*Journal of Risk and Financial Studies*
Vol. 2, No. 1, 2021, pp. 71-87

**ARF INDIA**
Academic Open Access Publishing
*www.arfjournals.com*

# Oil Price, Oil Revenue, Non-oil Revenue and Government Spending in Nigeria: A SVAR Analysis of Revenue and Expenditure Relationship

**David Oluseun Olayungbo**

*E-mail: doolayungbo@oauife.edu.ng*

*Received: 09 February 2021; Revised: 16 February 2021;*
*Accepted: 26 February 2021; Publication: 2 June 2021*

***Abstract:*** *The presentpaper examines the dynamic relationship among oil price, oil revenue, non-oil revenue and government expenditure between the periods of 1981 to 2017.This is an attempt to further confirm the revenue and expenditure relationship in Nigeria as an oil-revenue dependent economy. The structural model of SVAR is adopted to account for the exogeneity of the global oil price to the Nigeria's economy. The Johansen cointegration test confirms the oil price exogeneity and shows long run relationship among the variables. The finding of the study reveals the existence of both revenue-spend hypothesis and spend-tax hypothesis in Nigeria. Finally, this study suggests that more spending and diversification efforts should be directed towards generation of non-oil revenue for economic sustainability of the country.*

***Keywords:*** *Oil price, oil revenue, spending, SVAR, Nigeria*

## 1. INTRODUCTION

Before Nigeria started oil production in large quantity prior to 1960, agriculture was the main source of revenue, there were significant earnings coming from cocoa, palm oil, rubber, groundnut and other agricultural produce. Agriculture was the leading sector and was the highest employer of labour in terms of employment generation. World Bank (2013) asserted that before oil exploration in Nigeria, agricultural sector contributed about 95% of foreign exchange earnings, generated over 60% of employment capacity,contributed about 56% of gross domestic earning and provided about 80% of federal revenue. However, with the discovery of oil, agriculture only contributes only 22% to the production capacity of Nigeria's economy. Oil revenue has become the main source of foreign exchange earnings and government financing. Oil now constitutes 80% of revenue, 95% of export earnings, 83% of Federal government revenue, 65% of government budgetary revenues and 95% of foreign exchange earnings, while the non-oil sector, in spite of its recent improvement, contributes only 20% to the Nigeria's economy (Central bank of Nigeria (CBN), 2018).

In the last four decades, Nigeria's oil sector has continued to drive the nation's economy. Although the non-oil revenue is low, government has been taking steps to diversify the economy in the direction of non-oil economic activities like manufacturing, agriculture and extraction of mineral resources. Available data showed that in 2000 oil revenue was ₦1592 billion and non-oil was ₦314 billion, in 2008 oil revenue was ₦6531 billion and non-oil has increased by 325% to ₦1336 billion. By 2015, oil revenue was ₦3830 billion and non-oil revenue was ₦3082b, in 2016 due to economic recession experienced in the country, oil revenue fell to₦2693 billion while non-oil was above with₦2985 billion (Centre for Study of Economies of Africa, 2017).The increase in non-oil revenue has continued to reflect an upward increase in government spending such that it increased from ₦4767.37 billion in 2015 to ₦5320.42 billion in 2016 and ₦9532.27 billion in2017 (CBN, 2018). This line of argument is also supported by the fact that 70 percent of the income distributed among the federating units in 2016 by the federal government came directly from non-oil revenue sources (Adedokun, 2019).Figure 1 corroborates the contribution of oil price, oil revenue and non-oil revenue to government spending, where the global oil price, oil revenue, non-oil revenue and government spending moved togetherover the study period.

In the global scene, there are studies that have examined revenue and expenditure relationship. Hye and Jalil (2010) for Romania and Saunoris and Payne (2010) for United Kingdom (UK) found expenditure-revenue causality where expenditure Granger causes revenue. Studies like Eiita and Mbazima, (2008) for Namibia, Wolde-Rafael (2008) for 13 selected African countries and Magazzino (2012) for Italy reported revenue-expenditure causality where the level of revenue dictates the amount expended. Recent literature on the nexus between oil price shocks and government spending in Nigeria such as Olomola and Adejumo (2006), Akpan (2009), Ally et al (2014), Aregbeyen and Bashir (2015), Omitogun et al. (2018), and Adedokun (2018) found that oil price shocks have substantial effects on government spending. On the other hand,studies like Olusegun (2008) did not recordany remarkable impact of oil price on government spending in Nigeria. In another paper, the dynamic analysis of Olayungbo and Olayemi (2018) also supported the Keynesian and spend-tax hypothesis thatgovernment spending to Granger cause non-oil revenue and economic growth. Moreover, in a more recent study, Adedokun (2019) examined the forecast of non-oil revenue and oil revenue in Nigeria and found that the year 2023 to be the year non-oil revenue would overtake oil revenue income in Nigeria. This present study is, however, different from the past studies in Nigeria because it accounts for the period when the non-oil revenue sources are

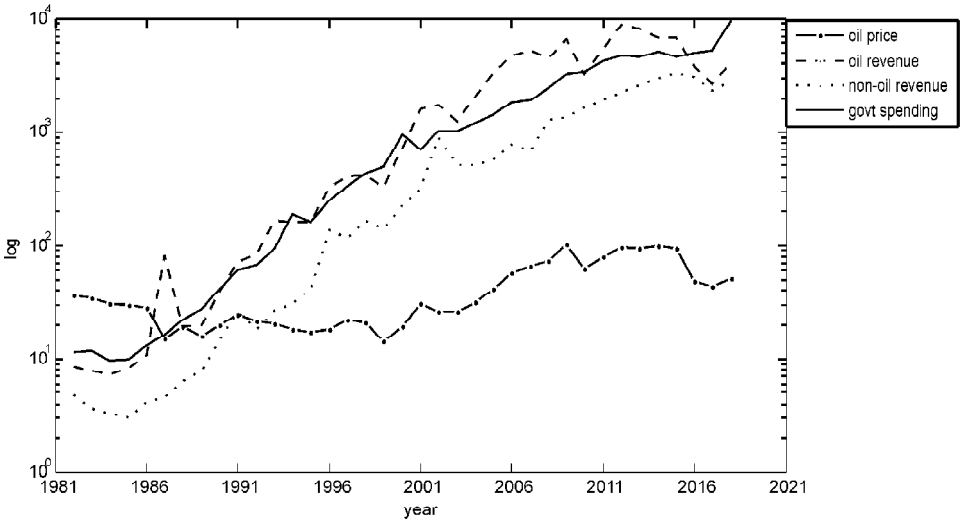



**Figure 1: The plot of growth rate of oil price, oil revenue, non-oil revenue and government spending**

improving due to the diversification efforts and policies of the government. The remaining sections of this study is listed as: Section 2 gives the theories on revenue and expenditure. Section 3 reviews the literature, while the data sources, variable measurement and the methodology are presented in section 4. Lastly, section 5 and 6 present the empirical analysis, conclusion and policy implications.

## 2. THEORIES ON REVENUE AND SPENDING

The Keynesian school of thought is the pioneer theory on expenditure in economic literature and history. Keynes (1936) argued that absolute reliance on the forces of demand and supply to ensure sustainable equilibrium in the economy may not be feasible. Failure of the market system to lift the United States (US) from the great depression in 1936 made Keynes to propose government intervention in terms of spending to rescue the US economy from the path of negative growth. As a result of the emancipation of the US economy from depression due to government intervention, countries have continued to adopt government spending to direct their economies to the path of growth and development. Secondly, another theory is the revenue-spend hypothesis. According to Buchanan and Wagner (1978) and Friedman (1978), government expenditure depends on revenue which indicates a unidirectional causality running from revenues to expenditure. The revenue-spend hypothesis was originally pioneered by Friedman (1978) and Buchanan and Wagner (1978), they argued that tax increase promotes

expenditures.The spend-revenue hypothesis was developed by Barro (1974) and Peacock and Wiseman (1979).The theory states that expenditure is determined earlier in time to revenues which is regarded as spend and revenue hypothesis. Peacock and Wiseman (1979) arguedthat increase in expenditures due to positive shockscan lead to increase in revenues. Hence, a unidirectional causality runs from expenditure to revenues. In addition,fiscal synchronization as argued by Musgrave (1966) and Meltzer and Richard (1981) posited that revenue in form of taxes and expenditureare realised together. This implies that both taxes and spending Granger cause each other.Another theory is the fiscal separation hypothesis. Baghestani and McNown (1994) give evidence about fiscal separation or fiscal neutrality in which revenue and spending are not correlated.This theory asserts that there is no relationship between spending and revenue. The amount spent does not depend on revenue generated. Lastly is the Ricardian Equivalence (RE) propounded by Barro (1974) that deficits and taxes have the same effects on consumers' spending. According to the theory, the increase in the saving of the consumers due to lower taxes is from the belief that government would take back the tax reduction through an increase in the future tax. Theoretically, the link from oil price to the non-oil sector is through the Dutch disease. The boom in the oil sector usually shifts all resources from the non-oil sector to oil sector and result in a less diversified economy (Mieiro and Ramos, 2010). The booming oil export sector usually bring about increase in marginal productivity and thus pay factor inputs relatively higher income than other sectors. This direct effect is the lower output in the non-oil sectors of the economy due to massive influx of factor inputs to the growing oil sector. The resulting appreciation of the real exchange ratedue to the oil boom discouragesnon-oil exports and the real sectorsof the economy.

## 3. LITERATURE REVIEW

Hamdi andsbia (2013) analyzed the relationship between oil revenue, government spending and economic growth in Bahrain, using a multivariate co-integration method and error-correction model with data gathered from 1960 to 2010. The results suggest that oil revenues is the main determinants of government spending and the main source of finance to the country.

In another paper, Dizaji (2014) studied the connection between government revenue and expenditure in relation to oil price for Iran with annual data from 1970 to 2008. The study adopted SVAR to model exogeneity of oil price. The impulse response function shows that oil revenue shock has larger effects than the global oil price on Iran's economy. The causality result showed revenue-expenditure hypothesis exists in the

study area. The study suggested that Iranian sanctions by the US matters for oil revenue generation and spending in Iran.In Nigeria,Emelogu and Uche (2010) conducted a study to investigate the relationship between public revenue and expenditure for the period of 1970 to 2007. The result discovered longrun relationship and a unidirectional causality emanating from public revenue to expenditure in the study area. Aregbeyen and Taofik (2012), also for Nigeria, investigated the long run relations between the government revenues and expenditures for the yearof 1970 to 2008. Using ARDLexperiment, the outcome showed a long run equilibrium between public expenditures and revenues and the tax-spend hypothesis was established. In the same year, for the same country, Ogujiubaand Abraham (2012) also looked into the revenue-spending hypothesis longerannual data span from 1970 to 2011. The study reported that revenue and expenditure were linked and that causality moved from revenue to expenditure. Aregbeyen and Kolawle (2015) evaluated oil revenue, government spending and economic growth in a shorter data span from 1980 to 2012. Time series data were analysed and the findings revealed that both government spending and growth are caused oil revenue, the study suggested increase in capital projects and spending on the oil subsectors.

In addition, Saka *et al* (2015) tested the validity of fiscal synchronization hypothesis from the year 1961 to 2013 using disaggregated data in Nigeria. The study found evidence of bidirectional causality moving between recurrent expenditure and oil revenue and between recurrent expenditure and non-oil revenue.This findings validate the presence of fiscal synchronization in Nigeria according to the study. In recent years, Abdulrasheed (2017) investigated the possible causal connection between spending and revenue in Nigeria ranging from 1986 to 2015. The findings showed that there is presence of spend-revenue connection in Nigeria. Using exogeneity restriction, Adedokun (2017) investigated the effect of oil shocks on spending and revenues nexus employed data from 1981 to 2014 for Nigeria. The study used structural vector autoregression (SVAR). The SVAR results showed the predictive power of oil revenue shocks have high predictive power for government spending both in the long and short–run. The VAR and VECM also substantiate the result of SVAR. The study found fiscal synchronization between the oil revenues and total government expenditure, with spend-tax hypothesis existing in the long-run between expenditure and revenue. In recent papers, Olayungbo and Olayemi (2018) examined the connections of non-oil revenue, government spending and economic growth in Nigeria. The study spanned from the period of 1981 to 2015. After employing error correction model, impulse response and Granger causality test to analyse the variables, the study supports the

Keynesian expenditure-revenue hypothesis for Nigeria. Finally, Adedokun (2019) investigated the number of years non-oil income would take to overtake oil income for the period of 1970 to 2014 in Nigeria. The result showed that it would take a period of 9 years for non-oil revenue to match oil revenue while it would take a period of four hundred and sixty six years for non-oil exports to record the same growth with oil exportsapplying autoregressive integrated moving average (ARIMA) model.

## 4. SOURCESOF DATA AND VARIABLE MEASUREMENTS

The data used for this study is from the year 1981 to 2017. The base year is selected due to data availability to the most recent year. The variables such as oil revenue, non-oil revenue and government spending were sourced from CBNStatistical Bulletin (2018) whilethe global oil price was sourced British Petroleum Statistical Review of World Energy (2018). In terms of measurement, the price of crude oil is measured in United States (US) dollars. Oil price is the annual price at which oil is sold per barrel in the international oil market. This price is usually influenced majorly by organization petroleum exporting countries (OPEC), non-OPEC, Saudi Arabia and the US supply, therefore, it is an exogenous variable to the Nigerian economy. Oil revenue is the income that accrues from the sales of crude oil at the international market, as well as the domestic sales of the commodity and royalties received from oil companies operating in Nigeria. Oil revenue is measured in naira. Moreover, non-oil revenue refers to all other revenue sources apart from oil. It includes taxation, rent, royalties, excise duties, custom, grants, borrowing, returns from direct investment, agricultural produce, manufactures, construction and mining. Non-oil revenue is also measured inthe local currency, naira. Finally, government spending refers to expenditure from income accrued to the government in order to achieve societal goals. Government spending is divided into capital expenditure and recurrent expenditure. Capital expenditure are money expended on capital project such as rural electrification, construction of power stations, road networks, health care facilities, stadia et cetera. Recurrent expenditure, on the other hand, is government spending on recurring expenses such as wages and salaries, maintaining of public property, administrative cost and so on. It is measured in naira.

### 4.1. The SVAR Model

The structural vector autoregression (SVAR) proposed by Amisano and Giannini (1997) and Blanchard and Quah (1989) metamorphosed from vector autoregression (VAR) of Sims (1980) due to the identification problem associated with VAR. The SVAR through its identification structure, can

be used to model the dynamic interdependence among variables of an economic system. The starting point of the SVAR is from VAR of order $\rho$ specified as:

$$Y_t = B_0 + B_1 Y_{t-1} + B_2 Y_{t-2} + \cdots + B_\rho Y_{t-\rho} + \varepsilon_t \quad (1)$$

Pre-multiplying the error term, $\varepsilon_t$ with matrix $B$, the autoregressive structure, Eq.(1) becomes:

$$Y_t = B_0 + B_1 Y_{t-1} + B_2 Y_{t-2} + \cdots + B_\rho Y_{t-\rho} + B\varepsilon_t \quad (2)$$

Multiplying the dependent variable $Y_t$ with matrix $A$ called the instantaneous relation Eq.(2) becomes:

$$AY_t = B_0 + B_1 Y_{t-1} + B_2 Y_{t-2} + \cdots + B_\rho Y_{t-\rho} + B\varepsilon_t \quad (3)$$

Inverting matrix $A$ gives:

$$Y_t = A^{-1}B_0 + A^{-1}B_1 Y_{t-1} + A^{-1}B_2 Y_{t-2} + \cdots + A^{-1}B_\rho Y_{t-\rho} + A^{-1}B\varepsilon_t \quad (4)$$

The reduced form of the SVAR can then be written as:

$$y = \beta_0 + \beta_1 y_{t-1} + \beta_2 y_{t-2} + \cdots + \beta_\rho y_{t-\rho} + u_t \quad (5)$$

Where $\beta_0 = A^{-1}B_0, \beta_1 = A^{-1}B_1, \beta_\rho = A^{-1}B_\rho$ and $u_t = B\varepsilon_t$ with $A^{-1} = I$ from Eq.(4) and (5). The SVARis mainly about the structural innovation denoted by $u_t = B\varepsilon_t$ which the concern of this study is. The structural innovation can be stated in a matrix form as:

$$\begin{pmatrix} \Delta(oilp) \\ \Delta(oilr) \\ \Delta(noilr) \\ \Delta(govs) \end{pmatrix} = \begin{pmatrix} b_{11}(L) & b_{12}(L) & b_{13}(L) & b_{14}(L) \\ b_{21}(L) & b_{22}(L) & b_{23}(L) & b_{24}(L) \\ b_{31}(L) & b_{32}(L) & b_{33}(L) & b_{34}(L) \\ b_{41}(L) & b_{42}(L) & b_{43}(L) & b_{44}(L) \end{pmatrix} \begin{pmatrix} \varepsilon_t oilp \\ \varepsilon_t oilr \\ \varepsilon_t noilr \\ \varepsilon_t govs \end{pmatrix} \quad (6)$$

Following the study of Adedokun (2018), we can equally assume in the SVAR modelthat oil revenue, non-oil revenue and government spending depend on the exogenous global oil price.

$$\begin{pmatrix} \Delta(oilp) \\ \Delta(oilr) \\ \Delta(noilr) \\ \Delta(govs) \end{pmatrix} = \begin{pmatrix} b_{11}(L) & 0 & 0 & 0 \\ b_{21}(L) & b_{22}(L) & 0 & 0 \\ b_{31}(L) & b_{32}(L) & b_{33}(L) & b_{34}(L) \\ b_{41}(L) & b_{42}(L) & b_{43}(L) & b_{44}(L) \end{pmatrix} \begin{pmatrix} \varepsilon_t oilp \\ \varepsilon_t oilr \\ \varepsilon_t noilr \\ \varepsilon_t govs \end{pmatrix} \quad (7)$$

Where $\Delta(oilp), \Delta(oilr), \Delta(noilr)$ and $\Delta(govs)$ are structural disturbances of oil price, oil revenue, non-oil revenue, and government spending. The model satisfies the assumption of $E(u_t) = 0, Var(u_t) = \delta^2$, and $\varepsilon_t^{oilp}, \varepsilon_t^{oilr}, \varepsilon_t^{noilr}$ and $\varepsilon_t^{govs}$ are the reduced-formresiduals. The restrictions on the structural parameters in the matrix are imposed followingstudies, such as, Sims (1998), Dizaji (2014), Adedokun (2017).The oil price are assumed to be exogenous such that the oil price shock is not contemporaneously affected by other shocks. The supply and demand of oil in the world market help to determine the optimal oil price, so a single economy might not have a significant domination in the global market (Chuku et al., 2011). Therefore, the exogeneity of oil price appears to be a reasonable assumption. Hence, four restrictions are imposed such that the first row vector implies $\Delta(oilp) = \varepsilon_t oilp$. Furthermore, the oil revenue is assumed to be affected by shocks to itself and oil price shock only. Therefore, two restrictions are imposed on the second row vector such that $\Delta(oilr) = b_{21}(L)\varepsilon_t oilp + \varepsilon_t oilr$. On the other hand, non-oil revenue is assumed to be affected by own shocks, oil price shocks, oil revenue shocks and government spending shocks. Government spending is also presumed to have contemporaneous effect on non-oil revenue in Nigeria. Hence only no restriction is imposed on the third row such that; $\Delta(noilr) = b_{31}(L)\varepsilon_t oilp + b_{32}(L)\varepsilon_t oilr + b_{34}(L)\varepsilon_t govs + \varepsilon_t noilr$. Lastly, shocks to $govs$ is assumed to be contemporaneously affected by itself, and shocks to all other variables. This seems to be a plausible assumption as an increase or decrease in oil price or oil revenue or non-oil revenue can result in an increase or decrease in government spending. Therefore, government shocks can be modelled as;

$$\Delta(govs) = b_{41}(L)\varepsilon_t oilp + b_{42}(L)\varepsilon_t oilr + b_{43}\varepsilon_t noilr + b_{44}\varepsilon_t govs.$$

## 5. EMPIRICAL ANALYSIS AND RESULTS

The first empirical analysis we carried out is thedescriptive statistics of the variable of interest with the results presented in Table 1. The global oil price shows an average value of $41.59, while that of the oil revenue shows N2259.33 billion, the non-oil revenue shows N829.97 billion and the value of the government spending is N1745.81 billion. The descriptive analysis shows that the average value of oil revenue is greater than both non-oil revenue and government put together. Moreover, the maximum value of

the global oil price is $100.06, while that of the oil revenue equals to N8847.8 billion, non-oil revenue is N3275.12 billion and government spending is N9532.27 billion during the period of study. There seems to be a correlation among the variable of interest with the minimum value of $14.39, N 7.25 billion, N 2.98 billion and N 9.64 billion for oil price, oil revenue, non-oil revenue and government spending respectively.

**Table 1**
**Descriptive analysis**

| *Statistics* | *Oil price* | *Oil Revenue* | *Non Oil Revenue* | *Government Spending* |
|---|---|---|---|---|
| Mean | 41.59 | 2259.33 | 829.97 | 1745.81 |
| Median | 30.3 | 724.42 | 224.77 | 701.06 |
| Maximum | 100.06 | 8847.8 | 3275.12 | 9532.27 |
| Minimum | 14.39 | 7.25 | 2.98 | 9.64 |
| Std-dev | 27.43 | 2687.646 | 1072.61 | 2256.66 |
| Jacque-Bera | 6.51 | 5.8 | 7.51 | 19.3 |
| Prob. | 0.03 | 0.05 | 0.02 | 0 |
| observation | 37 | 37 | 37 | 37 |

## 5.2. Unit root test

Most time series variables are not usually stationary. Therefore, using non-stationary variables in the estimation model might lead to spurious regression which cannot be used for precise prediction and policy purposes. Hence, the next step is to examine the stationarity property of the time series data used to determine whether the variables have unit roots, that is, whether it is stationary and the order of integration. The Augmented Dickey-Fuller (1979) and the Phillips-Perron (1988) tests are used for this purpose.

**Table 3**
**Results of the unit root tests**

| *Nigeria Augmented Dickey Fuller Test* | | | | *Phillips-Perron Test* | | | |
|---|---|---|---|---|---|---|---|
| *Variables* | *Levels* | *First Diff* | *Status* | *Variables* | *Levels* | *First Diff* | *Status* |
| Oil price | -2.1448 | -7.8873 | I(1) | Oil price | -2.8468 | -8.4294 | I(1) |
| Exchange rate | 0.9497 | -6.2974 | I(1) | Exchange rate | 1.3499 | -6.0027 | I(1) |
| Reserve | -2.0333 | -5.4494 | I(1) | Reserve | 1.9693 | -5.4494 | I(1) |
| Interest rate | -2.2344 | -13.3378 | I(1) | Interest rate | -1.9693 | -5.0945 | I(1) |
| Kazakhstan Augmented Dickey Fuller Test | | Phillips-Perron Test | | | | | |

*Note:* all the variables are expressed in logarithm. The critical values are -3.4573, -2.8733 and -2.5731 for 1%, 5% and 10% respectively

In Table 2, it is shown that all the variables are stationary after first difference. This means that, all the variables used for the study are integrated and of the same order (I(1)) which calls for the test of co-integrating relationships among the variables.

### 5.3. Weakly exogeneity test

The exogeneity of the global oil price to Nigeria's economy necessitates the carrying out of the weakly exogeneity test against the endogenous variables such as oil revenue, non-oil revenue and government spending using Johansen (1988) cointegration approach. The cointegration test requires the determination of lag length. The lag length of 2 is found to be optimal following the Schwarz information criterion (SC). The lag length result is presented at the appendix (See Appendix 1).The cointegration result, as presented in Table 3,shows that both the eigen and trace statistics are greater than their critical values for $r \leq 0$ meaning that the null hypothesis of absence of cointegration is accepted for $r \leq 0$ and rejected for $r \leq 1$. This is interpreted to mean that at least one cointegration relations exist among the exogenous and the endogenous variables. The cointegration relations of the global oil price with the endogenous variables actually suggest that oil price is strictly exogenous to the Nigerian economy. The strong exogeneity outcome is consistent with the SVAR identification structure adopted in this study. We further confirm the exogeneity of oil price as a global variable by purposely endogenizing oil price with the other endogenous variables to test for cointegration and verify that oil price is truly exogenous. The cointegration result accepts null hypothesis of no cointegration. The result, therefore,confirms that oil price is truly exogenous to the Nigerian economy.

**Table 3**
**Cointegration results of the exogenous and endogenous variables**

| *Coint. Rank* | *Eigen value* | *Trace Stat.* | *Critical value* | *prob.* |
|---|---|---|---|---|
| r≤0 | 0.54 | 35.83 | 29.8 | 0.00*** |
| r≤1 | 0.23 | 9.23 | 15.49 | 0.34 |
| r≤2 | 0.00 | 0.15 | 3.84 | 0.69 |
| *Coint. Rank* | *Eigen value* | *Eigen Stat.* | *Critical value* | *prob.* |
| r≤0 | 0.54 | 26.6 | 21.13 | 0.00*** |
| r≤1 | 0.23 | 9.07 | 14.26 | 0.28 |
| r≤2 | 0.00 | 0.16 | 3.84 | 0.69 |

*** denote the rejection of the null hypothesis of no cointegration at 5 percent significance level

### 5.3. Variance decomposition

As presented in Table 4, 100% of variations in oil price are explained by the variable itself in the first year and about 85% in the tenth year, while none of the variations in other variables could be explained by themselves in the same magnitude throughout the years. Its own shocks were the major determinant of oil price shocks both in the short and long run, while other variables in the model have little or no significant impact on oil price shocks. It reinforces the fact that oil price is determined exogenously in the world market. Furthermore, considering the variance decomposition of oil revenue, its own shock explained94.5% of variation in oil revenue. Oil price shocks is found to explain 5.52% of shocks to oil revenue while non-oil revenue and government spending had no explanatory power in relation to oil revenue. This result is also consistent with the SVAR model. In the sixth year own shocks have reduced to 55%, oil price shocks increased to 21%, government spending also to 22.8% and non-oil revenue was 0.89%. In the tenth year, own shock reduced further to 44.26%, oil price gained more explanatory power of about 30% of shocks in oil revenue, government spending increased marginally to 23.96% and non-oil revenue stood at 1.56%. This shows that oil price and government spending are major determinants of oil revenue, while non-oil revenue has small contribution to it. Similarly, the variance decomposition of the non-oil revenue follows the SVAR model. The results show 96.53% non-oil revenue own shock to itself in the first period with oil revenue, oil price and government spending contributing 2.33%, 1.13% and 0% respectively. However, by the sixth year, the own shock of non-oil revenue has reduced to 20.29% while the shocks increased to 7.89% for oil revenue, 50.96% for government spending and 20.77% for oil price. The shocks increased up to 33.59% in the tenth year for oil price and oil revenue while it fell to 44.04% for government spending and 13.54 for its own shock. The results also suggest that government spending has the largest contribution to non-oil revenue, followed by oil price and then oil revenue with the least contribution. Lastly, the own shocks of government spending accounted for huge explanation of variation in government spending in the short run but reduced in the long run. In the first year own shock accounted for 83.23%, oil price accounted for 0.20%, oil revenue accounted for 8.15%, and non-oil accounted for 8.41%. In the sixth year, its own shock was 63.92%, oil price accounted for 23%, oil revenue accounted for 12.24%, and non-oil accounted for 5.21%. By the tenth year, its own shock has reduced to 47.32%, oil price shock has increased 37.17%, oil revenue shock reduced to 10.98%, and non-oil revenue reduced to 4.52%. This analysis implies that oil price and oil revenue with non-oil revenue have strong predictive power on government spending. This finding

supports the revenue-spend hypothesis and empirically our results conform to the findings of Emelogu and Uche (2010), Aregbeyen and Taofik (2012), Ogujiuba and Abraham (2012) for Nigeria.

**Table 4**
**Results of the variance decomposition**

| *periods* | *oilp* | *oilr* | *noilr* | *govs* |
|---|---|---|---|---|
| variance decomposition of oilp | | | | |
| year 1 | 100 | 0.00 | 0.00 | 0.00 |
| year 2 | 96.89 | 1.64 | 0.24 | 1.22 |
| year 3 | 93.90 | 1.72 | 0.34 | 4.03 |
| year 4 | 91.72 | 1.87 | 0.37 | 6.04 |
| year 6 | 89.39 | 2.27 | 0.34 | 7.99 |
| year 8 | 87.28 | 2.7 | 0.34 | 9.67 |
| year 10 | 85.46 | 3.05 | 0.37 | 11.11 |
| variance decomposition of oilr | | | | |
| year 1 | 5.52 | 94.47 | 0.00 | 0.00 |
| year 2 | 13.86 | 82.09 | 0.08 | 3.95 |
| year 3 | 12.09 | 73.01 | 0.09 | 14.82 |
| year 4 | 14.69 | 63.53 | 0.18 | 21.59 |
| year 6 | 21.24 | 55.04 | 0.89 | 22.82 |
| year 8 | 25.66 | 49.29 | 1.28 | 23.76 |
| year 10 | 30.21 | 44.26 | 1.56 | 23.96 |
| variance decomposition of noilr | | | | |
| year 1 | 1.13 | 2.33 | 96.53 | 0.00 |
| year 2 | 3.27 | 5.52 | 89.9 | 1.31 |
| year 3 | 1.54 | 6.1 | 40.08 | 52.27 |
| year 4 | 11.29 | 5.91 | 27.05 | 55.74 |
| year 6 | 20.77 | 7.98 | 20.29 | 50.96 |
| year 8 | 27.00 | 8.91 | 16.23 | 47.85 |
| year 10 | 33.59 | 8.82 | 13.54 | 44.04 |
| variance decomposition ofgovs | | | | |
| year 1 | 0.20 | 8.15 | 8.41 | 83.23 |
| year 2 | 6.42 | 10.65 | 7.37 | 75.56 |
| year 3 | 8.28 | 11.79 | 6.16 | 73.77 |
| year 4 | 13.79 | 12.32 | 5.51 | 68.38 |
| year 6 | 23.00 | 12.24 | 5.21 | 63.92 |
| year 8 | 30.87 | 11.72 | 4.71 | 52.70 |
| year 10 | 37.17 | 10.98 | 4.52 | 47.32 |

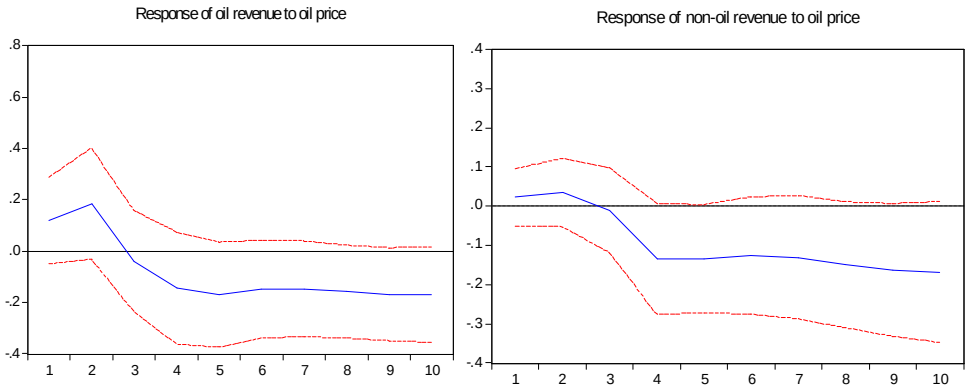
## 5.4. Impulse response function

The impulse response functions in Fig. 1-7 show the responses of the variables to oil price, oil revenue, non-oil revenue and government

spending. The impulse response in the first three Figuresdemonstrate that shocks to oil price have negative effect on oil revenue, non-oil revenue and government spending after the second year and are statistically insignificant all through the years. The variables are all seen to respond at -0.1% to -0.2% over the 10-year horizon.The negative responses of the variables to oil revenue shocks may have explained the recent recession that the country experienced in year 2016. The fourth and the fifth Figures, on the other hand, which are the response of non-oil revenue to oil revenue and the response of government spending to oil revenue show that innovations to oil revenue are statistically insignificant and exert positive effect on government spending and non-oil revenue in the long run respectively. The response to oil revenue shock is positive at 0.1% to 0.17% for non-oil revenue and at 0.1% to 0.15% for government spending. The response of government spending to non-oil revenue shock is also positive but insignificant. This is observable from the sixth Figure. Lastly, the seventh Figure shows a significant positive response of non-oil revenue to government spending shock. This can be interpreted to mean that non-oil revenue responded to shocks in government spending at 0.1% to 0.2% over the period of study, and became stable at 0.15% over the remaining period. Finally, the result indicates that the innovations in government spending significantly affect non-oil revenue, thus confirming spend-tax hypothesis. This finding supports previous works such as Zape and payne (2009) for US, Saunoris and Payne (2010) for UK, Olayungbo and Olayemi (2018), Balogun (2017) Nwosu and Okafor (2014) for Nigeria.

## 6. CONCLUSION AND POLICY RECOMMENDATIONS

This paper examines the dynamic relationship among oil price, oil revenue, non-oil revenue and government in Nigeria using the structural modelling of VAR for the period of 1981 to 2017. The SVAR is appropriate and adequate



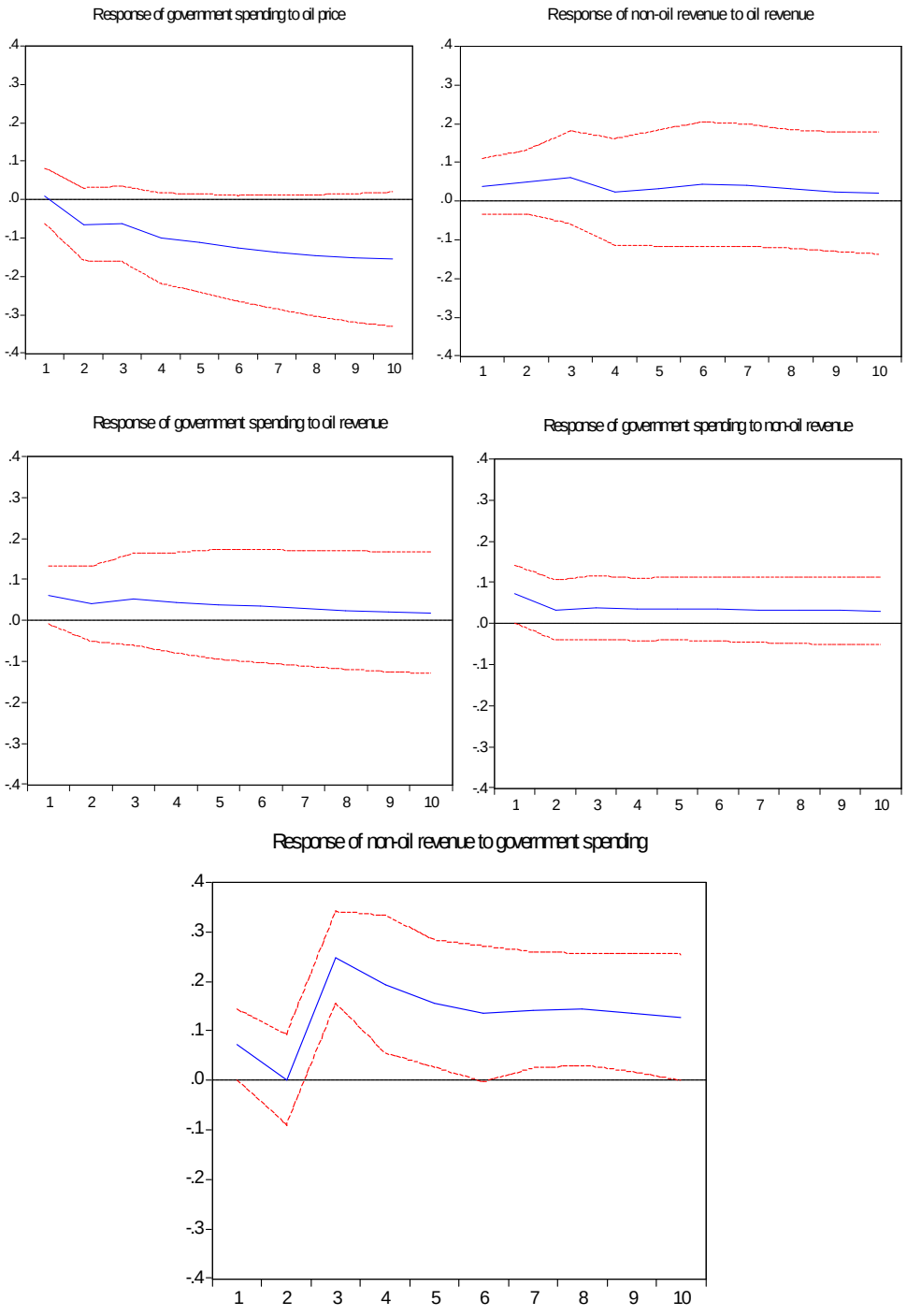



**Figure 1-7: Generalised impulse response function results**

for this study given the exogenous nature of the global oil price to the Nigeria's economy. The exogeneity of the oil price is also tested and confirmed through the cointegration exogeneity test. The cointegration result shows a long run relationship among the choice variables with the exogeneity of the oil price.The result of variance decomposition shows oil price, oil revenue and non-oil revenue to be high predictors of government spending in Nigeria. The impulse response result, on the other hand, suggests that government spending promotes non-oil revenue. The results imply that both revenue-spend hypothesis and spend-tax hypothesis exist together in Nigeria. This also ascertains fiscal synchronization of revenue and spending pattern in the country. The significant contribution of non-oil revenue to government spending can be explained by the recent move of the government to diversify away from oil and concentrating on non-oil sectors. This paper suggests that the government should continue on the recent initiative to diversify the economy from oil to non-oil. The reason is because the movement of oil price cannot be determined by the government, which makes oil revenue flow uncertain.Finally, since government spending has significant effect on non-oil revenue, proper allocation of government spending to the non-oil sectors would havea long way to sustain the revenue flow of the country even in the face of fluctuating oil revenue.

## REFERENCE

Adedokun, A. (2017). The effects of oil shocks on government expenditure and government revenue nexus in Nigeria (with exogeneity restrictions). *Future Business Journal* 4(1); 219-232.

Adedokun, A. (2019). Can Non-oil incomes outride oil incomes in Nigeria? Evidence from autorgressive integrated moving average. *African Journal of Economic Review,* 7(1): 188-205.

Akpan, E., (2009). Oil price shocks and Nigeria's macro economy. Journal of Economics, Ibadan, 4(2): 12-19.

Amisano, G., and Giannini, C. (1997). "Topics in Structural VAR Econometrics (2nd ed.), Berlin"*:* Springer.

Aregbeyen, O and Kolawole, B.O. (2015). Oil revenue, public spending and economic growth relationships in Nigeria. *Journal of Sustainable Development* 8(3), doi:10.5539/ jsd.v8n3p113.

Baghestani, H. and R. McNown, (1994). Do revenues or expenditures respond to budgetary disequilibria? *Southern Econ. J.*, 61: 311-322.

Barro, R.J. (1974). Are government bonds net wealth. *Journal of Political Economy,* 81, 1095-117.

Blanchard, O. and Quah, D. (1989). The dynamic effects of aggregate demand and supply disturnbances, *American Economic Review,* 79: 655-673.

Buchanan, J.M. and R.W. Wagner, (1978). Dialogues concerning fiscal religion. *J. Monetary Econ.*, 4: 627-636.

British Petroleum Statistical Review of World Energy, (2018). *Http://www.bp/com/statisticalreview.* Accessed 23rd December 2019.

Central Bank of Nigeria, *Statistical Bulletin,* 2018. Abuja, Nigeria.

Centre for Study of Economies of Africa. (2017). 4 Dep. Street off Danube Street, Maitama, Abuja, FCT, Nigeria.Available online: *www.cseaafrica.org* (accessed on 25 December 2019).

Dickey, D.A., and Fuller, W.A. (1979). Distribution of the Estimators for Autoregressive Time Series with a Unit Root, *Journal of the American Statistical Association* 74: 427-431.

Dizaji, S.F (2014). The effects of oil shocks on government expenditures and government revenues nexus (with an application to Iran's sanctions). Economic Modelling, 40, 299-313 *http://dx.doi.org/10.1016/j.econmod.2014.04.012.*

Eita, J.H. and Mbamzima, D. (2008). The causal relationship between government expenditure and revenue in Namibia, MPRA Paper No.9154, University of Munich.

Friedman, M., (1978). The limitations of tax limitations. *Policy Rev.*, 5: 7-14.

Hye, Q.M.A. and Jalil, M.A. (2010). Revenue and Expenditure nexus: A case study of Romania. *Romania Journal of Fiscal Policy*, 1(1), Pp. 22-8.

Johansen, S., (1988). Statistical analysis of cointegration vectors, *Journal of Economic Dynamics and Control* 12, 231-254.

Keynes, J.M. (1936). The general theory of interest, employment and money. London: Macmillan.

Miero, S. and Ramos, P. N. (2010). Dutch disease in Macau: diagnosis and treatment. [Online]. Available from: *http://www.eefs.eu/conf/Athens/ Papers/593.pdf*

Meltzer, A.H. and S.F. Richard, (1981). A rational theory of the size of government. *J. Political Econ.*, 89: 914-927.

Magazzino, C. (2012).Wagner versus Keynes: Public spending and national income in Italy, *Journal of Policy Modeling* 34, Pp. 890-905.

Musgrave, R.A., (1966). Principles of Budget Determination. In: Public Finance: Selected Readings, Cameron, A.H. and W. Henderson (Eds.). Random House, New York, pp: 15-27.

Olayungbo, D.O and Olayemi, O.F. (2018). Dynamic relationships among non-oil revenue, government spending and economic growth in an oil producing country:evidence from Nigeria. *Future Business Journal,* 4(2); 246-260.

Olusegun, O. A. (2008). Oil Price Shocks and the Nigerian Economy: A Forecast Error Variance Decomposition Analysis. *Journal of Economics Theory,* 2(4), 124-130.

Omitogun, O., Longe, A. E., and Muhammad, S. (2018). The impact of oilprice and revenue variations on economic growth in Nigeria. OPEC Energy Review.42(4), 387-402.https://doi.org/10.1111/opec.12139.

Narayan, P.K. (2005). The government revenue and government expenditure nexus: empirical evidence from nine Asian countries. *Journal of Asian Economics,* 15(6): 1203-1216. DOI:10.1016/j.asieco.2004.11.007.

Peacock, A.T. and J. Wiseman, (1979). Approaches to the analysis of government expenditure growth. *Public Finance Q.*, 7: 3-23.

Phillips, PCB. and Perron, P (1988). Testing for a unit in time series regression, Biometrica, 75:335-346. doi.org/10.1093/biomet/7.52.335

Saunoris, J.W. and Payne, J.E. (2010). Tax more or spend less? Asymmetries in the UK Revenue-Expenditure Nexus, *Journal of Policy Modelling*, 32: 1-47.

Sims, C. A. (1980). "Macroeconomics and Reality". *Econometrica* 48:1-48.

Wolde-Rafael, Y. (2008). The revenue-expenditure nexus:The experience of 13 African countries, *African Developement Review*, 20(2), Pp.273-83.

World Bank (2013), World Bank.org Washington D.C. United States.

**APPENDIX**

1. VAR lag order selection criteria

Exogenous variable: Oil price

Endogenous variables: Oil revenue, non-oil revenue and government spending

| *Lag* | *LogL* | *LR* | *FPE* | *AIC* | *SC* |
|---|---|---|---|---|---|
| 0 | -71.15 | NA | 2.49E-02 | 4.8218 | 5.0966 |
| 1 | -14.64 | 95.36 | 1.30E-03 | 1.8524 | 2.5395 |
| 2 | 6.59 | 31.85 | 6.00E-03 | 1.08876 | 2.1869 |
| 3 | 13.65 | 9.25 | 0.0007 | 1.2092 | 2.7208 |
| 4 | 21.03 | 8.3 | 9.00E-04 | 1.3102 | 3.234 |
| 5 | 35.14 | 13.22 | 8.00E-04 | 0.9914 | 3.3274 |

LR-Likelihood ratio, FPE-Final prediction error, AIC-Akaike information criterion, SC-Schwarz information criterion.

**2.**

VAR serial correlation LM test

Null Hypotheesis: No serial correlation at lag 10

| | | |
|---|---|---|
| 1 | 13.87723 | 0.6079 |
| 2 | 15.43310 | 0.4932 |
| 3 | 13.29200 | 0.6513 |
| 4 | 13.69127 | 0.6217 |
| 5 | 11.06846 | 0.8052 |
| 6 | 7.519167 | 0.9619 |
| 7 | 21.71444 | 0.1527 |
| 8 | 19.39035 | 0.2489 |
| 9 | 15.68380 | 0.4752 |
| 10 | 11.19498 | 0.7973 |