

Fiscal Policy and Macroeconomic Shocks in Nigeria: A Structural Vector Auto-Regression SVAR Approach

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Abstract: The paper investigates fiscal policy and macroeconomic shocks in Nigeria. It was motivated by the non-existence of consensus on the nature and levels of interactions between fiscal policy variables and macroeconomic variables. The study utilizes quarterly data from 1980 Q1 to 2015 Q4 which are analyzed using Structural Vector Auto-Regression (SVAR) to examine the responses of fiscal policy to some macroeconomic shocks and vice versa. The results indicate that exchange rate is the major macroeconomic medium through which external shocks influence fiscal policy variables in Nigeria. The level of interaction between fiscal policy variables and exchange rate, among other macroeconomic variables in the model, appears to be the most significant. Also, among all other macroeconomic variables the contributions of the exchange rate to the behavior of Nigeria's economic growth is the highest. All these are pointers to the significant role played by exchange rate in transmission of macroeconomic and external shocks to fiscal policy behavior with the resultant effect on the domestic economy.

Keywords: *Fiscal Policy, Macroeconomic shocks, Nigerian economic growth*

1. Introduction

Fiscal policy in Nigeria has been largely determined by oil revenue and oil windfalls. Nigeria is an oil-rich country and her fiscal revenues largely coincide with oil revenue. Oil revenue accounts for nearly 80 % of government revenue, which implies that the economy is highly exposed to price fluctuations in the world oil markets (CBN, 2016). Naturally, oil revenue is very volatile due to oscillation in world oil prices and to unpredictable changes in OPEC assigned oil quota of which Nigeria has been a member since 1958 (Obinyelauku, 2009). It has been observed that despite the huge fiscal deficit that characterizes fiscal behavior in Nigeria, the overall economy appears not to have performed well during these periods and this has constituted a major concern to the policy makers (Olasunkanmi, and Babatunde, 2013). For instance, domestic fiscal deficit worsened from an average of 2.6 % of the GDP in 1980s to 6.2 % in the 1990s. In 2010 alone, domestic deficit increased to 5 % of the GDP from 2 % in 2009. This increase in deficits results in a mounting stock of debt, ranging from 88 % of GDP in 1980s to 96 % in 2009. Around the same periods precisely in 2007 the real GDP growth rate fell from -3.1% to -7.6% in 2009 (World Bank 2010). The implication of this is that the accumulated fiscal deficit has not reflected in the growth of the Nigerian economy during these periods. Despite the Nigerian's government efforts to instil discipline on the fiscal behaviors by way of economic diversification policies and implementation of other fiscal variables like taxation, the economy still remains in comatose due to the consequences of fiscal irresponsibility.

However, the effectiveness of fiscal policy in a naturally endowed country like Nigeria has been strongly linked with influences of some external and internal factors which constitute shocks to macroeconomic policies (Obinyelauku, 2009). The severity of the influence is largely dependent on the level of diversification of the revenue base of the government. Nigeria is widely known to be practicing mono-economy, that is, oil remains the major driver of the economy contributing more than 80% to the foreign exchange earnings of the country. This, on its own exposes macroeconomic policy like fiscal policy to external shocks. The effectiveness of fiscal policy in achieving the set macroeconomic objectives in Nigeria has been largely dependent on the revenue from oil. However, oil being an international commodity, is highly susceptible to both external and cyclical changes in the world oil market. This, among others has caused unprecedented instability in the recent times in the oil revenue accruing to Nigeria as an oil-dependent country. Administration of fiscal policy in Nigeria is largely anchored by government revenue which is seriously affected by the fluctuations in the oil revenue. The government has attempted over the years to shift her revenue base from oil so as to reduce the vulnerability of government revenue to oil price fluctuations. All these efforts appear not to have yielded any positive results. However, apart from oil-related variables, some other factors which are mostly

macroeconomic variables have been identified by researchers as shocks that might cause perturbation of the fiscal policy variables and which can affect fiscal policy effectiveness in a particular country (Muneer et al., 2011; Kinnunen, Sulla, & Merotto, 2013; Gosse Guillamin, 2012).

They observe that some of these variables such as exchange rate, interest rate, public debt, among others, can be termed internal that is controllable by the Nigerian government while some variables such as oil price volatility, commodity price volatility, exchange rate volatility, among others, are purely external, that is outside the control of the Nigerian government. Moreover, the medium and the mode through which these macroeconomic shocks and external shocks affect the effectiveness of fiscal policy remains a subject of debate in Nigeria (See, Olasunkanmi, & Babatunde, (2013); Obinyeluaku, 2009). This study hopes to contribute to knowledge by identifying these shocks and examining the relationship between them and fiscal policy with a view to ascertaining the medium through which these shocks influence fiscal policy and eventually transferred to the domestic economy. Consequently, the major objective of this study is to investigate the interactions between macroeconomic shocks and fiscal policy behavior in Nigeria.

2. Literature Review

Over the years some researchers have been conducted around the effectiveness of fiscal policy and the influence of some macroeconomic variables in Nigeria. Some of these past studies are reviewed in chronological order as follows: Obinyeluaku and Viegi (2009) focused on oil revenue shocks and fiscal policy in Nigeria. They examined fiscal policy rule as a tool for managing oil revenue in Nigeria and observed that Nigeria is heavily dependent on oil revenue to finance over 80 % of its total expenditure, making its budget vulnerable to fiscal shocks. This poses a serious threat both to the sustainability of the country's budget and to its macroeconomic stability. Oil windfall induces government spending that is difficult to retrench when the oil revenue falls. This distorts government budget allocation pattern, cohesion and stability and increases deficits and debt stock that has often created an unfavorable environment for monetary policy. The question then is: what form of fiscal policy rules will perform better in reducing debt accumulation and promote the necessary medium-term budget deficit stability? The results show that the fixed surplus rule performs better than the simple variable surplus rule when real interest rate is relatively high and the ability to adjust government expenditure is limited.

Aremo, Orisadare and Ekperiware (2012) investigated oil price shock and fiscal policy management in Nigeria. They observed that high oil price fluctuations have been a common feature in Nigeria and these have considerably constituted a major source of fiscal policy disturbance to the Nigerian economy as well as the economies of other oil producing countries of the world. The over-reliance on oil production for income generation combined with local undiversified revenue and export bases is an issue for concern. This has policy implications for economic policy and in particular fiscal policy management. Their motivation for the study was to examine the effect of oil price shock on fiscal policy in the country. Using structural vector auto regression (SVAR) methodology, the effects of crude oil price fluctuations on two major key fiscal policy variables (government expenditure (GEXP) and government revenue (GREV)), money supply (MS2) and GDP were examined. The results showed that oil prices have a significant effect on fiscal policy in Nigeria within the study period of 1980 to 2009. The study also revealed that oil price shock affects GREV and GDP first before reflecting on fiscal expenditure. The study suggested strongly that diversification of the economy is necessary in order to minimize the consequences of oil price fluctuations on government revenue, by implication government expenditure planning in the country.

Olasunkanmi and Babatunde (2013) examined the effects of fiscal policy shocks on the current account as well as the dynamic interactions among fiscal policy shocks and current account with the other macroeconomic variables: real output, real interest rate and exchange rate for Nigeria over the periods 1980:1-2010:4. The identification of fiscal policy shocks is achieved via structural VAR approach proposed by Blanchard-Perotti (2002). The results of this study indicated that the expansionary fiscal policy shock has a positive effect on output, exchange rate and a negative impact on current account balance and interest rate. This study implied that fiscal policy can stimulate economic activity through expenditure expansions at a cost of lower interest rate and exchange rate appreciation in the medium term and a sustained current account balance will enhance output via fiscal consolidation.

3. Methodology

The structure of the SVAR is premised basically on the major sub divisions according to the variables in the model. The first variables are oil price volatility and commodity price volatility. This is a clear departure from what is common in the past empirical studies where prices are used instead of their behaviors (fluctuations) which has been identified as very germane to fiscal policy dynamics relationship with growth (Ojo, and Alege, 2014). The next sets of variables are the fiscal policy variables and other policy variables such as exchange rate, interest rate and inflation rate. The output variable is the last set of variables in the SVAR and it comprises GDP growth rate. Construction of our VAR model follows the conventional method where the primitive/structural model is specified thus:

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \dots + A_p y_{t-p} + \mu_t \quad \dots\dots\dots(1)$$

Where:

y_t represent an $(n \times 1)$ vector containing n endogenous variables,

$A_i \forall (i=1, 2, \dots, p)$ are $(n \times n)$ matrices coefficients,

And μ_t is an $(n \times 1)$ vector containing error terms. Though the error is $\mu_t \sim iidN(0, \Omega)$ but errors possess a tendency of correlating contemporaneously in all the equations. There are pn^2 parameters in the A matrices. Equation 1 can be rewritten using the lag operator L which is selected through $L^k x_t = x_{t-k}$. where x is a group of exogenous variable and k is the lag length. The equation becomes:

$$A(L)y_t = \mu_t. \quad \dots\dots\dots(2)$$

Where:

$$A(L) = A_0 L^0 - A_1 L^1 - A_2 L^2 - \dots - A_p L^p \quad \dots\dots\dots(3)$$

$A_0 = I$ (identity matrix). It is required that $A(L)$ lies outside the unit circle for stationary to be ensured.

Variance Decomposition and Impulse Response Functions: Analysis of the SVAR is carried out using variance decomposition and impulse response functions. Both variance decomposition and impulse response functions are computed by re-specifying our autoregressive (AR) function. The two of them evolve through the process described as follows:

$$A(L)\mu_t = y_t \quad \dots\dots\dots(4)$$

y_t represent a stationary stochastic process in the system and the lag operator is L, μ_t is a white noise error term. The theory also requires that $\text{root dot } (1-A(z))=0$ should have a modular greater than 1. In this case, $\text{dot } (1-A(z))$ is invertible. The interpretation of our VAR is based on the vector moving average (MA) presented in the following form:

$$y_t = \phi_t + \sigma(L)\mu_t \quad E(\mu_t) = 0 \quad \dots\dots\dots(5)$$

$$E(\mu_t \mu_{t-k}) = Q, |k| = 0 \quad \dots\dots\dots(6)$$

$$E(\mu_t \mu_{t-k}) = Q, |k| \neq 0 \quad \dots\dots\dots(7)$$

Where Q represents the covariance matrix sample, ϕ_t is predictable perfectly while the matrix of coefficients $\sigma(L)$ using lag 0 is the identity matrix. Equation 7 can be normalized to generate the impulse response functions and at the same time forecast the error decomposition. Nonetheless the variance decomposition adopted is equal to the MA.

Model Identification: The nature of SVAR requires imposition of enough restrictions so as to identify the orthogonal structural components of the error terms that are present in the shocks. Note that this is at variance to the standard recursive Cheeky orthogonalisation. The non-recursive orthogonalisation of the error terms produced through this process is used for the impulse response functions and variance decomposition. For clarity, assume that y_t comprised vector of endogenous variables. For example, say kith element of endogenous variables in our model where $\sum E[v_t \hat{v}_t]$ is the residual of the covariance matrix. Therefore, our identification procedure follows:

$$A v_t = B \mu_t \quad \dots\dots\dots(8)$$

Where v_t and μ_t are vectors with lag length k, v_t is the observed residual and μ_t represents the unobservable structural innovations. A & B are $k \times k$ matrices which are to be estimated. However, innovation μ_t is assumed to be orthogonal in nature. Hence the covariance is an identity matrix $E[\mu_t \mu_t'] = I$. Imposition of restrictions on A and B is made possible due to the orthogonal assumption of μ_t . hence we have:

$$A \sum \hat{A} = B \hat{B} \quad \dots\dots\dots(9)$$

The link between the reduced form and the structural form of the VAR model is presented as follows:

$$B(L) = B_0 + B^+(L) \quad \dots\dots\dots(10)$$

$$A(L) = -B_0^{-1}B^+(L) \quad \dots\dots\dots(11)$$

$$\Sigma \doteq B_0^{-1}AB_0^{-1} \quad \dots\dots\dots(12)$$

Equation 9 is the structural form divided into contemporaneous correlations i.e. B_0 and $B^+(L)$. The former represents correlations at lag zero while the later represents correlations at all strictly positive lags. Equation 12 separates each reduced form coefficient into its structural counterpart B_0 , identified through the reduced form, $\Sigma \doteq E[\mu_t \mu_t']$, and the diagonal covariance matrix of the structural form, $A = E[v_t v_t']$ as shown in 13. Furthermore, due to the vulnerability of long run restrictions to serious misspecification problems, we use a contemporaneous restriction on the B_0 matrix to identify the shocks as shown in Equation 12 since this study is interested in short-run and medium term responses (see Leeper, Sims and Zha, 1996; Elbourne, 2007).

$$\begin{bmatrix} v_t^{oilpv} \\ v_t^{compv} \\ v_t^{ge} \\ v_t^{gr} \\ v_t^{infr} \\ v_t^{intr} \\ v_t^{exr} \\ v_t^{gdpgr} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ B_{21}^0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ B_{31}^0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ B_{41}^0 & 0 & B_{43}^0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & B_{53}^0 & B_{54}^0 & 1 & B_{56}^0 & 0 & 0 \\ B_{61}^0 & B_{62}^0 & 0 & 0 & B_{65}^0 & 1 & B_{67}^0 & 0 \\ B_{71}^0 & B_{72}^0 & B_{73}^0 & B_{74}^0 & B_{75}^0 & B_{76}^0 & 1 & 0 \\ 0 & 0 & 0 & 0 & B_{85}^0 & B_{86}^0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \mu_t^{oilpv} \\ \mu_t^{compv} \\ \mu_t^{ge} \\ \mu_t^{gr} \\ \mu_t^{infr} \\ \mu_t^{intr} \\ \mu_t^{exr} \\ \mu_t^{gdpgr} \end{bmatrix} \quad \dots\dots\dots(13)$$

There are eight variables in the SVAR model namely oil price volatility (OILPV), commodity price volatility (COMPV), government expenditure, government revenue, inflation, interest rate, exchange rate and GDP growth rate which are the exogenous variable. The oil price volatility and commodity price volatility both put external pressure on the economy which is predominantly dominated by import dependent and primary goods production countries (Demachi, 2012). In the matrix described in Equation 13, they both occupied rows 1 and 2 respectively. According to Becklemans (2005), the transmission of the international shock to the domestic economy can be very rapid. Consequently, oil price volatility shock is the one driving itself while commodity price depends on oil price volatility and its fluctuations are captured by commodity price volatility. The position of the variables in the model describes the way they influence themselves in the identification scheme. For instance, the non-zero element B_{ji}^0 in the matrices shows that variable influences variable contemporaneously. The zero elements show that variables exercise some restrictions before responding. The remaining restrictions in the SVAR model are carried out following Ravnik and Zilic (2010) & Unai (2011). However, it should be noted that the volatilities of oil price and commodity price is used and they are developed through an Exponential Generalized Autoregressive Conditional Heteroskedaticity Eparch. The process is discussed as follows.

Derivation of Oil Price and Commodity Price Volatilities: Literature has confirmed both oil price fluctuations and commodity price movement as important factors affecting fiscal policy framework in the many of the resource endowed countries which are producers of primary products. In addition, Demachi (2012), Wagithunu, Muthee & Thinguri (2014) & Ayodeji (2015), among others, argued that the nature of the volatility of these two commodities has important implications for fiscal policy dynamics in developing economies due to their reliance majorly on primary commodity export and being largely import dependent. The nature of the volatility can either be symmetric or asymmetric. Either of the two cases has its own implication on fiscal policy framework of Nigeria. Consequently, Exponential Generalized Autoregressive Conditional Heteroskedaticity EGARCH was adopted. Firstly, volatilities for the commodity and oil prices used in the study are developed via the exponential generalize autoregressive conditional Heteroskedaticity EGARCH [1, 1]. The EGARCH process described as follows:

$$comp_t = \varphi + comp_{t-1} + \mu_t \quad \dots\dots\dots(14)$$

$$oilp_t = \varphi + oilp_{t-1} + \mu_t \quad \dots\dots\dots(15)$$

The AR [1] approach is followed. The following EGARCH model is estimated for each of the commodities prices used.

$$\ln \sigma^2 = \omega + \ln \sigma_{t-1}^2 + \alpha \left| \frac{\mu_{t-1}}{\sigma_{t-1}} \right| + \gamma \left| \frac{\mu_{t-1}}{\sigma_{t-1}} \right| \quad \dots\dots(16)$$

In Equation 16 above, γ is residual, and σ denotes the conditional variance obtained from the EGARCH equations. Here, if $\gamma < 0$, it indicates the asymmetric character of commodity price and oil price movements on volatility. This means that a negative price shock has a larger influence on volatility than a positive price shock. The estimates of the conditional variance for each of the commodity prices are used as their volatility components and are used as in Demachi (2012). This is capable of allowing us to know which of the prices has asymmetric effects. The a priori expectation is that the commodity and oil price volatility will impact negatively on Growth due to the fact that both are direct consequence of macroeconomic mismanagement which will likely have negative feedback effect on the economy. However, from Table 1 variables like oil price volatility, commodity price volatility, External Debt and government expenditure are all stationary at levels hence we can apply SVAR.

Data Source: Data used for this study were collected from both the World Bank Tables 2016 edition and the IFS (international Financial Statistics). Quarterly data for the period 1980Q1 to 2015Q4 were chosen because they coincided with the periods when many macroeconomic variables in Nigeria witnessed many reforms.

4. Results and Discussion

Unit Root Test: In this study, two types of unit root test were implemented, that is, the Augmented Dickey test (Dickey and Fuller, 1979) (ADF) and Philip-Perron (PP) test. The two tests assume unit root in their null hypothesis. Table 1 reports the result of the unit tests. The results of the unit root test indicate that the variables are either stationary at levels or at the first difference. The implication is that Johansen type of co integration techniques cannot be applied since it emphasizes the need for all the variables in the model to be stationary at first difference.

Table 1: Unit Root Test

Variable	ADF Statistic	Alpha Level	Decision	PP-Statistics	Alpha Level	Decision
FB	-3.937	0.01	I(1)	-3.937	0.01	I(1)
GR	-8.707	0.01	I(1)	-8.707	0.01	I(1)
GE	-3.096	0.01	I(0)	-3.096	0.01	I(0)
ER	-3.568	0.01	I(1)	-3.568	0.01	I(1)
ED	-5.244	0.01	I(1)	-5.244	0.05	I(0)
EXR	-5.516	0.01	I(1)	-5.516	0.01	I(1)
DUMR	-5.831	0.01	I(1)	-5.831	0.01	I(1)
OILPVOL	-3.988	0.01	I(0)	-3.988	0.01	I(0)
COMPVOL	-3.600	0.01	I(0)	-3.600	0.01	I(0)
INF	-5.515	0.01	I(1)	-5.515	0.01	I(1)
K	-5.500	0.01	I(1)	-5.500	0.01	I(1)
GDPGR	-4.514	0.05	I(1)	-4.514	0.05	I(1)

Source: Author's Computation

EGARCH Process for Both Commodity and Oil Prices: The process begins with verification of ARCH effect. The two series are tested for ARCH affects both the residual plot and ARCH tests are used. The result is presented as follows:

Figure 1: Residual Plot for Both Commodity and Oil Prices

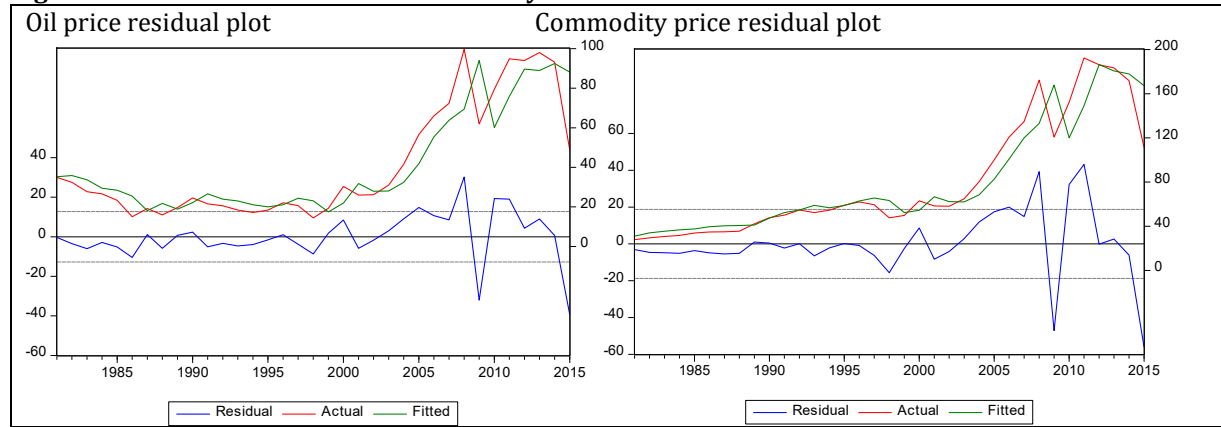


Table 2: Arch Tests for Oil and Commodity Prices

Oil prices			
F-statistic	5.192702	Prob. F(1,32)	0.0295
Obs*R-squared	4.746949	Prob. Chi-Square(1)	0.0294
Commodity Prices			
F-statistic	6.315168	Prob. F(1,32)	0.0172
Obs*R-squared	5.603935	Prob. Chi-Square(1)	0.0179

Both graphs in Figure 1 show the likelihood of ARCH effect. Both commodity and oil price residual plot indicates undulating shapes that confirms the presence of ARCH effect. Notwithstanding, the ARCH analysis has provided an avenue for double checking the results presented in Figures 1 through the ARCH test. The results of the ARCH test for oil and commodity prices are presented in Table 2. The results from Table 2 shows that the Null hypothesis of no ARCH effect is rejected at 5% level for both prices. The implication of this is that the results from the table confirm that there is ARCH effect. Therefore, we are justified to run any of the ARCH families' analysis. The EGARCH is applied here in order to verify if oil price has asymmetric effect. The estimated EGARCH equations for both oil and commodity prices are presented as follows: EGARCH or conditional variance equation for oil price

$$\ln\sigma^2 = 1.351934^{***} - 1.169635^{***} \ln\sigma_{t-1}^2 + 0.821859^{***} \left| \frac{\mu_{t-1}}{\sigma_{t-1}} \right| + 0.882097^{***} \left| \frac{\mu_{t-1}}{\sigma_{t-1}} \right| \dots (17)$$

(3.94E-06) (0.024807) (0.151661) (1.6E-103)

EGARCH or conditional variance equation for commodity price

$$\ln\sigma^2 = 0.319702 - 0.442090 \ln\sigma_{t-1}^2 - 0.034851 \left| \frac{\mu_{t-1}}{\sigma_{t-1}} \right| + 1.067861^{***} \left| \frac{\mu_{t-1}}{\sigma_{t-1}} \right| \dots (18)$$

(0.221492) (0.323958) (0.394033) (0.002111)

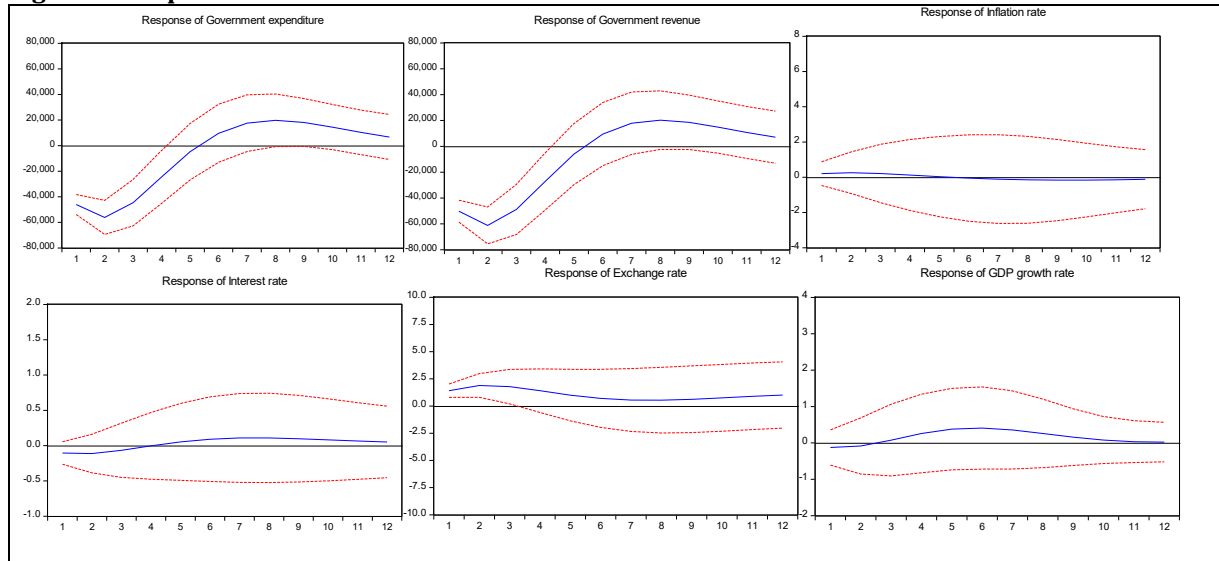
*, **, ***: significance at 10%, 5% and 1% respectively us

Equations 17 and 18 are the estimated EGARCH models for both oil and commodity price respectively. The results show that both prices do not have asymmetric effect but rather a significant symmetric effect during the period under review. This can be attributed to the fact that the coefficients 0.882097 and 1.067861 are greater than zero and they are statistically significantly. This indicates that a positive price shock will have more pronounced effect than negative price shock. Consequently, the residuals of the conditional variance equations that is $\ln\sigma^2$ in Equations 1 and 2 for both oil and commodity prices are used as oil price volatility (OILPVOL) and commodity price volatility (COMPV) respectively as stated in Equation 13 under the SVAR model. The impulse response functions that explain the behavior of a particular variable to 1% standard deviation in another variable called shock are presented as follows:

Impulse Response Functions: The discussion of the impulse response function begins with the exogenous variables that are oil price shocks and commodity price shocks followed by other variables. The responses of the fiscal variables as well other fiscal policy shocks to 1% standard deviation in oil price are described in Figure 2. The results show that both government revenue and government expenditure showed an upward

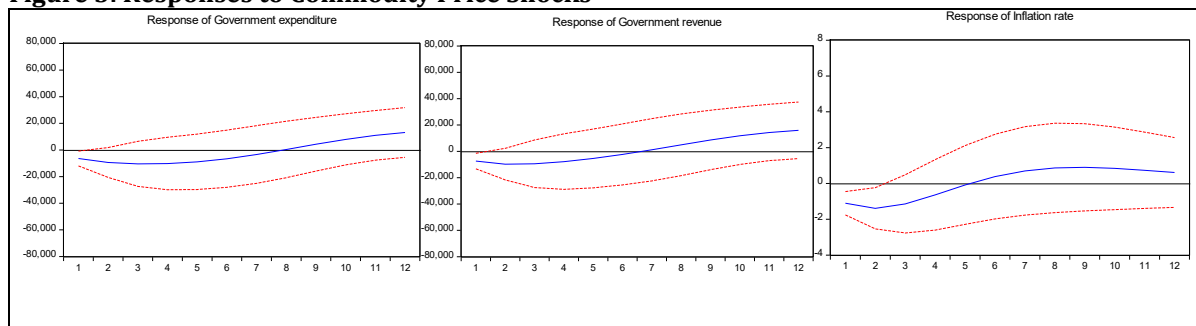
reaction to the shock. The pattern of responses by the two core fiscal variables is an indication that oil price volatility is very germane to behavior of fiscal policy in Nigeria. The responses of the two fiscal variables are apart from being positive, also significant. Another variable that shows significant response to the oil price shock is exchange rate.

Figure 2: Response to Oil Price Shock



The responses of the variables to commodity price shocks are explained in Figure 2. The results show some slight differences between the responses to oil price shocks and commodity price shocks. The two core fiscal variables namely; government revenue and expenditure, do not react significantly to the shock from commodity price for the largest part of the period. Significant reactions are only noticed at the earliest beginning of the periods. This is an indication that oil price volatility appears to have more significant impact on fiscal behavior in Nigeria than commodity price volatility. Exchange rate appears to be the most affected variable in the impulse function of commodity price. It causes the local currency to depreciate significantly. Another variable that demonstrates a relative significant response to commodity price shock is inflation rate. The shock from commodity price causes the inflation rate in Nigeria to rise significantly at least for the first 2 periods; however, this response becomes insignificant as the period progresses. The same situation is noticed in interest rate. The implication is that commodity prices appear to affect more macroeconomic variables than oil prices. After the exogenous variables, the next shocks studied are the core fiscal policy variables which comprise the government expenditure shocks and government revenue shocks. We start with government expenditure shocks.

Figure 3: Responses to Commodity Price Shocks



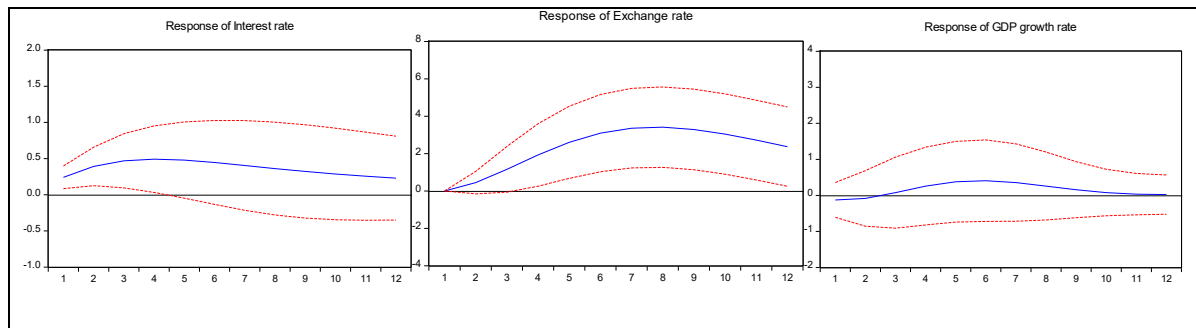
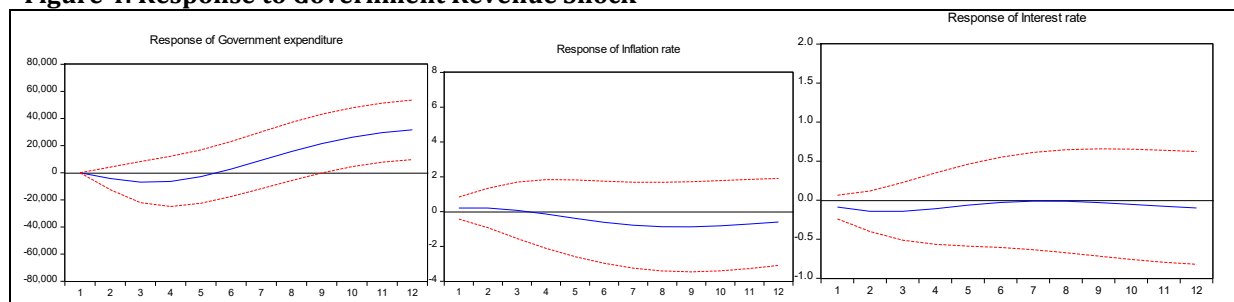


Figure 3 shows the responses of all the endogenous variables to 1% standard deviation in government expenditure in Nigeria. The result is a clear indication that the two core fiscal policy variables are significantly correlated or have strong association. The result shows that government revenue falls significantly as government expenditure rises suddenly. The reaction conforms to reality in that government expenditure is financed through government revenue therefore a positive shock to government expenditure is bound to have a reverse effect on government revenue. Not with standing, the responses of other variables to government expenditure shocks are also examined. Figure 3 further shows that none of the other variables in the model react significantly to the shock from government expenditure except the government revenue. It is important to note that the GDP growth rate also fails to react significantly to the shock from government expenditure. However, the result shows that GDP growth rate rises but the reaction is not significant. This reason raises many questions about the judicious use of the government revenue in Nigeria since a sudden upsurge in government expenditure fails to affect the GDP growth rate significantly. The next core fiscal variable considered is government revenue shock.

The result is presented in Figure 4. The strong relationship between government expenditure and government revenue is further confirmed from the reactions of government expenditure to government revenue shock. Figure 5 shows that government expenditure responds positively to the shock from government revenue. The reaction is also significant. The implication is that a positive shock to government revenue in Nigeria will produce a corresponding positive reaction from government revenue. This implies that the finance of government activities in Nigeria is solely dependent on the revenue of the government. Apart from government expenditure that reacts significantly to government revenue shock, the result also indicates that the GDP growth rate is significantly affected by government revenue. The GDP growth rate reacts positively and significantly at the beginning of the period but as the period progresses the GDP growth rate begins to fall. This shows that the positive impact is not sustained throughout the period length. The reason for this might be connected with the government expenditure that is financed from the government revenue that fails to have significant impact on GDP growth rate.

Figure 4: Response to Government Revenue Shock



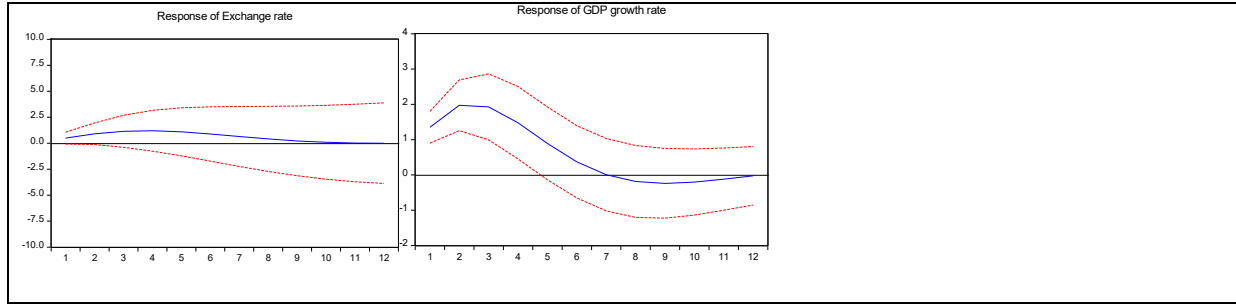


Figure 5: Responses to Government Expenditure Shocks

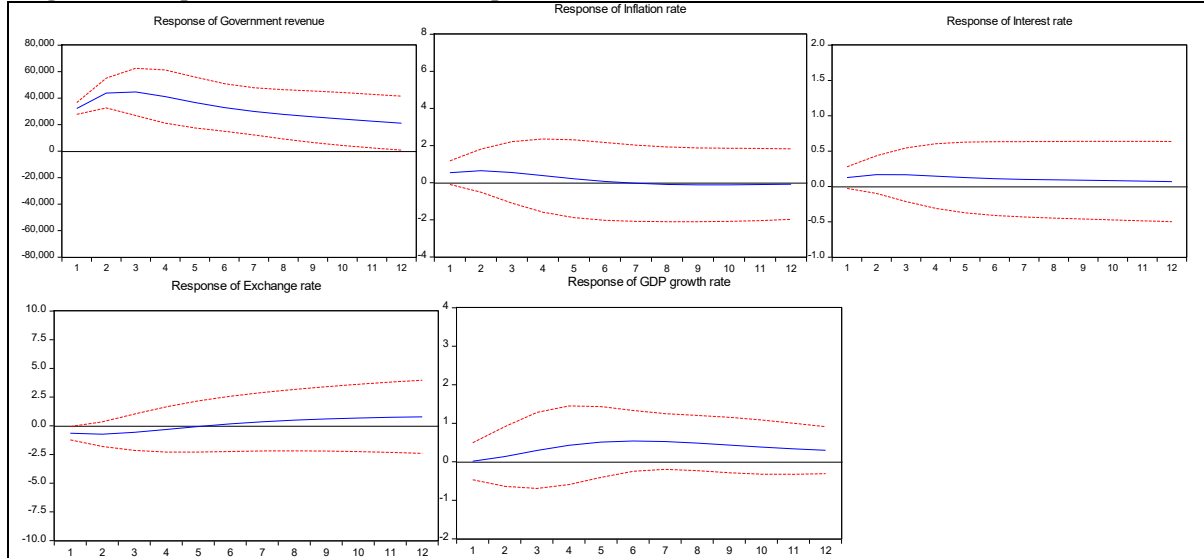
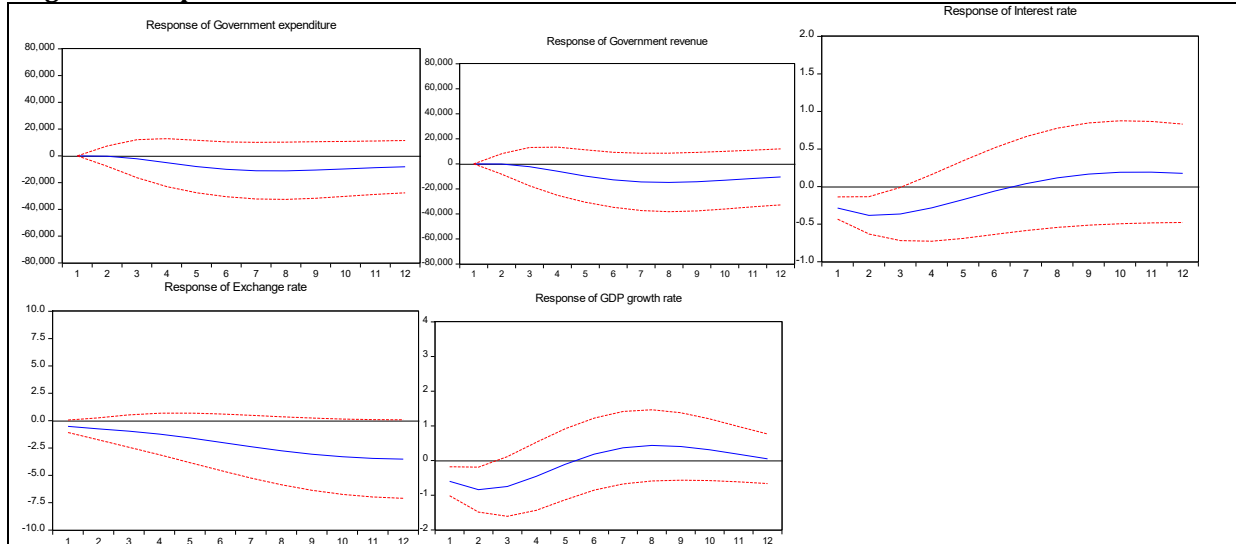
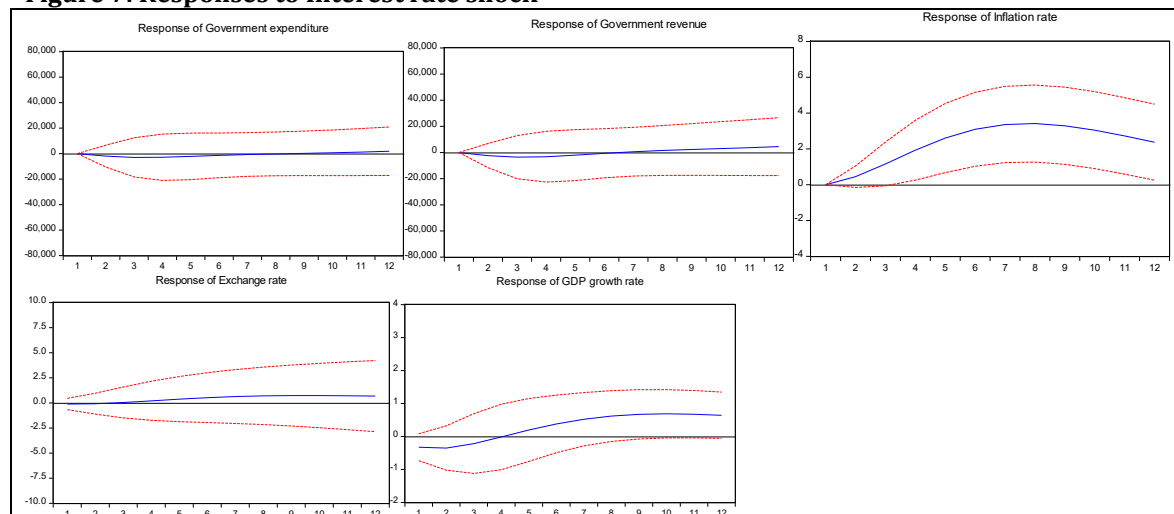


Figure 6: Responses to Inflation rate shock



The results shown in Figure 6 indicates that virtually all the variables in the impulse response functions fail to react significantly to inflation shock. Notwithstanding, interest rate and GDP growth rate react significantly at the first two periods but, for the remaining ten periods of the investigation their reactions are not significant.

Figure 7: Responses to Interest rate shock



The only variable that represents monetary policy in the model is interest rate. The responses to its shocks are described in Figure 7. The results show that exchange rate is highly connected with interest rate being the only variable that responds significantly to interest rate shock in the impulse response function of interest rate. A positive shock to interest rate causes the currency to depreciate significantly. The implication is that rise in interest rate in Nigeria might cause the naira to depreciate in value. Again, the shock fails to have significant impact on the core fiscal policy variables that is government expenditure and revenue. The implication is that the core fiscal policy variables namely; government revenue and expenditure might not be affected significantly by the inflation shock. Although the shock causes the two of them to fall, the effect is not significant.

Figure 8: Responses to Exchange rate shock

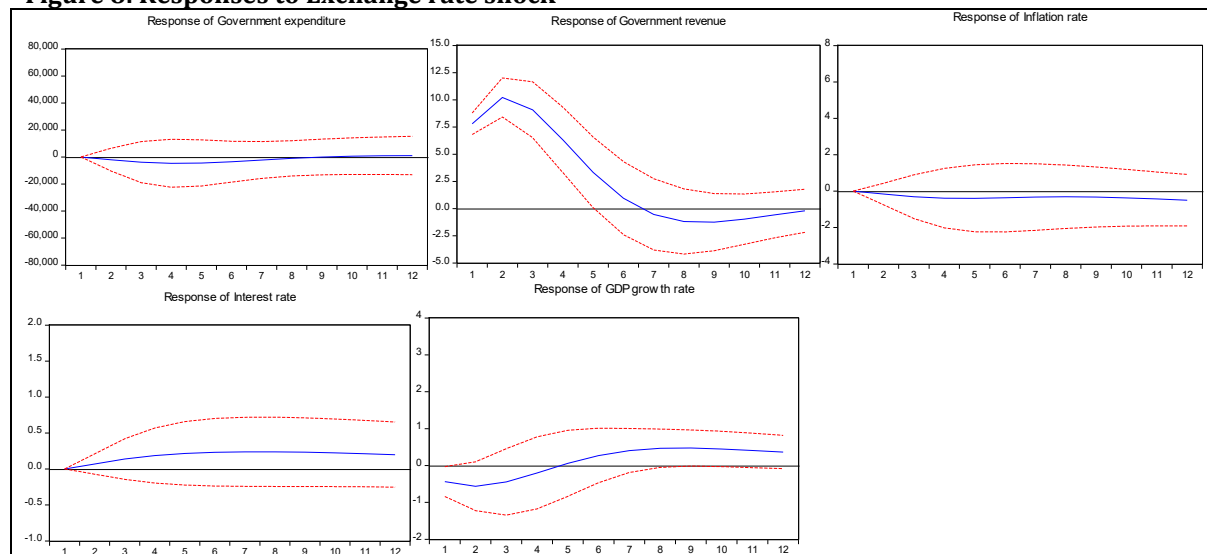


Figure 8 describes the responses of the fiscal policy variables and other variables in the model to the shock from exchange rate. The results show that exchange rate shock produces significant responses from both the GDP growth rate and government revenue. The implication is that exchange rate is an important shock that affects fiscal policy in Nigeria. Firstly, the shock causes government revenue to rise initially and later falls significantly. This is an indication that government revenue in Nigeria is highly susceptible to exchange rate shocks. The meaning of this result is that currency depreciation or devaluation of naira might not have a sustainable rising effect on government revenue. However, the vulnerability of the Nigerian economy to

exchange rate shock is further confirmed through the reaction of the GDP growth rate to the shock. Results show that GDP growth rate rises steadily but not significantly at the beginning of the periods but as the period progresses it starts falling significantly. The result further justifies what we discussed in the previous paragraph that it appears that currency devaluation might not have a sustainable positive impact on the growth of the Nigerian economy. After the impulse response function, the contributions of each shock to the behavior of each variable in the model are also investigated. This is done through the variance decomposition. The result of the variance decomposition is explained as follows:

Variance Decomposition: The variance decomposition is one of the important outputs of the SVAR model that describes the relative contributions of each of the shocks examined in the SVAR model to the behavior of each of the variables in the model as well. We focused on the core fiscal variables and other macroeconomic variables that constitute shocks to fiscal policy.

Table 3: Variance decomposition of government expenditure

PERIOD	OILPVOL	COMPVOL	GE	GR	INF	INTR	EXR	GDPGR
3	57.60039	1.890445	39.57435	0.523067	0.037103	0.101456	0.148096	0.125094
6	44.65527	2.599965	50.12489	0.685877	1.099438	0.155388	0.402753	0.276422
9	40.65480	2.233604	49.73509	4.128206	2.516385	0.128141	0.351559	0.252216
12	34.76793	3.158683	45.51602	12.89042	2.959482	0.124761	0.298495	0.284197

The results in Table 3 show that oil price volatility contributes the highest volume of shocks to the behavior of government expenditure in Nigeria. This further confirms that the finance of the Nigerian economy is highly susceptible to oil price fluctuations. Again, apart from the own shock, commodity price volatility appears to contribute the next high volume of shock to the behavior of government expenditure. It is an indication that the two exogenous variables, that is, oil prices and commodity prices are very important determinants of the behavior of fiscal policy in Nigeria. It should be noted that the contributions of oil price and commodity price volatility to the behavior of government revenue is more than the contributions of government revenue which is a fiscal policy variable.

Table 4: Variance Decomposition of Government Revenue

Period	OILPVOL	COMPVOL	GE	GR	INF	INTR	EXR	GDPGR
3	59.58922	1.639899	34.10732	4.308808	0.154368	0.126245	0.034706	0.039437
6	45.71855	1.606273	43.61878	6.942436	0.421145	0.158878	1.424085	0.109849
9	41.17506	1.446791	43.19774	10.65090	0.379611	0.143882	2.911929	0.094083
12	32.74235	3.075409	38.67087	20.86061	0.305913	0.251036	4.009924	0.083889

The dominance of oil price shocks in determination of fiscal policy behavior continues with its contributions to the behavior of government revenue. The results on Table 4 indicate that oil price volatility contributes the highest shocks to the behavior of government revenue in Nigeria. Not with standing, government revenue takes the second position here contributing the second highest shocks to the behavior of government revenue thus confirming the extent to which expenditure of the government in Nigeria rests on government revenue. Apart from the two, commodity prices and exchange rates are other variables that contribute relatively high shocks to the behavior of government revenue in Nigeria. It is important to note from Table 4 that the contributions of oil price volatility and government expenditure to the behavior of government revenue in the variance decomposition analysis are also greater than the own shock contributions. Government revenue itself fails to contribute higher shock to its own behavior when compared to the contributions of oil price volatility. The behavior of other macroeconomic variables that are also treated as fiscal policy shocks are investigated via the variance decomposition analysis as follows:

Table 5: Variance decomposition of inflation rate

Period	OILPVOL	COMPVOL	GE	GR	INF	INTR	EXR	GDPGR
3	0.159170	4.647728	1.055890	0.092467	92.00109	1.601646	0.125259	0.316748
6	0.086401	2.518142	0.605968	0.317692	84.90418	10.82284	0.278668	0.466114
9	0.091928	2.797559	0.486979	1.090066	72.90867	21.88707	0.342415	0.395309
12	0.104454	3.111041	0.451244	1.532769	66.12798	27.76829	0.513437	0.390788

Result in Table 5 shows that the behavior of inflation in Nigeria is more affected by interest rate and commodity price volatility than oil price. Commodity price shocks make the highest contributions to the behavior of inflation rate in Nigeria after the own shock and interest rate shock. This is an indication that inflation rate in Nigeria might be structural. However, the two fiscal policy core variables do not have much role to play in the behavior of inflation in Nigeria.

Table 6: Variance decomposition of interest rate

Period	OILPVOL	COMPVOL	GE	GR	INF	INTR	EXR	GDPGR
3	0.540790	8.288890	1.375122	0.929927	6.961002	80.71727	0.461317	0.725676
6	0.325962	9.168180	1.010322	0.541604	3.966068	80.61537	1.331746	3.040748
9	0.420508	8.723302	0.862633	0.385613	3.021005	80.73679	1.909010	3.941143
12	0.409456	8.111589	0.790283	0.405761	2.973717	81.19708	2.213360	3.898758

Table 6 explains the contribution of shock to the monetary policy variable in the model which is the interest rate. The results show that commodity price volatility contributes the largest percentage of shock to the behavior of interest rate GDP growth rate and inflation rate are other variables that constitute significant shocks to the behavior of interest rate. Again, none of the two core fiscal policy variables have significant contribution to the behavior of interest rate.

Table 7: Variance Decomposition of Exchange Rate

Period	OILPVOL	COMPVOL	GE	GR	INF	INTR	EXR	GDPGR
3	9.761012	0.016992	1.432321	2.661426	1.952815	0.021914	84.12368	0.029838
6	5.128530	0.107842	0.593480	2.434704	4.041584	0.201473	87.36054	0.131846
9	3.316648	0.510615	0.535164	1.617682	8.118492	0.479798	85.16649	0.255113
12	2.751656	0.936954	0.661611	1.137436	11.90178	0.602293	81.63457	0.373703

The behavior of exchange rate in Nigeria appears to be mostly affected by oil price volatility. Inflation rate is another variable that constitute some shocks that are noticeable to the behavior of exchange rate. The implication is that exchange rate appears to be the medium through which oil price volatility affects the fiscal policy behavior since government revenue also contributes some shocks to the behavior of exchange rate. The result further affirms the strong association between government revenue and exchange rate in Nigeria. Notwithstanding, oil price fluctuations is a factor to reckon with in the analysis of the behavior of exchange rate.

Table 8: Variance Decomposition of GDP Growth Rate

Period	OILPVOL	COMPVOL	GE	GR	INF	INTR	EXR	GDPGR
3	0.084919	2.132805	0.304226	27.57173	2.061691	0.802694	4.741564	62.30038
6	0.917789	4.069285	1.911594	28.48838	1.867873	1.041984	4.258468	57.44463
9	1.305665	4.536551	3.231568	26.51426	2.997802	3.289803	4.963561	53.16079
12	1.256631	4.461709	3.766278	25.32022	3.845190	5.803421	4.980823	50.56572

Table 8 explains the behavior of the GDP growth rate which is the proxy for Nigeria's economic growth. The result shows that government revenue mostly affects the behavior of Nigeria's economic growth. Again, in support of our findings under impulse response function, government expenditure does not contribute much to the behavior of output growth in Nigeria. Commodity prices appear to have greater influence on the behavior of Nigeria's economic growth than oil price. Again, among the remaining macroeconomic variables, exchange rate is the most influential to the behavior of output growth rate in Nigeria. The results indicate that the behavior of the GDP is strongly affected by exchange rate thereby further confirming exchange rate as an important medium through which exchange rate affects fiscal policy variables in Nigeria

5. Conclusion and Recommendations

Both the oil price and commodity price shocks have varying degrees of effects on the Nigerian economy. Oil price shocks produce a significant response from both government revenue and government expenditure

thus further confirming the importance of oil price in determining the fiscal policy behavior in Nigeria. The findings conform to the conclusions from Aremo, Orisadare and Ekperiware (2012) that oil price shocks have significant effect on fiscal policy variables in Nigeria. But commodity price fails to produce the same kinds of responses as the responses of the fiscal variables to commodity price shocks are not significant. Notwithstanding, commodity price shocks appear to have impact on more macroeconomic variables than oil price. Inflation rate, interest rate and exchange rate all responded significantly to commodity price shocks to some extent but oil price shocks only attract significant response from exchange rate. An important inference from the impulse response function of commodity price shocks is that it causes the local currency to depreciate significantly. The result shows that exchange rate is the macroeconomic variable that shows the most significant response to commodity price shocks; this is followed by inflation rate and interest rate. The reason for this might be connected with high inflation pressure that usually accompanies positive commodity price shocks in import dependent economy like Nigeria. Domestic prices rise sharply and naira slumps against other major currencies in the world. All these have ripple effects on the overall economic growth of Nigeria.

The extent of the influence of commodity price shocks on macroeconomic stability of Nigeria than oil price shocks lies in the fact that commodity prices affects more commodities than oil price. And most of these commodities are included in the import bills of Nigeria that is rising on a daily basis. In addition, the impulse response functions have shown a very strong association between government expenditure and government revenue which are the core fiscal variables in the study. Results from the study indicate that government expenditure shock produces a reverse and significant response from government revenue that is a sharp fall in government revenue. The inferences that are drawn from this tally with the position of Demachi (2012) that finance of government expenditure in Nigeria is highly dependent on government revenue and that of Official Development Assistance (ODA) or foreign aid to Nigeria which should serve as another source of finance of government expenditure is too little to have any significant impact on government expenditure. It is very important to know that despite the positive shock to government expenditure, GDP growth rate which measures the economic growth of Nigeria fails to respond significantly to the shock. The implication is that government expenditure though might improve the economic well-being of the country but the effect appears not to be significant. The position above is further supported by the response of government expenditure to government revenue shock which is significant especially towards the end of the period. The strong link between the two core fiscal variables is further affirmed.

But the difference is that government revenue shock produces a significant response from economic growth unlike government expenditure. The significant response of Nigerian economic growth to government revenue is the fact that economic prosperity of Nigeria is more tied to her revenue due to the direct effect on national income which is a measure of economic growth. According to Demachi (2012), national income growth as a measure of economic growth might be misleading for a country like Nigeria which suffers low domestic outputs which could have been propelled by judicious use of government expenditure in promoting the growth of the real sector of the economy. Out of the three macroeconomic shocks, that is, interest rate, inflation rate and exchange rate shocks, only exchange rate shocks attract the most significant response from fiscal policy variables especially government expenditure. Exchange rate shock produces sharp decline in government expenditure as a result of devaluation. Currency depreciation affects the domestic prices and causes cost on investment to rise and hence a fell in government finance (Olasunkanmi & Babatunde, 2013). The position of these authors has been supported by the findings from this study. Again, from another perspective Usenobong & Johnson (2015) concluded from their study that attendant effect of currency depreciation is a fall in government revenue for a country which heavily depends on single primary export and with large import bill.

This situation describes Nigeria's scenario where the government revenue has been on a decline since the naira has been on a free fall against the US dollar and other currencies. The situation has affected government expenditure seriously with a lot of wage bills unsettled at both state and federal levels. The variance decomposition results indicate that government expenditure does not contribute much to the economic growth behavior of Nigeria like government revenue. This raises questions about the prudence in management of government finance. This further supports our earlier position that the Nigerian economy is suffering from low productive capacity as a result of ineffectiveness of government expenditure. Finally,

exchange rate has been shown to be the major macroeconomic medium through which external shocks influence fiscal policy variables in Nigeria. The level of interaction between fiscal policy variables and exchange rate among other macroeconomic variables in the model appears to be the most significant. Also, among all other macroeconomic variables, the contributions of exchange rate to the behavior of Nigeria's economic growth are the highest. All these are pointers to the significant role played by exchange rate in transmission of fiscal policy shocks especially the external shocks to the domestic economy. It is recommended that fiscal authorities in Nigeria should endeavor to factor in exchange rate behavior whenever fiscal documents are being drafted for the purpose of policy formulation.

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