. This is in contrary to the study of Bernanke & Gertler (1995) who found supports to the existence of the credit channel using the same US data and methodology.

The empirical work of Romer and Romer (1990) with the same USA monthly data 1941-1984 adopting St. Louis Equation OLS 2SLS IV reports that by using six 'periods' of

restrictive monetary policy, they found that the forecast errors of credit supply is smaller than the forecast errors of money supply. This implies that the money channel transmits more information than the credit channel.

Matthews and Ioannidis (1992) on the other hand uses the UK quarterly data 1970:I - 1990:I and adopted structural VAR model unadjusted data. Using the annual growth rates of credit; inflation; real income; M4 and M0 their results show that [1] there exist a long-run relationship between narrow money and inflation rate, [2] both credit growth and M0 growth plays an important role in the determination of inflation and output, [3] credit shock affects the variance of inflation but not its mean,; the mean rate of inflation is dominated by the rate of growth of M0, [4] M0 is a useful "advance indicator". Focusing on Canada quarterly data 1970:I - 1990:IV and adopting a single reduced-form equation Duguay (1994) emphasizes the transmission mechanism through interest rates and exchange rate rather than through changes in monetary aggregates. Other studies (Taylor, 1995; Oliner & Rudebusch, 1996) found similar evidences which is consistent with a broad view of the credit channel existence and importance.

The study of Uchendu, (1996), Nnanna (2001, P. 11) and Adebiyi and Lawanson (2006) identified that monetary policy work through liquidity, credit, and exchange rate channels in Nigeria. Examining the evolution of monetary policy in Nigeria in the past four decades, (Nnanna, 2001, P. 11) observe that though, the Monetary management in Nigeria has been relatively more successful during the period of financial sector reform which is characterized by the use of indirect rather than direct monetary policy tools yet, the effectiveness of monetary policy has been undermined by the effects of fiscal dominance, political interference and the legal environment in which the Central Bank operates. This paper reveals that inflation affects volatility of its own rate as well as the rate of real exchange. Adebiyi and Lawanson (2006) for instance investigation the relationship between financial sector reforms and commercial banks adopting VAR model, using quarterly time series data from 1986:1 to 2002:4. They found from their impulse response function that interest rate spread, exchange rate and real lending rate have no significant effect on commercial bank credits in the short run. Their forecast error variance decomposition shows that the prominent source of commercial banks' credit to private sector fluctuations is due largely to own shocks and that the predominant source of real lending fluctuations is due largely on inflation.

By and large, the above studies indicate that not only does money does matter to the monetary policy transmission mechanism, but both the narrow and the broad credit channels play a similar role. Furthermore, the survey also showed that it is very hard to find any empirical evidence in the context of developing countries implying that the bulk of the literature focus on the developed countries and majorly US leaving the developing countries like Nigeria where issues of credit could be more important. This is not a surprise, in fact it is

to be expected, because of the basic question as to whether there exists a clear monetary policy pass-through from credit channel - interest rate – prices - to domestic investment and aggregate demand in Nigeria.

4.1 Methodology: Data and Choice of Variables

The Nigerian financial system has undergone several policy regimes, particularly, between 1986 till date. Any meaningful empirical investigations would have to capture these structural shifts, which include: the change in the monetary policy implementation framework from an implicit controlled regime to a regime that relied on market forces for resource allocation. These changes are expected to impact on the effective transmission of monetary policy to the real economy. Consequently, two periods are suggested for empirical investigation: the first period covers 1985:q1 to 1998:q4 and the second period stretched

from 1999:q1 to 2010:q4, otherwise analysis based on the whole data sample under different policy regimes would be exposed to the Lucas critique. The study uses quarterly data to ensure enough data points for estimation and account for loss of degree of freedom. The variables used in the model include: Measures of economic activities (RGDP), the consumer Price index (CPI), Money supply (M2), credit to core private (CCPS). Data are obtained from the official reports and publications of CBN and the National Bureau of statistics (NBS).

In characterizing relationships between output, prices, and policy-related variables, stationarity properties of the data are important. The Augmented Dickey-Fuller (ADF) test suggests that the null hypothesis that the variables are I(1) cannot be rejected. As in most VAR models of the monetary transmission mechanism, we do not perform an explicit analysis of the economy's long-run behaviour. By conducting the analysis in levels, we allow

for implicit co integrating relationships in the data. Imposing co integrating restrictions on a VAR in levels could increase efficiency in the estimation, but given the short data series, may result in inconsistencies. Since the monetary transmission mechanism is a short-run phenomenon, most comparable studies employ unrestricted VARs in levels to evaluate impulse responses over the short to medium term (Favero, 2001).

The lag length of the VAR estimation was selected using the Akaike (AIC) and Schwartzn (SC) Information Criteria, and the residuals were tested for autocorrelation. Both tests suggest a lag of the first order, and the Lagrange Multiplier Test suggests that the residuals are not serially correlated.

4.2 Model Specification

Following the theoretical background of this study, and using the autoregressive framework developed by Sims (1980) we specify a VAR model of the 2nd order. The general form of a VAR model is given by the following unrestricted (reduced form) system.

$$Z_t = \alpha + \psi(L)Z_t + ut$$

Where Z_t is a vector of the η (stationary endogenous)

Variable, α is an $n \times 1$ vector of constants,

$\psi(L)$ is an $n \times n$ matrix of (lagged) polynomial

Coefficients, and ut is an $n \times 1$ vector of white noise innovation terms with $E(u_{tk}) = 0$ and $E(u_{tk}, u_{sk}) = 0 \ \ for\ t \neq s)$. The disturbance term, ut, also has a covariance matrix, $E(u_t u_{t'}) = \Sigma$. Finally, the lag operator is defined as $\psi(L) = \psi_1 + \psi_2 L + ...+ \psi_k L^{k-1}$ of degree $K-1$ and $\psi_j \ \ for\ j = 1,.....,K.$

More specifically, our model which also incorporates the above direct and indirect linkages is presented as follows:

$$RGDP = f(CPS, INTR, INFL, INV)$$

$$RGDP_t = \beta_{0it} + \sum_{j=1}^{n-i}\beta_{1ij}RGDP_{t-j} + \sum_{j=1}^{n-i}\beta_{2ij}CPC_{t-j} + \sum_{j=1}^{n-i}\beta_{3ij}INTR_{t-j} + \sum_{j=1}^{n-i}\beta_{4ij}INV_{t-j} + \sum_{j=1}^{n-i}\beta_{5ij}INFL_{t-j} + U$$

$$CPS_t = \beta_{0it} + \sum_{j=1}^{n-i}\beta_{1ij}CPS_{t-j} + \sum_{j=1}^{n-i}\beta_{2ij}RGDP_{t-j} + \sum_{j=1}^{n-i}\beta_{3ij}INTR_{t-j} + \sum_{j=1}^{n-i}\beta_{4ij}INV_{t-j} + \sum_{j=1}^{n-i}\beta_{5ij}INFL_{t-j} + U_{2t}$$

$$INV_t = \beta_{0it} + \sum_{j=1}^{n-i}\beta_{1ij}INV_{t-j} + \sum_{j=1}^{n-i}\beta_{2ij}GDPPC_{t-j} + \sum_{j=1}^{n-i}\beta_{3ij}CPS_{t-j} + \sum_{j=1}^{n-i}\beta_{4ij}INTR_{t-j} + \sum_{j=1}^{n-i}\beta_{5ij}INFL_{t-j} + U_{3t}$$

$$INTR_t = \beta_{0it} + \sum_{j=1}^{n-i}\beta_{1ij}INTR_{t-j} + \sum_{j=1}^{n-i}\beta_{2ij}GDPPC_{t-j} + \sum_{j=1}^{n-i}\beta_{3ij}CPS_{t-j} + \sum_{j=1}^{n-i}\beta_{4ij}INV_{t-j} + \sum_{j=1}^{n-i}\beta_{5ij}INFL_{t-j} + U_{4t}$$

$$INFL_t = \beta_{0it} + \sum_{j=1}^{n-i}\beta_{1ij}INF_{t-j} + \sum_{j=1}^{n-i}\beta_{2ij}GDPPC_{t-j} + \sum_{j=1}^{n-i}\beta_{3ij}CPS_{t-j} + \sum_{j=1}^{n-i}\beta_{4ij}INTR_{t-j} + \sum_{j=1}^{n-i}\beta_{5ij}INV_{t-j} + U_{5t}$$

$\beta_0, \beta_1, \beta_2, \beta_3, \beta_4$ *and* β_5 are the unknown parameters where β_0 is the constant or intercept and

GDPPC= gross domestic product per capita

CPS = credit to core private sector

INTR = interest rate

INV = investment

INFL = inflation

$\sum \beta_{ij} RGDP_{t-j}$ = sum of the lags of real gross domestic product from period t to j

$\sum \beta_{ij} CPS_{t-j}$ = sum of the lags of credit to core private sector from period t to j

$\sum \beta_{ij} INTR_{t-j}$ = sum of the lags of interest rate from period t to j

$\sum \beta_{ij} INV_{t-j}$ = sum of the lags of investment from period t to j.

$\sum \beta_{ij} INFL_{t-j}$ = sum of the lags of inflation from period t to j

The method used in this study being the Vector Auto Regression (VAR) model, is better explains a revolving door model. This choice of the estimation technique is as a result of the fact that Vector Auto Regression model best captures the two-way relationship between shocks, and other variables used and their related lags. A unique feature of the VAR model is that an endogenous variable in one equation of the system appears in another equation as an explanatory variable thereby becoming stochastic and correlated with the disturbance term (Shock or impulse term) of the equation. Also, in a VAR model, variables are treated equally and no distinctions are made between endogenous and exogenous variables. Hence, the Ordinary Least Square (OLS) technique will appear to produce results that are inconsistent.

4.3 Empirical Analysis: Unit Root Test

Standard inference procedures do not apply to regressions which contain an integrated dependent variable or integrated regressors. Therefore, it is important to check whether a series is stationary or not before using it in a regression. The formal method to test the stationarity of a series is the unit root test. An important assumption of a unit root test - the Dickey-Fuller Test is that the error terms are independently and identically distributed. The ADF test adjusts the DF test to take care of possible serial correlation in the error terms by adding the lagged difference terms of the reggressand. Philips and Perron use nonparametric statistical methods to take care of the serial correlation in the error term without adding the lagged deference terms. Perron (1989) argue that the standard tests of the unit root hypothesis may not be reliable in the presence of structural changes. Because of this, Maddala and Kim advocate that the traditional DF, ADF and PP tests should be jettisoned (Gujarati and Porter, 2009, p.760). Our study therefore keeps in mind this limitation of the commonly used unit root test and having found out that there is structural changes problem(see table 4.1 and figure 4.2 below), this study therefore adopt Perron and Ng, Elliot.

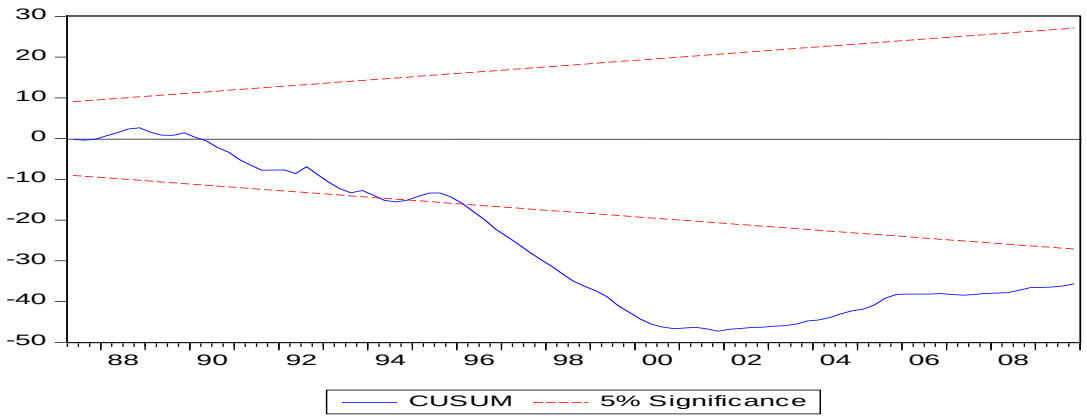
Table 4.1 Structural Break Test

Chow Breakpoint Test: 1999:1

Null Hypothesis: No breaks at specified breakpoints
Varying regressors: All equation variables
Equation Sample: 1986:1 2009:4

F-statistic	4.397834	Prob. F(5,86)	0.0013
Log likelihood ratio	21.85763	Prob. Chi-Square(5)	0.0006
Wald Statistic	21.98917	Prob. Chi-Square(5)	0.0005

Fig 5: CUSUM STRUCTURAL BREAK POINT TEST: 1986:Q1 - 1998:Q4 TO 1999:Q1-2010:Q4



This implies an upward trend, suggesting that the mean of the series has been changing. Figure 4.2 perhaps indicates that the series are individually not stationary. In figure 4.3 however, only credit to private individual show unit root problems other time series data may be stationary.

Fig 1: General Trend of Nigeria's Quaterly log of Investment and real GDP : 1986:1 to 2010:4

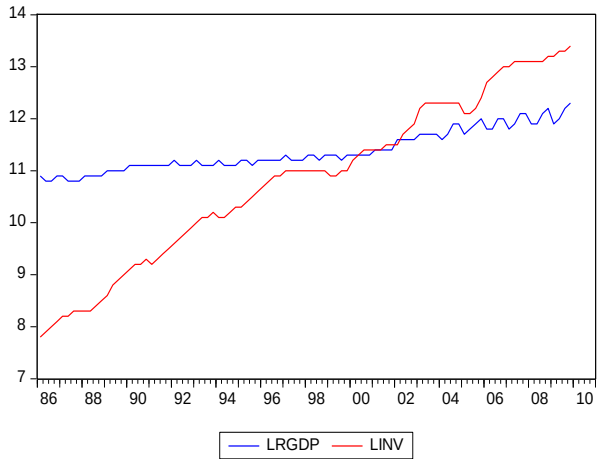
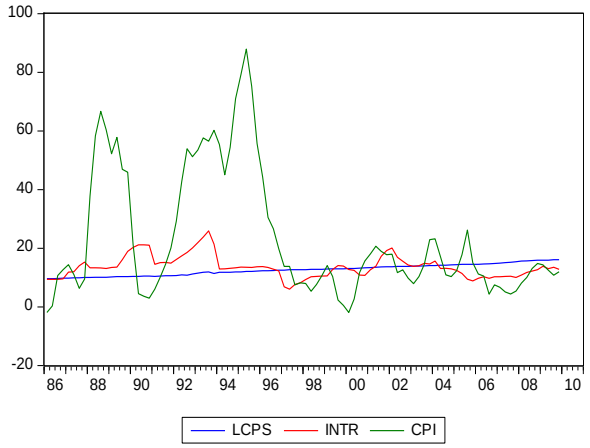
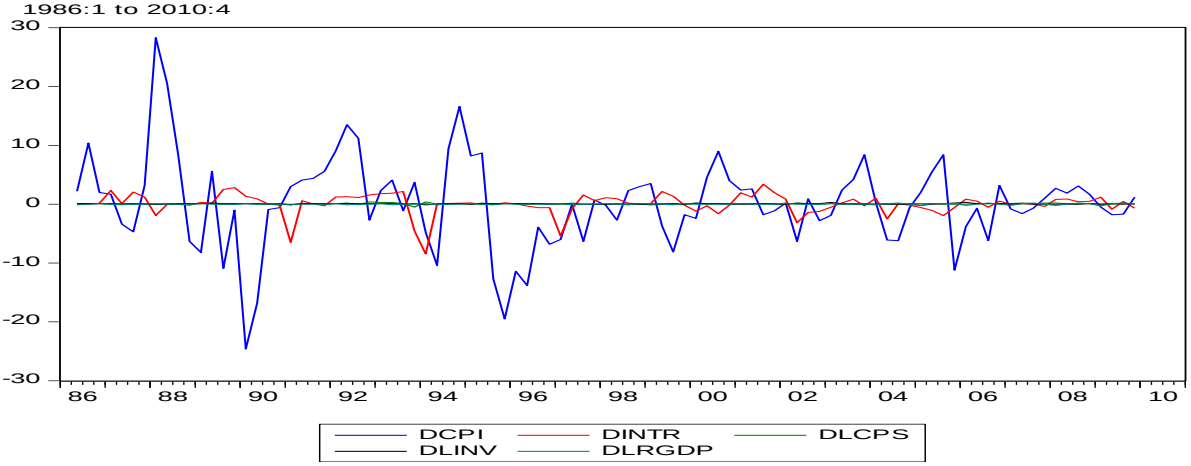


Fig 2: General Trend of Nigeria's Quaterly Data of CPI, Credit to Private Sector and Interest Rate: 1986:1 to 2010:4



A closer look at figure 4.2 and 4.3 give such an intuitive feeling that all the series except credit to private sector might be stationary after first differencing.

Fig 2: Nigeria quaterly difference of lrgdp, cpi, interest rate, crediдt to private and log of investment: 1986:1 to 2010:4



Ng Elliot Unit Root Test

Table 6 below reveals that at levels that none of the variables was stationary at level but after taking the fisrt difference, they all became stationary. This implies that CPI, RGDP, INTR, CPS and INV are stationary and integrated of order one i.e I(1). This result therefore certifies the conduct of further test.

Table 4.2 Ng Elliot Unit Root Test

Variables		NG Perron Statistics		5 % Critical Values			Order of Intergration
		MZa	MZt	MZa	MZt	HAC	
CPI	Level	-16.1991	-2.8410	-17.3000	-2.9100	187.63377	I(1)
	Ist dif	-35.7690	-4.2270	-17.3000	-2.9100	44.7565	
LRGDP	Level	-1.2544	-0.4658	-17.3000	-2.9100	0.0013	I(1)
	Ist diff	-0.6206	0.5352	-17.3000	-2.9100	0.0001	
INV	Level	-10.4865	-2.2521	-17.3000	-2.9100	0.0113	I(1)
	Ist diff	-42.9804	-4.6233	-17.3000	-2.9100	0.0054	
CPS	Level	-11.8921	-2.3406	-17.3000	-2.9100	0.0103	I(1)
	Ist diff	-45.6976	-4.7647	-17.3000	-2.9100	0.0111	
INTR	Level	-17.6628	-2.9703	-17.3000	-2.9100	0.1752	I(1)
	Ist diff	-42.7887	-4.6231	-17.3000	-2.9100	2.7672	

Source: Arthur's Estimate. Our result is based on 5% critical values

Table 4.3: VAR Granger Causality/Block Exogeneity Wald Tests

VAR Granger Causality/Block Exogeneity Wald Tests

Date: 02/24/08 Time: 01:13

Sample: 1986:1 2010:4

Included observations: 94

Dependent variable: CPI

Excluded	Chi-sq	df	Prob.
INTR	0.721252	2	0.6972
LCPS	0.381886	2	0.8262
LINV	0.102458	2	0.9501
LRGDP	0.234381	2	0.8894
All	4.702843	8	0.7888

Dependent variable: INTR

Excluded	Chi-sq	df	Prob.
CPI	0.598242	2	0.7415
LCPS	19.85415	2	0.0000
LINV	0.178351	2	0.9147
LRGDP	1.217516	2	0.5440
All	26.08653	8	0.0010

Dependent variable: LCPS

Excluded	Chi-sq	df	Prob.
CPI	2.364214	2	0.3066
INTR	1.271221	2	0.5296
LINV	6.820668	2	0.0330
LRGDP	2.050339	2	0.3587
All	11.59626	8	0.1701

Dependent variable: LINV

Excluded	Chi-sq	df	Prob.
CPI	3.895802	2	0.1426
INTR	0.231668	2	0.8906
LCPS	1.834056	2	0.3997
LRGDP	2.306673	2	0.3156
All	8.825741	8	0.3572

Dependent variable: LRGDP

Excluded	Chi-sq	df	Prob.
CPI	0.165054	2	0.9208
INTR	1.558474	2	0.4588
LCPS	4.387271	2	0.1115
LINV	0.264980	2	0.8759
All	12.45740	8	0.1319

Generally, the results from table 7 of CPI and real GDP equations (VAR Granger Causality/Block Exogeneity Wald Tests) show that individually and collectively there is no

granger causality between their dependent variables in the model. The same holds for other other equations except where credit to private sector granger causes investment individually at 6.82 Chi-sq with 0.033 probabilities but not collectively at 11.60 Chi-sq with 0.17 probabilities and interest rate cause credit to private both individually and collectively.

4.3.3 The Lag Structure Test: *AR Roots Table/Graph*

AR Roots Table/Graph investigates the lag structure of our equation and reports the *inverse* roots of the characteristic AR polynomial; Lütkepohl (1991). The estimated inverse root indicate that the (VAR) equation is stable (stationary) since all roots have modulus less than one in table 5 and lie inside the unit circle in table 5. Assuming the VAR equation is not stable, the impulse response standard errors result would be invalid and the variance decomposition is inefficient.

Table 4.4 The Lag Structure Test: *AR Roots Table/Graph*

Roots of Characteristic Polynomial

Endogenous variables: DCPI DINTR DLCPS DLINV DLRGDP

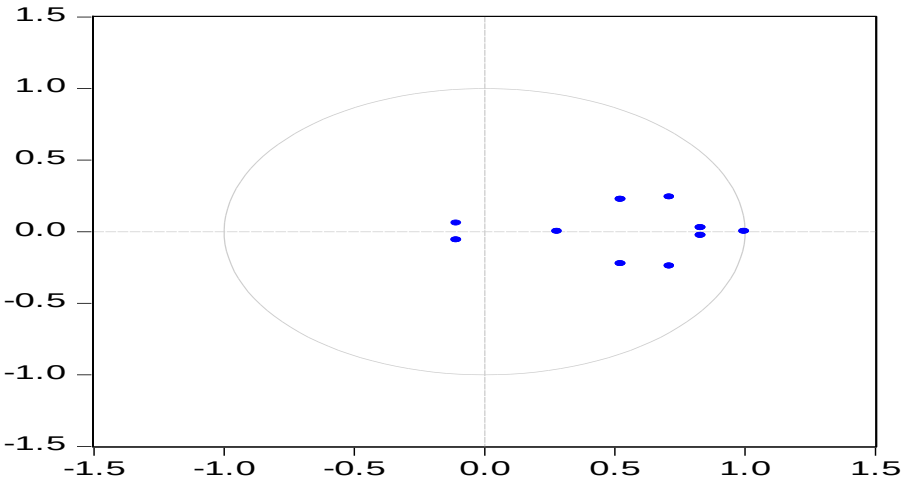
Exogenous variables: C

Lag specification: 1 2

Date: 02/25/08 Time: 02:01

Root	Modulus
-0.114485 - 0.782298i	0.790631
-0.114485 + 0.782298i	0.790631
0.436996 - 0.232059i	0.494789
0.436996 + 0.232059i	0.494789
-0.221238 - 0.347614i	0.412046
-0.221238 + 0.347614i	0.412046
0.345927 - 0.137132i	0.372116
0.345927 + 0.137132i	0.372116
-0.367666	0.367666
0.189789	0.189789

Fig 5: Inverse Roots of AR Characteristic Polynomial of lrgdp, cpi, intr, linv and cps

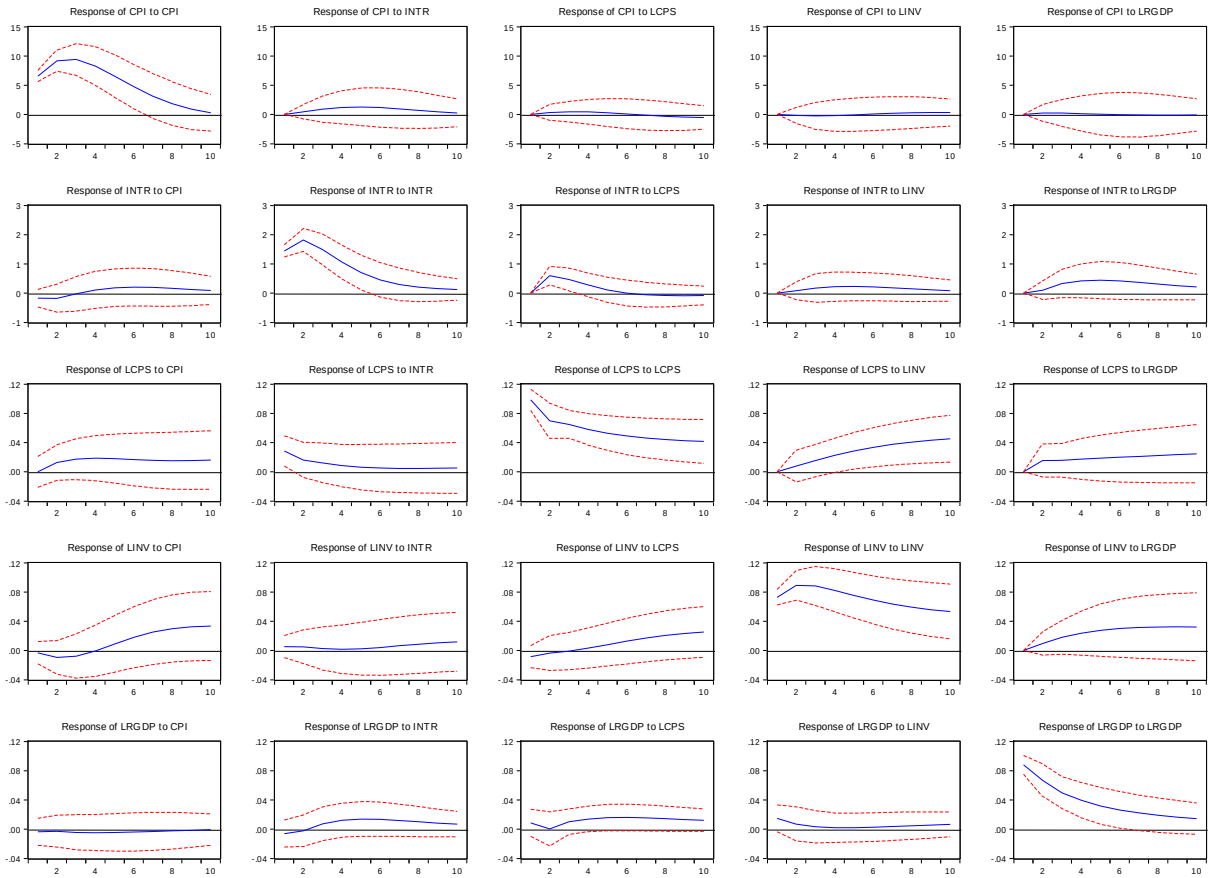


4.3.4 Impulse Response Functions and Variance Decomposition

This section analyses the dynamic property of the model using impulse response functions and variance decomposition. Figure 2:3 being the basic equation of the credit sector channel traces out the behaviour of the credit to private sector in the VAR system to a one unit shock to the other variables- CPI, INTR, LCPS, INV and LRGDP. The x-axis gives the time horizon or the duration of the impact of the shocks while the y-axis gives the direction and intensity of the impulse or the percentage variation in the dependent variable.

The figure show that a positive shock to the general price level increased credit to private sector after some 6 periods abet gradually. Similar trends are observed for investment and real GDP but the trend are not gradual. However, positive shock to interest rate initially leads to a decline in credit to private sector but die out after about the 12 periods. The salient feature of these results is that business confidence still grows as a result of investment increase but not leading to a full multiplier effects on national income (Real GDP accounting for just 6.98 percent). This might be because of the monetary policy high interest rate leading to the crowding out effects in Nigeria.

Fig 3: Steps Ahead forecast of Response to Cholesky One S.D. Innovations ± 2 S.E.



Having shown the dynamic effects of each disturbance, however, the next step is to assess their relative contribution to the fluctuations in prices. This is done by decomposing the forecast variance of the inflation rate over different horizons. The statistics in table of the credit to private sector indicate the percentage contribution of innovations in each of the variables in the system to the variance of decomposition of the credit to private sector.

Table 4.5 Variance Decomposition

Variance Decomposition of CPI: 4.5a	

Period	S.E.	CPI	INTR	LCPS	LINV	LRGDP
1	6.568275	100.0000	0.000000	0.000000	0.000000	0.000000
2	11.30865	99.66278	0.166366	0.099101	0.021013	0.050741
3	14.74430	99.26273	0.483705	0.153499	0.040825	0.059246
4	16.95585	98.83877	0.879410	0.185420	0.044624	0.051780
5	18.22757	98.46161	1.263448	0.189967	0.039817	0.045159
6	18.87437	98.16425	1.572921	0.180616	0.039601	0.042611
7	19.15981	97.94414	1.781886	0.178390	0.052349	0.043232
8	19.26693	97.77796	1.898555	0.200513	0.077678	0.045295
9	19.30229	97.64123	1.950299	0.252432	0.108519	0.047524
10	19.31646	97.51990	1.966452	0.327852	0.136445	0.049347

Variance Decomposition of INTR:table 4.5b

Period	S.E.	CPI	INTR	LCPS	LINV	LRGDP
1	1.454087	1.384044	98.61596	0.000000	0.000000	0.000000
2	2.413451	1.033488	92.53440	6.134765	0.115765	0.181578
3	2.899256	0.722548	90.62079	6.822518	0.434047	1.400100
4	3.138859	0.737807	88.80523	6.606554	0.857214	2.993196
5	3.262067	1.008254	86.85685	6.233062	1.287980	4.613854
6	3.332787	1.358632	85.04723	5.971368	1.643931	5.978835
7	3.377167	1.658119	83.60023	5.843352	1.896963	7.001331
8	3.405962	1.861173	82.56405	5.800002	2.057901	7.716877
9	3.424663	1.977508	81.87406	5.797139	2.151244	8.200045
10	3.436740	2.034869	81.43413	5.810041	2.200376	8.520579

Variance Decomposition of LCPS:table 4.5c

Period	**S.E.**	**CPI**	**INTR**	**LCPS**	**LINV**	**LRGDP**
1	**0.102683**	**4.17E-05**	**7.730814**	**92.26914**	**0.000000**	**0.000000**
2	**0.126987**	**0.998177**	**6.674512**	**90.45283**	**0.382037**	**1.492443**
3	**0.145740**	**2.170786**	**5.760662**	**88.39338**	**1.391824**	**2.283346**
4	**0.160716**	**3.125074**	**5.015931**	**85.66950**	**3.115210**	**3.074289**
5	**0.173671**	**3.741578**	**4.429588**	**82.64182**	**5.384398**	**3.802619**
6	**0.185482**	**4.088290**	**3.963247**	**79.46148**	**7.999142**	**4.487845**
7	**0.196650**	**4.269854**	**3.585186**	**76.23493**	**10.76789**	**5.142137**
8	**0.207457**	**4.372196**	**3.273935**	**73.04429**	**13.53574**	**5.773837**
9	**0.218057**	**4.452914**	**3.015627**	**69.95290**	**16.19208**	**6.386484**
10	**0.228530**	**4.546304**	**2.801016**	**67.00517**	**18.66775**	**6.979761**

Variance Decomposition of LINV:table4.5d

Period	S.E.	CPI	INTR	LCPS	LINV	LRGDP
1	0.073572	0.181582	0.526393	1.319147	97.97288	0.000000
2	0.116595	0.732071	0.403744	0.617237	97.57719	0.669762
3	0.147564	0.729498	0.283902	0.389025	96.70078	1.896798
4	0.170673	0.545943	0.221653	0.329254	95.55214	3.351013
5	0.189052	0.671197	0.195836	0.449061	93.80702	4.876885
6	0.204750	1.343449	0.208460	0.769658	91.34933	6.329108
7	0.218931	2.494314	0.270169	1.275817	88.34366	7.616042
8	0.232118	3.888706	0.381551	1.919306	85.10576	8.704673
9	0.244479	5.284962	0.529660	2.640770	81.93903	9.605575
10	0.256034	6.520606	0.695144	3.388496	79.04576	10.34999

Variance Decomposition of LRGDP:table 4.5e

Period	S.E.	CPI	INTR	LCPS	LINV	LRGDP
1	0.089992	0.159427	0.453471	0.936835	2.744160	95.70611
2	0.112461	0.161515	0.325408	0.600522	2.150444	96.76211
3	0.123805	0.256087	0.614357	1.174795	1.842884	96.11188
4	0.131383	0.357533	1.395649	2.165083	1.659575	94.42216
5	0.136924	0.438488	2.315985	3.323249	1.549746	92.37253
6	0.141090	0.489394	3.098368	4.416659	1.497162	90.49842
7	0.144233	0.514367	3.659063	5.358305	1.498939	88.96933
8	0.146626	0.521342	4.021636	6.140685	1.554364	87.76197
9	0.148490	0.517737	4.240905	6.787650	1.661105	86.79260
10	0.149990	0.509447	4.366950	7.328860	1.814971	85.97977

Cholesky Ordering: CPI INTR LCPS LINV LRGDP

Note: Cholesky Ordering: CPI, INTR, CPS, INV and LRGDP

While impulse response functions trace the effects of a shock to one endogenous variable on the other variables in the VAR, variance decomposition separates the variation in an endogenous variable into the component shocks to the VAR. Thus it provides information about the relative importance of each random innovation in affection the variables in the VAR. From table 4.5c, own shocks constitute a significant source of variation in commercial banks credit to private sector, forecast errors in the short run, ranging from 67.00 percent to 100 per cent over the 10 quarter of the horizon. Variance decomposition of the credit to private sector shows that shocks to investment are important source of fluctuations accounting for 18.67 percent while INTR account for just 2.80 percent. These results are strengthened by the impulse response analysis above. Although the response of inflation to credit to private sector innovations was steady throughout at around 4 percent except the decline in period 2. Inflation responds quickly to innovation in bank credit. This shows that response of inflation to credit is more significant than that of interest rate variable.

5. Conclusion

In this paper we focus on the theoretical and empirical developments in the credit view in order to assess and bring home the results of the past decade's research and its legacy for macroeconomics and monetary policy. This is to examine how monetary policies affect the role which bank credit plays in the transformation of monetary policy impulses to aggregate demand in Nigeria. This study expound the main models of the "credit channels" of monetary transmission, using quarterly time series data from 1986:1 to 2010:4 the study investigate empirically the time series properties of the data and other stability issues within a Vector Autoregressive (VAR) model. What sets this study apart from other studies done in Nigeria is that, in addition to the commonly researched interest, exchange rate channel this study researched on credit channel usually ignored in the literature. Specifically the lumping of all non-money assets into bonds in the earlier studies implying that the credit market is largely ignored in the standard IS-LM model and is restricted to a single portfolio equation (Brunner and Meltzer, 1988) is an aberrant. Consequently, the presence of endogenous credit rationing is also ruled out by the earlier authors' assumption (Bernanke and Blinder, 1988).

Bernanke and Gertler (1995) credit extension to the private sector was used as an explanatory variable for analysing pass through. Our model for estimating credit pass-through includes five variables: inflation, bank credit to the private sector, interest rate, the real GDP

and domestic investment. Unit root tests indicated that all variables were integrated to the order *I* (1), for all the techniques used and that stability tests are significant. Drawing from impulse responses and forecast error variance decompositions and whether output responds differently to credit our results suggest a potential connection between credit conditions and firms' production activity.

By implication monetary policy might have a greater effect on the expenditures on firms that are dependent on bank loans. This study also indicates that business confidence still grows as a result of investment increase but not leading to a full multiplier effects on national income.

In Nigeria there is a close relationship between the bank credit and the aggregate demand, which suggests a stronger monetary transmission system via credit channels and investment multiplier. Further considerations to be drawn from our analysis can be summarized as follows. Firstly, the shift in theoretical focus implied by the credit view is important, yet whether the credit transmission mechanism has stronger effects than the money transmission mechanism remains largely an empirical matter.

Reference

Adebiyi, M. A. and Lawanson, O.I (2006), 'Financial sector Reforms, Monetary Policy Transmission Mechanism and Commercial Bank Credit,' the National Economic Empowerment and Development Strategy: Philisophy, opportunities and challenges.

Argenor, P.R. and Montiel, P.J. (2008), 'Development Macroeconomics 3rd Edition Prince ton University Press Princeton and Oxford.

Bernanke B., (1993), 'Credit in the Macroeconomy', Federal Reserve Bank of New York Quarterly Review, 18, pp. 50-70.

Bernanke B., Blinder, A. (1988), 'Credit, Money, and Aggregate Demand', Papers and Proceedings of the American Economic Association, American Economic Review, 78, 435-439.

Bernanke B., Blinder A. (1992), 'The Federal Funds Rate and the Channels of Monetary Transmission', American Economic Review, 82, 901-21.

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

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

Duguay, P. (1996), 'Empirical Evidence on the Strength of the Monetary Transmission Mechanism in Canada: An Aggregate Approach The Transmission of Monetary Policy in Canada Bank of Canada.

Favero, C. A. (2001), 'Applied Macroeconometrics,' (Oxford: University Press).

Fiorentini, R. and Tamborini, R. (n.d), 'The Monetary Transmission Mechanism in Italy: The Credit Channel and a Missing Ring. '

Friedman, M and Schwartz, A. (1963), 'Money and business cycles' Review of Economics and Statistics, February, pp. 32-64.

Friedman, Milton. (1968), 'The role of monetary policy, American Economic Review, Vol. 58, No 1.Pp 1-17.

Gertler, M and Gilchrist, S. (1991), 'Monetary policy, business cycles and the behaviour of small manufacturing firms' WP 3892, National Bureau of Economic Research, Cambridge, November.

Gujarati, D.N. and Porter, D.C. (2009). Basic Econometrics 5th International Edition. The Macgraw-Hill Companies.

Lutkepohl, H. (1991), Introduction to Multiple Time Series Analysis, 2nd edition Springer Berlin.

Keynes, J. (1930), 'Treatise on money' London, Macmillian. P. 90.

Mishkin, S. F. (1996), "The Channels of Monetary Transmission: Lessons for Monetary Policy," NBER Working Paper, No. 5464 (Cambridge, Massachusetts: National Bureau of Economic Research).

Nnanna, O. (2001), 'The monetary policy framework in Africa: The Nigerian experience. Extracted from www2.resbank.co.za/internet/publication..../Nigeria.pdf. Pp 11.

Oliner, S.D and Rudebusch, G.D. (1996), 'Is There a Broad Credit Channel for Monetary Policy? FRBSF Economic Review 1996, Number 1.

Onyeiwu, C. (2012), 'Monetary Policy and Economic Growth of Nigeria Journal of Economics and Sustainable Development,' Vol.3, No.7, 2012 www.iiste.org ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online).

Patinkin, D. (1956), 'Money, Interest, and Prices,' New York: Harper and Row, 1956.

Perron, P. (1989), 'The Great Crash, the Oil Price Shock and the Unit Root Hypothesis,' Econometrica, vol.57, 1989, pp. 1361-1401.

Romer, C.D., Romer, D. (1990), 'New Evidence on the Monetary Transmission Mechanism', Brookings Papers on Economic Activity, n.1, pp. 149-213.

Taylor, J.B. (1995), 'The Monetary Transmission Mechanism: An Empirical Framework', Journal of Economic Perspectives — Volume 9, Number 4 — Fall 1995 — Pages 11–26.

Walsh, C., and Wilos, F. (1991), 'Monetary Theory and Policy', Second Edition, The MIT Press.

Walsh, Carl (2003b), "Speed Limit Policies: The Output Gap and Optimal Monetary Policy", American Economic Review 93(1), March, pp. 265 – 278.

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