OIL PRICE VOLATILITY AND FISCAL BEHAVIOUR OF GOVERNMENT IN NIGERIA

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ABSTRACT

This paper examined the fiscal response of government to oil price volatility in Nigeria during the period 1970-2013. This is because no study has analysed the peculiar fiscal behaviour of the government given the unpredictable nature of oil prices. Yet, government fiscal activities had significantly determined and shaped the growth path of the economy. The multivariate vector Auto regression model was explored for the empirical analysis. Our findings showed that real oil prices had driven government expenditure dynamics and a long run relationship between real oil prices and government spending, non-oil growth, inflation and discount rate differential exist; and no asymmetric effect of oil price shocks on the government spending. However, these results are robust to different non-linear transformation of the real oil prices and inclusion of additional variables. Since oil price is highly volatile, it is advised that the government diversify the sources of foreign exchange inflows.

Contribution/ Originality:

This study is one of very few studies which have investigated the fiscal behavior of government to oil price volatility, and particularly for Nigeria. The major innovation of this study is the use of the Generalised Impulse Response function as against the traditional response function in establishing this relationship.

1. INTRODUCTION

From 1956 when oil was discovered in commercial quantity in Nigeria and the ensued oil boom of 1970s, oil has dominated the economy. As much as 85 percent of government total revenue and 95 percent of foreign exchange earnings is attributed to oil exports. Consequently, the economy has been substantially unstable, due to the high dependence on oil revenue, and the volatility in oil prices (Odularu, 2008). Though several previous studies have analysed the dependence of the country on natural resources, especially crude oil (see, (Ayadi, 2005; Olomola and Adejumo, 2006; Akpan, 2009; Aliyu, 2009; Adeniyi et al., 2011; Chuku et al., 2011; Iwayemi and Fowowe, 2011; Fasanya et al., 2013; Babatunde, 2014;2015)) but non provided decisive evidence as to how volatility in oil prices have affected the fiscal behaviour of the government. Analysing the fiscal behaviour of the government to oil price volatility is considered important for two reasons. First, the budgetary impact of volatility in oil price is considerably larger than those of the volatility to the public budget from aid, loans, grants and remittances commonly studied in the public finance literature (Wyckoff, 1991; Hines and Thaler, 1995; Aregbeyen and Fasanya, 2014). Second, oil price volatility has been positive and negative, and therefore allows for a test of the possible asymmetries in the fiscal stance of the government (Hamilton, 1983; Videgaray-Caso, 1998; Pieschacon, 2012). This paper, therefore, filled this gap as it analysed the impact of oil price volatility on the fiscal behaviour of the government during the period 1970-2013. It is aimed at enriching the literature

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with empirical evidence in the context of Nigeria. The study is rooted in the Ricardian-Equivalence theory and adopted the VAR model with emphasis on Generalized Impulse Response (GIRF) and Variance Decomposition (VD) functions in conducting the analysis. Our interest was on fiscal policy reactions to oil price changes with specific focus on (i) oil price volatility, (ii) oil price shocks, and (iii) the asymmetric effects of oil price shocks. Overall, the results suggest important linkages between oil price and government spending. However, there was no evidence of asymmetric effect of positive and negative oil price shocks on government spending. The structural lay out of the remaining part of the paper is as follows: section 2 reviewed related studies; section 3 presents the theoretical framework and methodological approach to the study; section 4 discusses the empirical results obtained; while the conclusion and policy implications are rendered in section 5.

2. REVIEW OF RELATED STUDIES

Several previous studies on the relationship between oil price volatility and the fiscal response of resource-rich countries since the 1973/1974 oil price shocks abound. These studies have produced different outcomes overtime, and more results are still evolving. Gelb (1988) studied the impact of oil windfalls in 6 oil exporting countries[1] using the Ordinary Least Square (OLS) technique. The study focused on the fiscal response to positive oil price shock of the 1970s and concluded that oil price hikes were mainly transformed to additional revenue thereby leading to increased government expenditure on large industrial projects with low productivity, and to reduced level of government consumption. El Anshasy and Bradley (2012) also focused on a larger set of 16 oil-exporting countries for the period 1972-2007 using the systemic GMM approach. The results revealed that oil price changes had a direct and material impact on government spending growth. In addition, higher oil price volatility induced government prudence, by reducing the growth rate in government spending, especially in inflationary periods. In yet another study of 10 oil-exporting countries spanning the period 1980-2007, Husain *et al.* (2008) using a panel VAR concluded that oil price changes affected the economic cycle only through their impact on fiscal policy. But, in the absence of fiscal policy changes, oil price shocks had no significant independent effect on the economic cycle.

The study of 28 developing oil-producing countries covering the period 1990-2009 by Erbil (2011) indicated that expenditure was pro-cyclical and countercyclical in the low and middle-income and high-income countries, respectively. Fiscal policy tends to be affected by the external financing constraints in the middle- and high-income groups. Very instructive, the quality of institutions and political structure was reported likely more significant for the low-income group. In contrast, in an earlier study, Villafuerte and Lopez-Murphy (2010) reported that fiscal policy was pro-cyclical and exacerbated fluctuations in economic activity. But Arezki and Ismail (2010) examined the behaviour of expenditure policy for 32 oil-producing countries over the period 1992-2009 using least squares and System-GMM estimations. They came to a number of interesting conclusions including that (i) change in current spending had stronger impact on the change in real exchange rate compared to capital spending; (ii) current spending was downwardly sticky, but increased in boom time, and conversely for capital spending; and (iii) there was limited evidence that fiscal rules had helped reduce the degree of responsiveness of current spending during booms. In contrast, there was evidence that fiscal rules were associated with a significant reduction in capital expenditure during busts while responsiveness to boosts were muted. It, therefore, cast doubt on the potential adverse consequences of this asymmetry on economic performance in oil-producing countries. Ossowski *et al.* (2008) stressed the trade-offs between increasing spending and the institutional ability to effectively and efficiently absorb such increases. It was observed that while the 2008 oil boom allowed oil-producing countries to increase public spending though associated with relatively lower indices of government effectiveness.

Using a dynamic general equilibrium model to study the impact of oil price volatility on the economy and then calibrated the model using data from Mexico and Norway during 1980–2006, Pieschacón (2009) reported that fiscal policy was a key propagation mechanism for transmitting oil price volatility to the domestic economy. Nakov and Pescatori (2010) analyzed the extent to which the greater USA macroeconomic stability since the mid-1980s can be accounted for by changes in oil price volatility and the oil elasticity of GDP. They performed counterfactual simulations and nest two popular explanations for the Great Moderation: smaller (non-oil) real price volatility and better monetary policy. They found that oil played an important

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[1] This include Algeria, Ecuador, Indonesia, Nigeria, Trinidad and Tobago, and Venezuela

role in the stabilization. For Columbia, González *et al.* (2013) developed a fiscal model assuming the existence of non-Ricardian households, price and wage rigidities, and a fiscal authority that finances government spending partly with public debt. The model was calibrated under different fiscal rules to assess the macroeconomic effects of oil price shock. The findings suggest the structural fiscal rule delivered a better outcome in terms of macroeconomic volatility relative to a balanced budget rule or a countercyclical fiscal rule. Schmidt-Hebbel (2012) review of evidences on fiscal policies and outcomes in resource-rich economies of large and Arab oil-exporting countries in particular, suggests that the resource curse can be a blessing on the strength of fiscal (and political) institutions. Habibi (1998) investigated the impact of fluctuations of oil revenues on budgetary decisions with a panel data for 5 Middle East oil-exporting countries. The findings suggest that the budget shares of Defense and Economic Affairs and Services were positively correlated to oil export revenues, while social showed a negative correlation. This implies that since social expenditures are politically more important, they are shielded against fluctuations in oil revenues and the burden of budget cuts fall more on capital expenditures and defense. However, Habibi (1994) and Fardmanesh and Habibi (2000) demonstrated that degrees of political stability and political liberty matters for the distribution of the burden of a budget cut across expenditure categories, with social expenditures less vulnerable in more democratic countries.

In a study of the Kingdom of Bahrain, Hamdi and Sbia (2013) examined the dynamic relationships between oil revenues, government spending and economic growth between 1960-2007. The multivariate cointegration analysis and error-correction model were utilized. The results indicated that oil revenues was the principal source of growth and the main source of government spending. In the case of Indonesia, Kuncoro (2011) focused on the volatility of crude oil price in United Kingdom, Texas, and Dubai markets, from January, 1980 to May, 2010 and discovered that the increases in oil price marginally induced fiscal stance with about 0.02 percent. It was inferred that the primary balance surplus was vulnerable to maintaining fiscal sustainability, hence, the conclusion was that price smoothing based on long-term trends would have imposed a considerable fiscal drain. The focus of existing studies on Nigeria have largely been on the monetary impacts of oil price shocks and not on the fiscal impacts of oil price volatility. For instance, Iwayemi and Fowowe (2011) conducted an empirical analysis of the effects of oil price shocks using quarterly data from 1985 to 2007. The Granger-causality tests, impulse response functions, and variance decomposition analytical techniques were deployed. The reported results indicated different measures of linear and positive oil shocks had no impact on output, government expenditure, inflation, and the real exchange rate. The tests supported the existence of asymmetric effects of oil price shocks because negative oil shocks significantly influenced output and the real exchange rate. For Chuku *et al.* (2011), the focus was on the effects of oil price shocks on the current account balance. Quarterly data from 1970-2008 was explored. The key finding was that oil price shocks had a significant short run effect on current account balances. Understanding the effects of oil price shocks on macroeconomic fundamentals was the preoccupation for Olomola and Adejumo (2006). They also explored quarterly data but for the period 1970 to 2003 while the VAR model was tested. Oil price shocks was found to have significantly affected the money supply in the long run. On the strength of this finding, they concluded there was the inclination towards the "Dutch disease".

The foregoing review of previous studies was quite insightful, however, most of the studies did not empirically examine the effect of oil price volatility on the fiscal response of government as well as checking for the asymmetry effect of oil price shocks, which is a major thrust of this study. Moreover, several of these studies are cross country in nature in which country-specific analysis cannot be isolated. Thus, the need for specific policy relevance in respect of Nigeria necessitates this study.

3. THEORETICAL FRAMEWORK AND METHODOLOGY

3.1. The Theoretical Framework

The Ricardian-Equivalence theory provided the theoretical basis for this study. Its choice is based on the fact that the Nigerian economy largely depends on oil revenue that is volatile in nature. High volatility in government revenues is closely associated with pro-cyclical government expenditures. Unprecedented change in the price of oil can induce important fiscal

policy responses which, in turn, affect the country's short-run economic performance and possibly its long-term growth[2]. Videgaray-Caso (1998); Engel and Valdes (2000); Barnett and Ossowski (2002); El Anshasy and Bradley (2012) and González *et al.* (2013) employed fiscal policy reaction function to analyse the effect of a shock in oil price on government budgetary operations. This study sets off from these works by emphasizing on the role of shocks, volatility and asymmetry effect of oil price fluctuations. The existence of a dynamic representative agent model with a social planner determining optimal government expenditures is assumed. It has a household sector and a government sector, tied together with commodity and financial market equilibrium conditions. Accordingly, we layout the general structure of our theoretical model and derive a fiscal reaction function, in terms of government spending[3].

To begin with, production in the economy is classified into oil output (Y_{G_t}) and non-oil output (Y_{p_t}). Output of the oil sector is a function of the amount of oil extracted (Q) and its price (P_t). Since all oil receipts accrue to the government, therefore, real oil output equals government revenue (Y_{G_t}):

$$Y_{G_t} = Q_t P_t \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (1)$$

Oil extraction is assumed to grow at a constant rate n, while Q follows a deterministic trend. It is assumed further that the total oil reserves are known and fixed, and would be fully exhausted by a known terminal period. We therefore normalize the initial extraction to one and rewrite the total real oil revenue as:

$$Y_{G_t} = e^{n(t)} P_t \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (2)$$

For the non-oil output, there is the endowed of relevant and required factors of production (*X).* This is characterized by the activities of the private sector where output fluctuates in response to changes in real oil prices (P_t). This is premised on the fact that despite diversification efforts, the non-oil sector in oil dependent countries closely follows the ups and downs in oil revenues. Our non-oil output, Y_{P_t}, equation is therefore specified as a product of the availability of factors of production and oil prices:

$$Y_{P_t} = X_t^{\varphi} P_t^{\gamma} \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (3)$$

Where, φ and γ are the elasticities with respect to private sector factors and oil prices, and P_t is the price of oil. Thus, total output (Y_t) is the sum of the output of the two sectors:

$$Y_t = Y_{G_t} + Y_{p_t} \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (4)$$

We then assume that there is one, infinitely-lived, risk-averse, individual agent that can either consume or accumulate assets in the form of government bonds, who neither pays taxes on income nor receives transfer payments from the government. The private sector can import (export) consumption goods such that the trade balance is zero at the beginning of every period.

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[2] Barro, 1979. intertemporal public finance rule is that the optimal policy should be to smooth tax rates over time. In a deterministic environment, this implies that tax rates will never change while the government budget will fluctuate between deficit and surplus depending on the business cycle.

[3]As Fedelino, Mark and Anna 2009. Observed, government spending is not correlated with the business cycle, with the exception of unemployment-related expenses, which generally hold a small weight in total public expenses, therefore, the dynamic of public expenses generally reflects discretionary decisions.

The dynamic period-by-period budget constraint that defines the evolution of private wealth is:

$$A_{t+1} = \tilde{r}_t A_t + Y_t - Y_{G_t} - C_t \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (5)$$

Solving the difference equation forward generates the household's inter-temporal budget constraint:

$$A_t + \sum_{j=0}^{\infty} \tilde{r}^{-(t+j)} E_t[Y_{P_{t+j}}] = \sum_{j=0}^{\infty} \tilde{r}^{-(t+j)} E_t[C_{t+j}] \dots \dots \dots \dots \dots \dots (6)$$

Household behavior is governed by inter-temporal utility maximization:

$$\max_C E_t \sum_{t=0}^{\infty} \beta\, u(C_t) \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (7a)$$

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C is private consumption, A_t is the initial private wealth, and $\tilde{r}$ is the gross real rate of return on government bonds. The private agent maximizes her expected life-time utility from the future consumption stream subject to an inter-temporal budget constraint. The resulting optimal consumption path is defined by the following Euler equation that describes the inter-temporal marginal rate of substitution of the private agent:

$$u'(C_t) = \beta\, E_t[\tilde{r}_{t+i}^i\, u'(C_{t+i})] \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (8)$$

$\beta \epsilon (0,1)$ denotes the private agent's subjective discount factor, $u(c)$ is the individual's instantaneous utility function that is assumed to be strictly increasing and strictly concave, and $u'(.)$ is the marginal utility of private consumption.

Assuming that the government finances it's spending through revenue from oil and borrowing on financial markets. The dynamic period-by-period budget constraint that defines the evolution of government's debt is then given by:

$$B_{t+1} = \tilde{r}_t B_t + G_t - Y_{G_t} \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (9)$$

Where $\tilde{r}_t B_t$ is the outstanding debt, B_t is the government's initial debt, $\tilde{r}$ is the gross discount rate on government debt, G is (non-interest) government spending. The government is committed to a no-default policy on its debt. Therefore, solving the difference equation forward gives the government's inter-temporal budget constraint:

$$B_t + \sum_{i=0}^{\infty} \tilde{r}^{-(t+i)} E_t[Y_{G_{t+i}}] = \sum_{i=0}^{\infty} \tilde{r}^{-(t+i)} E_t[G_{t+i}] \dots \dots \dots \dots \dots \dots (10)$$

The government maximizes her expected life-time utility from the future government expenditure subject to an inter-temporal budget constraint.

$$\max_G E_t \sum_{t=0}^{\infty} \rho^t v(G_t) \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (11)$$

$$s.t. \qquad B_t + \sum_{i=0}^{\infty} \tilde{r}^{-(t+i)} E_t[Y_{G_{t+i}}] = \sum_{i=0}^{\infty} \tilde{r}^{-(t+i)} E_t[G_{t+i}] \dots \dots \dots \dots \dots \dots (12)$$

$\rho\epsilon(0,1)$ denotes the government's subjective discount factor, $v(G)$ is the instantaneous utility function which is strictly increasing and concave. The resulting optimal time path of government spending is defined by the Euler equation:

$$v'(G_t) = \rho E_t\left[\hat{r}^i_{t+i} v'(G_{t+i})\right] \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (13)$$

The model is closed with two equilibrium conditions, one for the goods market and one for the financial market. The goods' market clearing condition is such that total output equals the sum of government (non-interest) spending and the purchases of consumption goods.

$$Y = Y_G + Y_P \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (14)$$

Because the trade balance is zero every period, net capital outflows are zero, and the financial market's clearing condition is given by[4]:

$$A_t = B_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (15)$$

Conceptually, a government reaction function can be found by solving the two Euler equations and the two equilibrium conditions for the equation dictating the time path of government spending. Let the social planner and the individual agent have constant-relative-risk-aversion identical preferences. The instantaneous utility functions take the following form:

$$u(Z), v(Z) = \begin{cases} \dfrac{Z^{1-\emptyset}}{1-\emptyset} & if \emptyset < 1 \\ \ln Z & if \emptyset = 1 \end{cases} \qquad for\ Z = C, G \dots\dots\dots (16)$$

There are two defining features of this instantaneous utility function. First, $Z^{1-\emptyset}$ is increasing in Z if $\emptyset < 1$ but decreasing if $\emptyset > 1$; dividing $Z^{1-\emptyset}$ by $1-\emptyset$ thus ensures that the marginal utility of consumption is positive regardless of the value of $\emptyset$.

Second, in the special case of $\emptyset \to 1$, the instantaneous utility function simplifies to $\ln Z$; this is often a useful case to consider[5].

Where, $\emptyset > 0$ is the risk-aversion parameter. For tractability we set $\emptyset = 1$, providing logarithmic utility functions[6]. So, we can derive:

$$\frac{v'(G_{t+i})}{v'(G_t)} = (1 + g^G_t)^{-1} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (17)$$

$$\frac{u'(C_{t+i})}{u'(C_t)} = (1 + g^C_t)^{-1} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (18)$$

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[4] Since bonds are the only financial asset in the model economy, household lending (borrowing) can only take the form of positive (negative) holdings of government bonds. Hence, equilibrium in the financial market implies $A_t = B_t$ for $t=0,1,2$.

[5] To see this, first subtract $1/(1-\emptyset)$ from the utility function; since this changes utility by a constant, it does not affect behaviour. Then take the limit as $\emptyset$ approaches 1; this requires using L'Hôpital's rule. The result is $\ln Z$.

[6] The simplifying assumption of identical preferences and that $\emptyset = 1$ can be relaxed without affecting the core results.

Where g_t^G is the growth rate of government spending, and g_t^C is the growth rate of private consumption. Next, we specify the stochastic structure of the model. We then assume that there is only one source of shocks in the economy, oil prices, which follow a random walk. Thus, $P_t = P_{t-1}e_t$, where e is an i.i.d oil price shock; $E(e) = 1; E(e_i e_j) = 0, \forall i \neq j$. We can, therefore, define the unanticipated changes in oil prices as the first difference of the log of real oil prices: $\tilde{P}_t = \ln e_t$, such that $\tilde{P}$

$\sim (0, \sigma_{\tilde{P}}^2)$; and $E[\tilde{P}_i \tilde{P}_j] = 0 \ \forall i \neq j$.

To derive the government's fiscal reaction function, we revisit the Euler equations for consumption and government spending. Note that the model's assumptions imply that private consumption is not dependent on government spending[7]. However, in such a stochastic economy, the two variables co-vary in response to the exogenous common oil price shock. Using equations (17), and (18), we can solve the two Euler equations (8) and (13) for the gross growth rate in government spending[8]:

$$E_t \ln(1 + g_t^G) = \tilde{\beta} - \tilde{\rho} + E_t \ln(1 + g_t^C) - \frac{\rho}{\beta} Cov[g_t^G, g_t^C] \dots \dots \dots \dots \dots \dots \dots . (19)$$

The correlation between private consumption and government spending is then specified by decomposing both growth rates into their deterministic and stochastic components (which captures the impact of the oil shock). Carroll and Kimball (1996) and Carroll and Kimball (2001) have shown that future income uncertainty results in a strictly concave spending rule and that the growth rate of spending must be a function of the parameters of the distribution of future income. Because of uncertain future oil revenues, the growth rate of government spending would be a function of those revenues and hence fluctuates in response to the unanticipated fluctuations in oil prices. Specifically, for government spending we have:

$$g_t^G = \bar{g} + \delta \tilde{P}_t \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (20)$$

A similar construction holds for the growth rate in consumption. In equilibrium, consumption growth will be equal to the growth rate in the private sector output. However, in the short run, it will fluctuate in response to the oil shock. Thus, for consumption we have:

$$g_t^C = \bar{g}_{y_v} + \alpha \tilde{P}_t \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (21)$$

Using equations (20) and (21), and the fact that:

$$Cov[g_t^G, g_t^C] = E\left[\left(g^C - \bar{g}_{y_v}\right)\left(g^G - \bar{g}\right)\right] \dots \dots \dots \dots \dots \dots \dots \dots (22)$$

we can simplify equation (19):

$$E_t \ln(1 + g_t^G) = \tilde{\beta} - \tilde{\rho} + E_t \ln(1 + g_t^C) - \frac{\rho\alpha\delta}{\beta} E[\tilde{P}]^2 \dots \dots \dots \dots \dots \dots \dots \dots . (23)$$

Where $E[\tilde{P}]^2$ is the variance of oil price shocks, equivalent to $\sigma_{\tilde{P}}^2$. A forward looking government in an oil producing country will take into account the volatility of oil prices when setting the optimal growth path for government expenditures. As demonstrated by Carroll and Kimball (1996) and Carroll and Kimball (2001) a log-linearized Euler equation would miss important parameters of the distribution of future income, namely all the non-linear parameters. Therefore, to capture potential

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[7] The private sector pays no taxes and receives no government transfers, and all oil revenues accrue to the government.

[8] Note that in a deterministic economy the covariance term will not exist.

nonlinear effects of higher order terms of the distribution of oil prices which might affect government spending, we employed a third order Taylor approximation. In addition, we replaced the unobservable expectations for government and consumption growth with their realizations from equations 20 and 21 to obtain:

$$g_t^G = (\tilde{\beta} - \tilde{\rho}) + g_{y_{pt}} + (\delta + \alpha)\tilde{P}_t + \left[\frac{\delta^2}{2} - \frac{\beta\alpha^2 + 2\rho\alpha\delta}{2\beta}\right]E[\tilde{P}]^2 + \frac{\alpha^3 - \delta^3}{3}E[\tilde{P}]^3 \ldots \ldots \ldots \ldots \ldots . (24)$$

where $E[\tilde{P}]^3$ measures of the asymmetric effects of oil price shocks. Note that $g_{y_{pt}}$, the growth rate in the non-oil output, is linked to the growth in the private factors.

Equation (24) states that the expected growth of government expenditure is determined by: (i) the differential between the private and government subjective discount rates; (ii) the growth rate of the non-oil sector; (iii) the shock in oil prices as measured by the net increase in oil prices; (iv) the volatility of oil prices as measured by their variance; and (v) the asymmetry (skewness) of oil price shocks. Taking this theoretical argument into consideration, we derive an empirical model that describes the relationship between volatility in oil prices and fiscal behaviour of government.

3.2. Methodology

3.2.1. The Empirical Model

Going by our theoretical model, three set of variables affect the growth in government spending. These include discount rate differential between the household and the government (dr), non-oil sector growth (nos- private sector activities) and lastly the set of variables linked with oil prices[9]. Accordingly, our empirical model is specified thus:

$$g_t^G = \vartheta_0 + \vartheta_1 dr_t + \vartheta_2 nos_t + \vartheta_3 oilp_{SHK_t} + \vartheta_4 oilp_{VOL_t} + \vartheta_5 oilp_{ASM_t} + \varepsilon_t \ldots \ldots \ldots (25)$$

Though, our theoretical model provides valuable guidance for determining the variables to include in an optimal fiscal policy equation, nevertheless, when moving to an estimable equation, a few generalizations must be made. First, in the theoretical model, fiscal policy is set optimally in each period with no subsequent adjustment necessary. In reality, that is unlikely to be the case. To allow for the possibility that the government spending growth may be correlated through time, we include lagged values of government spending growth in the empirical equation. Similarly, fiscal policy adjustments to non-oil growth variable or the various oil price variables may take more than one period. We thus also allow for lags in those variables. Table 1 provides the definitions of the variables.

Table-1. Definitions of Model Variables

Variable (s)	Definition
g_t^G	Growth in government spending-measured by the log difference of total government expenditure as a percentage of GDP
dr	Discount rate differential between the household and the government. Lending rate is used for household discount rate while Monetary Policy Rate (MPR) is used for govt. discount rate
NOS_t	Non- oil sector growth- Measured by the log difference of Non-oil GDP as a percentage of total GDP
$oilp_{SHK}$	Oil price shock measured by the log difference of real crude oil prices, and using net oil price increase (NOPI)
OIL_{VOL_t}	Conditional Standard Deviation from a GARCH (1,1) model of real oil price. Using the Scaled oil price increase (SOPI)
$oilp_{ASM}$	Skewness (Asymmetry) in real oil price changes. This is measured through the Wald test
INF	Inflation, measured by the log difference of CPI.

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[9] Includes different channels through which oil prices affect fiscal policy. This includes, oil price changes, skewness in oil price (asymmetry effects) and oil price volatility.

3.2.2. Estimation Techniques and Procedures

We first examined the time-series characteristics of the variables to determine their order of integration, using the Dickey-Fuller Test with GLS Detrending and Ng-Perron tests, and thereafter conducted cointegration test for the existence of long run relationships. The empirical analysis employed the vector autoregressive model (VAR), as opposed to the restricted VECM, as it helped overcome the need for structural modelling by treating every endogenous variable in the system as a function of the lagged values of all of the endogenous variables in the system as well as for the non-linear transformations of oil price variables in capturing the asymmetric effects of oil price shock. Following the study by Mork (1989), which found that oil price increases had a greater influence on a country's macroeconomy than oil price decreases did, a great deal of literature has focused on the asymmetric effects of oil price shocks (Jones and Leiby, 1996; Sadorsky, 1999; Cong *et al.*, 2008; Babatunde *et al.*, 2013; Babatunde, 2015). Hence, the determination of the asymmetric effect of oil price shock on government fiscal behaviour in Nigeria. Finally, the structural characteristics of the variables were examined using the generalised impulse response functions (GIRFs) and variance decomposition (VD- separates the variation in the endogenous variables into the component shocks to the VAR). The generalized VAR framework of Koop *et al.* (1996) and Pesaran and Shin (1998) that yields variance decompositions which are invariant to the ordering was exploited. The responses obtained were quite unique and fully take account of the historical patterns of correlations observed amongst the different shocks.

3.2.2.1. The VAR Model

We defined our baseline VAR model as a four-dimensional column vector of the log difference of government spending (g_t^G), real oil price (op_t), log difference of non-oil sector output (nos_t) and real differential discount returns (dr_t), as $y = (op_t, nos_t, dr_t, g_t^G)$, and set up as follows:

$$y_t = A_1 y_{t-1} + A_1 y_{t-2} + \ldots + A_p y_{t-p} + v_t, \qquad t = 1, 2, \ldots, T \qquad (26)$$

p is the lag order which is determined by the AIC and the SIC information criterion. T is the size of the sample. A_1, A_2, A_p and B are parameter matrices, u_t is a column vector of errors with the properties of $E(v_t) = 0$ for all t, $E(v_s, v_t) = \varphi$ if s = t and $E(v_s, v'_t) = 0$ if s $\neq$ t, where φ is the covariance matrix. Consequently, v_t are assumed to be serially uncorrelated but may be contemporaneously correlated, while φ has non zero off diagonal elements.

3.2.2.2. Non-Linear Transformations of Oil Prices

The often large oil price rises and high volatility, and the evidence of asymmetric response of economic activity to oil price shocks has informed the need to explore different oil price specifications in order to test the relationships between variables from different views by previous researchers (Hamilton, 1983;1996; Cong *et al.*, 2008; Adeniyi *et al.*, 2011; Babatunde, 2014). Following the approach of Hamilton (1983) we define two non-linear transformations as follows:

$oilp_t^+$ = real oil price increases

$oilp_t^+$ = max (0; $oilp_t$).

Accordingly, we separated oil price changes into positive and negative changes in the belief that oil price increases may have a significant effect on the fiscal behaviour (though less likely for oil price decreases):

$NOPI_t^{nt}$ is Net oil price increases; and

$$NOPI_t^{nt} = (0, \log(oilp_t) - \max(\log(oilp_{t-1}), \ldots, \log(oilp_{t-n})) \qquad (27)$$

Equation (27) defines a monthly percentage change of real oil price in log level form from the past n months if that is positive and zero otherwise. This transformation of oil price as proposed by Hamilton (Hamilton, 1983;1996; Afshar *et al.*, 2008; Cong *et al.*, 2008; Adeniyi *et al.*, 2011; Babatunde, 2014) indicates a measure of how unsettling an increase in the price of oil is likely to be for the spending decisions of consumers and firms, and the need to compare the current price of oil with what it has been over the previous months rather than the previous month alone. Indeed, Hamilton (1983;1996) advised the use of the difference between the log of oil price in month t and its maximum value over the previous n months. If the difference is negative, no oil shock is said to have occurred. Thus, When $n = 1$, $NOPI_t^{nt}$ is just $oilp_t^+$.

3.2.2.3. Oil Price Volatility

Volatility was calculated using the standard deviation of change in crude oil price, as obtained from Conditional Standard Deviation from a GARCH (1,1) model, also called Scaled oil price or Standardized oil price increase (SOPI) by Lee *et al.* (1995). The calculations from monthly data followed the lead by Anderson and Bollerslev (2003) as follows:

$$\sigma_t^2 = \beta_0 + \sum_{j=1}^{q} \beta_j \varepsilon_{t-j}^2 + \sum_{i=1}^{p} \gamma_i \sigma_{t-i}^2 \qquad (28)$$

where $p \geq 0$, $q > 0$; $\beta_0 > 0$, $\beta_j \geq 0$, $\gamma_i \geq 0$, $j = 1, \dots, q$ and $i = 1, \dots, p$.

Equation (28) is the GARCH (*p,q*) model where p and q denote the lagged terms of the conditional variance and the squared error term respectively. The ARCH effect is denoted by $\sum_{j=1}^{q} \beta_j \varepsilon_{t-j}^2$ and the GARCH effect $\sum_{i=1}^{p} \gamma_i \sigma_{t-i}^2$. Using the lag operator, equation (28) is expressed equivalently as:

$$\sigma_t^2 = \beta_0 + \beta(L)\varepsilon_t^2 + \gamma(L)\sigma_t^2 \qquad (29)$$

Similarly, $\gamma(L)\sigma_t^2 = \sum_{i=1}^{p} \gamma_i \sigma_{t-i}^2$ and $\gamma(L)$ is the polynomial lag operator $\gamma_1 L + \gamma_2 L^2 + \cdots + \gamma_p L^p$. By further simplification, equation (29) can be expressed as:

$$\sigma_t^2 = \beta_0 [1 - \gamma(L)]^{-1} + \beta(L)[1 - \gamma(L)]^{-1} \varepsilon_t^2 \qquad (30)$$

The unconditional variance, however, is smaller when there is no evidence of volatility:

$$\sigma_t^2 = [1 - \beta(L) - \gamma(L)]^{-1} \beta_0 \qquad (31)$$

3.2.2.4. Symmetric Effect of Oil Price Shocks

First, we separated $oilp_t$ into positive and negative oil price changes as follows:

$$op_t^+ = \max(0, oilp_t), \text{ and } op_t^- = \min(0, oilp_t)$$

Thereafter, we constructed a five variable VAR $(oilp^+, oilp^-, nos, dr, g_t^G)$ model. A Wald coefficient test was used to examine whether the coefficients of positive and negative oil price shocks in the VAR were significantly different. Another six-variable VAR $(oilp^+, oilp^-, nos, dr, g^G, inf)$ model was then constructed to examine the robustness of the results. Growth in government spending as proxy for fiscal behaviour is defined by equation (32) and (33):

$$g_t^G = \beta_0 + \sum_{i=1}^{p} \beta_{2i} \, oilp^+_{t-i} + \sum_{i=1}^{p} \beta_{3i} \, oilp^-_{t-i} + \sum_{i=1}^{p} \beta_{1i} nos_{t-i} + \sum_{i=1}^{p} \beta_{4i} dr_{t-i} + \sum_{i=1}^{p} \beta_{5i} g_{t-i}^G$$
$$+ \varepsilon_t \qquad (32)$$

$$g_t^G = \alpha_0 + \sum_{i=1}^{q} \alpha_{2i} \, oilp^+_{t-i} + \sum_{i=1}^{q} \alpha_{3i} \, oilp^-_{t-i} + \sum_{i=1}^{q} \alpha_{1i} \, nos_{t-i} + \sum_{i=1}^{q} \alpha_{4i} \, dr_{t-i} + \sum_{i=1}^{q} \alpha_{5i} \, inf_{t-i} + \sum_{i=1}^{q} \alpha_{6i} \, g_{t-i}^G$$
$$+ \varepsilon_t \qquad (33)$$

The null hypothesis are H_0: $\beta_{2i} - \beta_{3i} = 0$ $i = 1, \dots, p$ (or H_0: $\alpha_{2i} - \alpha_{3i} = 0, i = 1, \dots, q$),

Where $oilp^+$ and $oilp^-$ are positive and negative oil price shocks; p and q are lag orders, which are determined based on Akaike Information criterion or Schwarz Criterion.

3.2.3. Data Description and Sources

The study utilizes secondary data from 1970 to 2013 based on data availability. Annual data on exchange rate of the Naira to US dollar and the consumer price index (CPI), total government expenditure, discount rates, and non-oil GDP were sourced from the Central Bank of Nigeria- Annual report (various issues) and Statistical Bulletins, while monthly brent oil price (dollars per barrel) was obtained from the US Energy Information Administration (EIA) annual reports.

Table-1. Dickey-Fuller Test with GLS Detrending (DFGLS) unit root test results

Variables	Constant (Model 1)		Constant and Linear Trend (Model 2)		Order of Integration
	Levels	First Diff.	Levels	First Diff.	
Government spending	0.4851	-2.9395*	-1.0093	-2.5261	I(1)
Oil Price	-0.6181	-2.5579**	-2.0417	-4.7870*	I(1)
Discount rate differential	-1.5177	-14.157*	-1.7135	-14.160*	I(1)
Inflation	0.2232	-14.514*	-1.6374	-5.2643*	I(1)
Non-oil growth	-0.5397	-4.6724*	-1.7325	-5.9815*	I(1)
Asymptotic Critical Values:					
1%	-2.5758	-2.5759	-3.4611	-3.4611	
5%	-1.9423	-1.9423	-2.9278	-2.9278	
10%	-1.6157	-1.6156	-2.6361	-2.6361	

Source: Author's Calculations, (2015)
Note: The Null Hypothesis is the presence of unit root. Model 1 includes a constant, Model 2 includes a constant and a linear time trend. *,**,***, significant at 1%, 5%, and 10% respectively. Lag length selected based on Schwarz information criterion (SIC). The Elliott-Rothenberg-Stock DF-GLS test statistics are reported.

4. EMPIRICAL ANALYSIS

4.1. Time Series Properties

The unit root tests results are presented in Tables 1 and 2. Going by the tables, the null hypothesis that the variables have unit root are not rejected at the conventional test bound for the DF-GLS and NP-test. We, therefore, accepted that the series are integrated of order one (I(1)).

4.2. Cointegration Analysis

Following the unit root tests results, we applied the Johansen test for co-integration relying on the trace and max-eigen value statistics. However, the lag length of the VAR must be determined a priori. Five different information criteria including Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), Hannan-Quinn Information Criterion (HQ), Final Prediction Error (FPE) and Sequential Modified LR test Statistic (LR) was explored in arriving at the optimal lag length. The five information criteria for the three models in Table 3 show that the optimal lag length criterion is one. Both the trace test and Max-Eigen statistics indicate one cointegrating equations at 1% level of significance (See Table 4). Based on this evidence, we concluded that a long run relationship exists among the variables.

Table-2. Ng-Perron unit root test results

Variables	Constant (Model 1)		Constant and Linear Trend (Model 2)		Constant (Model 1)		Constant and Linear Trend (Model 2)		Order of Integration
	Levels (MZ_a)	First Diff (MZ_a)	Levels (MZ_a)	First Diff (MZ_a)	Levels (MZ_t)	First Diff (MZ_t)	Levels (MZ_t)	First Diff (MZ_t)	
Government spending	0.4212	-1.4332	-2.57553	-6.9464*	0.5253	-0.6901	-0.9471	-3.154**	I(1)
Oil Price	-1.0446	-9.8590*	-9.1631	-32.515*	-0.6094	-2.1883*	-1.9975	-3.9184*	I(1)
Discount rate differential	-4.5270	-106.90*	-6.1120	-106.90*	-1.5043	-7.3110*	-1.6913	-7.3110*	I(1)
Inflation	0.2582	106.99*	-2.8383	-106.99*	0.2554	-7.3083*	-1.1099	-7.3103*	I(1)
Non-oil growth	0.8142	-36.626*	2.1634	-18.308*	0.9162	-2.9884*	1.3610	5.2398*	I(1)
Asymptotic Critical Values:									
1%	-13.800	-13.800	-23.800	-23.800	-2.580	-2.580	-3.420	-3.420	
5%	-8.100	-8.100	-17.300	-17.300	-1.980	-1.980	-2.910	-2.910	
10%	-5.700	-5.700	-14.200	-14.200	-1.620	-1.620	-2.620	-2.620	

Source: Author's Calculations, (2015).

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Note: The Null Hypothesis is the presence of unit root. Model 1 includes a constant, Model 2 includes a constant and a linear time trend. *,**,***, significant at1%, 5%, and 10% respectively. Ng-Perron test statistics are reported. Spectral GLS-detrended Auto Regressive based on Schwarz Information Criterion (SIC).

Table-3. VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	316.6070	NA	6.16e-07	-2.949122	-2.885790	-2.923525
1	1716.977	2734.685	1.31e-12*	−16.00922*	−15.69256*	−15.88123*
2	1727.970	21.05280	1.37e-12	-15.96198	-15.39200	-15.73161
3	1743.008	28.23129*	1.39e-12	-15.95290	-15.12959	-15.62014
4	1751.281	15.21995	1.49e-12	−15.88001	−14.80337	−15.44486

Source: Author's Computation, (2015). * indicates lag order selected by the criterion.

Table-4. Johansen-Juselius Maximum Likelihood Cointegration Test Results

| Hypothesized No. of CE(s)	Eigen value	Max-Eigen value	Critical value		Trace statistic	Critical value	
			5 percent	1 percent		5 percent	1 percent
None	0.5782	39.7159**	33.46	38.77	79.61812**	68.52	76.07
At most 1	0.2883	15.64656	27.07	32.24	39.90216	47.21	54.46
At most 2	0.2498	13.22578	20.97	25.52	24.25559	29.68	35.65
At most 3	0.1855	9.443536	14.07	18.63	11.02981	15.41	20.04
At most 4	0.0338	1.586272	3.76	6.65	1.586272	3.76	6.65

Source: Author's Computation, (2015). *(**) denotes rejection of the hypothesis at the 5% (1%) level

4.3. Impulse Response Analysis

This section analyses the fiscal response of government to oil price volatility. Following Sims (1980) most results that come from a VAR model especially the estimated coefficients are not statistically significant. Therefore, we explored the generalized impulse response functions (GIRF) and variance decompositions.

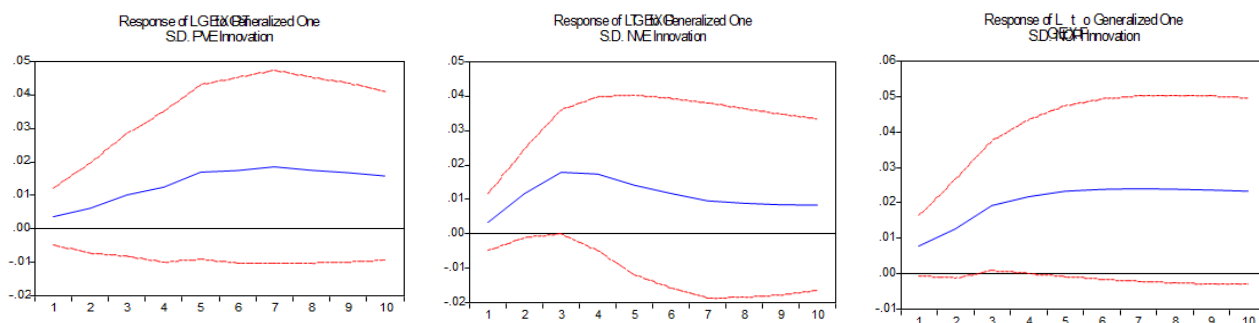### 4.3.1. Effects of Oil Price Shocks

Figure 1 presents the generalized impulse response analysis for government spending and showed its responds positively to positive oil prices shocks but move to zero in the 5th month. Negative oil prices shocks also impacted positively on government spending after the initial period but its effect is felt from the 7th month when the government spending begins to decline. The net oil price oil increase, however, indicates that government spending will be affected negatively in the third month if there is an oil price shock that is persistent. This reflects the uneven impact on the real price of oil shocks on the government spending. Overall, shocks in the crude oil market that raise the real price of oil tend to improve the government spending but shocks that reduces the price of oil diminish the government spending. This result is consistent with the findings of Farzanegan (2011); Pieschacon (2012) and González et al. (2013).
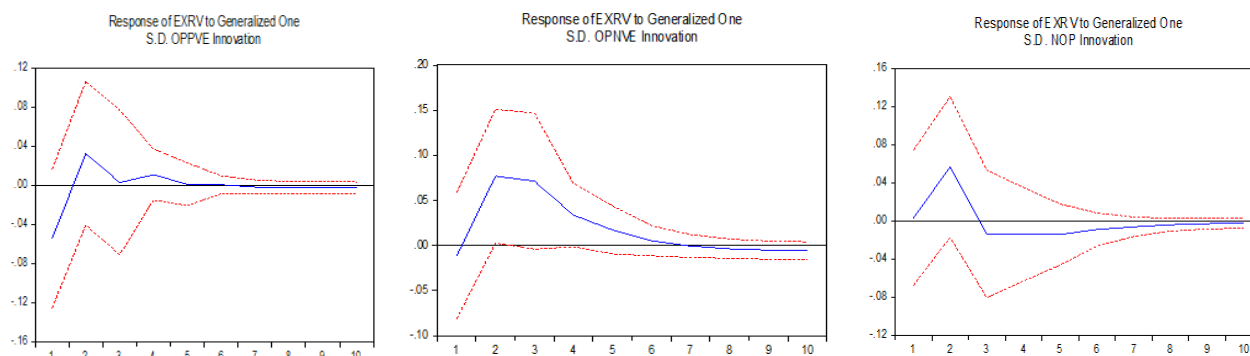
A. The response of government spending generalized one standard

B. The response of the government spending to a generalized one standard

C. The response of the government spending to a generalized one standard

deviation positive oil price shocks (OPPVE) innovation.

deviation negative oil price shocks (OPNVE) innovation.

deviation net oil price increases (NOPI) innovation.

Figure-1. Generalized impulse response results of Government spending to oil price shocks (NOPI- non-linear transformation).

Source: Authors Computations, (2015)

A. The response of the govt. expenditure a to a generalized one standard deviation positive deviation scaled oil price shocks (PVE) innovation.

B. The response of the govt. expenditure to a generalized one standard deviation negative oil price shocks (NVE) innovation.

C. The response of the govt. expenditure to generalized one standard price increases (SOPI) innovation.

Figure-2. Generalized impulse response results of govt. expenditure to oil price volatility (GARCH(1,1)-non-linear transformation).

Source: Authors Computations, (2015)

4.3.2. Effects of Oil Price Volatility

Figure 2 presents the generalized impulse response analysis for government spending using GARCH (1,1) approach also known as the scaled oil price increase. The different shocks from oil prices causes expenditure to improve accordingly. This is expected given that negative supply shocks or positive demand shocks in the crude oil market improves the oil trade balance of the government, to the extent that such shocks increase the price of oil as well as revenue. This result is consistent with the findings of Videgaray-Caso (1998) and El Anshasy and Bradley (2012).

4.4. Variance Decomposition (VD) Error

Tables 5a and 5b show the results of the VD of oil price shocks within a 10 month period horizon. From Table 5a, the VD reveals that 2.62% and 2.55% of future changes in the spending pattern is due to changes in the oil price in the 5th and 10th period. This implies that oil price shocks have a significant future impact on government expenditure. Inflation was added to the VAR model for robustness check.

Table-5a. Variance Decomposition of Forecasting Error in Government Spending due to Oil Price Shock

Dependent Variable	Period	Standard Error	Govt. Expenditure	Inflation	Non-oil growth	NOPI	Discount rate diff.
Govt. Expenditure	1	0.0336	100.0000	0.0000	0.0000	0.0000	0.0000
	5	0.0843	96.6629	0.2239	0.3044	2.6244	0.1844
	10	0.1157	94.7605	0.2119	2.2933	2.5546	0.1797
Inflation	1	7.9091	13.4424	86.5576	0.0000	0.0000	0.0000
	5	20.0009	14.2899	82.4955	2.4499	0.3034	0.4612
	10	22.0352	17.2140	79.2440	2.5248	0.3719	0.6424
Non-oil growth	1	0.0398	0.1433	0.0005	99.8562	0.0000	0.0000
	5	0.0781	0.6219	0.9857	96.9197	0.6159	0.8566
	10	0.0829	7.0481	2.2535	88.7732	0.5745	1.3918
NOPI	1	0.0367	1.1088	0.0352	2.2669	96.5891	0.0000
	5	0.0379	1.6056	1.6067	2.9115	92.7704	1.1058
	10	0.0379	1.6105	1.6099	2.9317	91.9818	1.8660
Discount rate diff.	1	8.6261	1.9493	0.3345	1.5396	0.1191	96.0574
	5	9.0921	8.2279	0.3752	4.7750	1.7119	84.8830
	10	9.1228	8.8039	0.3974	4.9655	1.7167	84.1164

Source: Author's Calculations, (2015)

Table 5b presents the forecast error VD when the scaled oil price increase is used to capture oil volatility. Volatility in oil price had 0% initial impact on government spending but increased to about 5.77% in the 5ᵗʰ period before an eventual marginal decline to 4.71% at the end of the 10ᵗʰ period. It contributes less than 1% to the deviations in the other macroeconomic variables except for inflation in the 5ᵗʰ and 10ᵗʰ period(s). It is noted that the results from the use of alternative oil price movement measures, i.e. Net oil price increase (NOPI), is quantitatively indistinguishable from the results in Table 5b. Also, irrespective of the oil shock measure adopted the proportion of the variances in the forecast errors of inflation and discount rate differential explained by oil shocks remains indiscernible. Instructively, neither of the oil price shock following the net oil price increase method nor the conditional variance GARCH (1,1) approach, recognises the role of the private sector in oil price movement captured by non-oil growth. It is easily seen that volatility in oil price and oil price shock contribute less than 1% to variations in private sector development.

4.5. Asymmetric Effects of Oil Price Shocks

Following the separation of oil price changes to positive and negative, we conducted a Wald test to determine whether the coefficient of positive or negative oil price shocks in the VAR are significantly different as specified in equations (32) and (33). The Full Information Maximum Likelihood (Marquardt) technique was then utilized to estimate the system equation. Table 6 shows the results obtained. Going by the chi-square test statistics, the results are insignificant. Likewise, the asymmetric effect of positive and negative oil price shocks on the government spending lacks statistical significance. This implies a symmetrical effect of statistically insignificant positive and negative oil price shocks on the fiscal response of government in Nigeria. This result is in contrast with that of Akpan (2009) who scrutinized the asymmetric effects of oil price shocks on the Nigerian economy, which reported a strong positive relationship between positive oil price changes and real government expenditure.

Table-5b. Variance Decomposition Forecasting Error in Government Spending due to Oil Price Volatility

Dependent Variable	Period	Standard Error	Govt. Expenditure	Inflation	Non-oil growth	SOPI	Discount rate diff.
Govt. Expenditure	1	0.0335	100	0.0000	0.0000	0.0000	0.0000
	5	0.0842	93.6226	0.1787	0.3182	5.7748	0.1057
	10	0.1157	84.8183	0.1780	2.1926	4.7066	0.1045
Inflation	1	7.8579	12.8816	87.1194	0.0000	0.0000	0.0000
	5	20.0953	13.95	80.9528	2.4535	1.4394	1.2046
	10	22.0548	16.3977	78.3156	2.5164	1.4702	1.3001
Non-oil growth	1	0.0399	0.0926	0.0022	99.9052	0.0000	0.0000
	5	0.0782	0.6139	1.0589	98.2475	0.0182	0.0614
	10	0.0829	6.6924	2.2438	90.7632	0.1242	0.1763
SOPI	1	0.0689	7.0196	1.8054	2.3477	88.8273	0.0000
	5	0.0764	11.5558	2.8615	2.6233	81.0519	1.9075
	10	0.0767	11.6436	3.1032	2.6123	79.7540	2.8869
Discount rate diff.	1	0.0443	14.9968	0.3095	0.0164	0.7751	83.9030
	5	0.0884	21.4332	0.3583	15.6795	0.1887	62.3403
	10	0.1138	27.8509	1.1339	22.9213	0.2048	47.8891

Source: Author's Calculations, (2015)

Table-6. Wald test for the asymmetric impact of positive and negative oil price shocks on Government spending

Variable	Chi-square test results $(g_t^G, op^+, op^-, DR, NOS)$ H₀: $\beta_{1i} = \beta_{2i}$
Government spending	0.2076 (0.7815)
	Chi-square test results $(g_t^G, op_t^+, op_t^-, DR, NOS, INF_t)$ H₀: $\alpha_{1i} = \alpha_{2i}$
Government spending	0.0114 (0.9334)

Source: Author's Calculations, (2015)

Note: *, **, ***, denote statistical significance at 1%, 5%, 10% levels. Chi square values are reported. The probability is reported in the parenthesis.

5. CONCLUSIONS AND POLICY IMPLICATIONS

This study examined the impact of oil price volatility on the fiscal behaviour of the government in Nigeria using data for the period 1970 to 2013. Modern econometric approaches/techniques were deployed. Our findings showed that real oil prices affected government expenditure dynamics and that there was a long run relationship between real oil prices and government spending, non-oil growth, inflation and discount rate differential. However, there was observed robustness of the estimates to different non-linear transformation of the real oil prices and inclusion of additional variables. And very instructive, the asymmetric effect of oil price shocks on the government spending was not significant. Nevertheless, real oil prices had significant forecasting power for government spending over the long run horizons. By and large, we concluded that there was important linkages between oil price and the government spending movement in Nigeria. Given that crude oil is an exhaustible resource, it portends dire implication on budget management in Nigeria in the future. Hence, the imperatives of diversifying the sources of foreign exchange inflow and revenue by reinvigorating the huge agricultural potentials which has been ignored since the discovery of oil in the 1970s as well as take advantage of its rich untapped solid minerals deposit. Also, there is the need for effective management of oil windfall in mitigating the effect(s) of shocks. Nigeria should also invest heavily in infrastructural development especially in the provision of steady power and good road networks in order to create the enabling environment for an enduring industrial development.

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