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OIL PRICE SHOCKS AND FISCAL POLICY MANAGEMENT: IMPLICATIONS FOR NIGERIAN ECONOMIC PLANNING (1981-2019)

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Abstract

Since the end of the second World War till the recent time, fluctuations in high oil prices have been a reoccurring decimal, with increased intensity. Oil price fluctuations has remained the major source of disturbances for the economies of oil producing and importing countries like Nigeria. This could partly be attributed to oil proceeds accounting for over 90 per cent of Nigeria revenue. Hence, fluctuations in oil prices has policy implications for both economic and fiscal management. Therefore, this study is fundamentally motivated to examine effects of the oil price shocks on fiscal expenditure in Nigeria. Leveraging on the structural vector autoregressive (SVAR) model, the major contribution of this study to the body of knowledge on impact of oil price shocks on fiscal policy management is the examination of the impacts of oil price volatilities on Government Expenditure (GEXP), Money Supply (MS2), Gross Domestic Product (GDP) and Government Revenue (GREV). The outcomes indicate that oil prices have momentous impact on fical policy in Nigeria within the study horizon. Furthermore, the finding divulges that the impacts of oil price shock were first felt by Government Revenue and Gross Domestic Product before impacting on Government Expenditure. Hence, for policy purposes, the study opines that the economy should be diversified with a view to curtail the effects of external shocks on Nigeria's economy.

Keywords: Fiscal policy, oil price shocks, structural vector-autoregressive model, Nigeria.

1. Introduction

Global demand for Nigeria's oil will stand the test of time for several reasons. Chief among them is its high quality or location outside the volatile Persian Gulf. Although this is significant and advantageous for the robust development of the Nigerian petroleum sector, however, it poses a critical risk and challenge to the economy and government. This is simply because of the likely repeated patterns of weak economic governance and volatile spending associated with the industry, unless appropriate policies measures are put in place as safeguards to cushion the effects of volatilities that could arise.

The challenges associated with the existence of profuse mineral resources are not unique to Nigeria alone. Shocks associated to oil prices and the accompanying clouds that impede the accuracy of forecast of government revenues poses a threat to oil-exporting and importing

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countries like Nigeria that rely heavily on oil proceeds for their public expenditures. As documented in extant literature, exporters of minerals tend to suffer from myriads of political and economic challenges (Auty 2001). Available empirical evidence from studies carried out depicts that States that relied on mineral exports are incline to slow and irregular economic growth (Manzano and Rigobon, 2001; Sachs and Warner 1997, 2001); bizarre low rate of democratization (Lam and Wantchekon, 1999l; Ross, 2001a); abrupt higher risks of civil war (Collier and Hoeffler 1998, 2001) ; and high corruption rates (Leite and Weidemann, 1999; Sachs and Warner, 1999; Gylfason, 2001).

Nigeria, after over five decades of independence, four decades of oil exportation, and three decades of bitter experience of economic downturn, resulting from slump in oil price, is yet to learn from her mistakes as its dependence on oil proceeds accounting for over 90 per cent of its export and revenue. Nigeria's dependency on oil, and the allure it generated from great wealth through government contracts, has brought about other economic distortions. Oil was discovered in Nigeria in 1956 while its export commenced in 1958. Presently, Nigeria is ranked 7th amongst the organization of oil exporting countries (OPEC) and oil remains an overriding factor in Nigeria's economy in the last fifty years, accounting for one third of the Gross Domestic Product (GDP). The associated consequences of not adjusting expenditure programs arising from shocks in oil prices has led to external imbalances, inflation challenges and fiscal and monetary disequilibrium.

The severity of these challenges was at the zenith in the mid-70s and early 80s, with a persistent shortfall of revenue over expenditure accounting for Nigeria's large stock of external debt. Hence, during these precarious era, external and internal imbalances were difficult to maintained which paved way for expenditure cuts. However, those cuts were either too late or too costly, or both, which paved way for lack of private investment. The contraction and expansion of the public expenditure programs arising from impulse in oil revenues, the hot-bloodedness and cloud that surrounded oil earnings were directed to the home economy via the structure of production and changes in the relative prices. Had the oil price shocks persisted permanently, the response would have been appropriate. However, oil prices are highly unpredictable and highly indeterminate, hence investors are beclouded with the challenge of predicting when the next shock will likely occur or its direction and the likely sector to be favored or hurt. This uncertainty spillover to the risk investors encounter in the non-oil activities, hence adversely affecting the size of private investment and the growth of the non-oil economy. As documented widely in extant literature on World Bank studies, shock in oil price is one of the critical reasons that limit private sector investment in developing countries.

The spike in oil prices and its attendant high revenues paved way for sloppy project selection criteria in Nigeria anchored on the footing that oil booms would remain permanent which encouraged Nigeria to embark on gigantic expenditure programs. However, the qualities of most of these projects leave much to be desired that they were not sustainable. Though for political permutations, the ventures were left ongoing.

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The fruitless political struggle among economic agents weakened the process of decision making in Nigeria. In a study carried out by Husain et al (2008), the authors leveraged on panel VAR methodology to assess the impact of oil price shocks on the underlying non-oil economic cycle in oil-exporting countries. Evidence from accompanying impulse responses show that countries with large oil in relation to the economy and changes in oil price has an impact on the economic cycle through fiscal policy.

Other studies that lend credence to the effects of oil price shocks on fiscal policy stance includes Mulyadi (2012) and El-Anshasy et al (2005) which observe that oil price shocks exact an impact on Venezuela main fiscal variable. But evidence from studies in Nigeria by Akpan (2009), Agbede (2013), and Olusegun (2008) found no significant impact of oil price shock on price level, GDP, Government Expenditure and Money Supply.

The model developed and estimated by Merlevede et al (2009), on the impact of oil price, private sector confidence, exchange rate and fiscal policy on economic performance of Russia opine that the Russian economy is susceptible to downward oil price shocks. Omisakin et al (2009) affirmed that Nigeria's economy is vulnerable to changes in international oil price shocks.

Substantial part of the empirical studies carried out in the literature centered on oil importing economies located in the developed world. Few studies are available on the effect of oil price shocks on the fiscal policy management in the world oil exporting countries with dearth of literature on oil exporting and importing countries like Nigeria. These few existing studies (Olomola and Adejumo, 2006) focused mainly on assessing the effect of oil price shocks on the broad macroeconomic variables. Our study is distinct from the existing ones on policy specifics and reassesses existing stale studies. Thus, our present study besides populating extant literature will reassess the efffect of oil price shocks on fiscal policy episodes in Nigeria. Hence, the goals of the study are to evaluate the effects and magnitude of oil price shocks on fiscal policy in Nigeria within the study horizon.

This study is organized into five sections. Section one introduces the study while the fiscal policy and oil price historical trend were detailed in section two. Section three contains the theoretical framework and literature review while section four covers the model specification. While section five comprises the analysis and discussion of results, section 6 completes the study with some policy inferences

2. Historical trend in Oil Price and Fiscal Policy

Contrary to developed nations where income tax remains the main source of government finances, in the Nigeria the reverse is the case. This is so because oil is the main source of Nigeria's revenue, accounting for more than 90 per cent of its total revenue and export proceeds. Hence, Nigeria is susceptible to the vagaries and vicissitude associated with oil price shocks. The attendant impact of the uncertainty surrounding government finances poses dire consequences on government activities, arising from fluctuations in revenue and expenditures. According to the United Nation (2005), information asymmetry among market participants remains one of the key drivers of oil price volatility. Other factors include mistrust among members, crude oil inventories, incongruities on production quotas among OPEC members and

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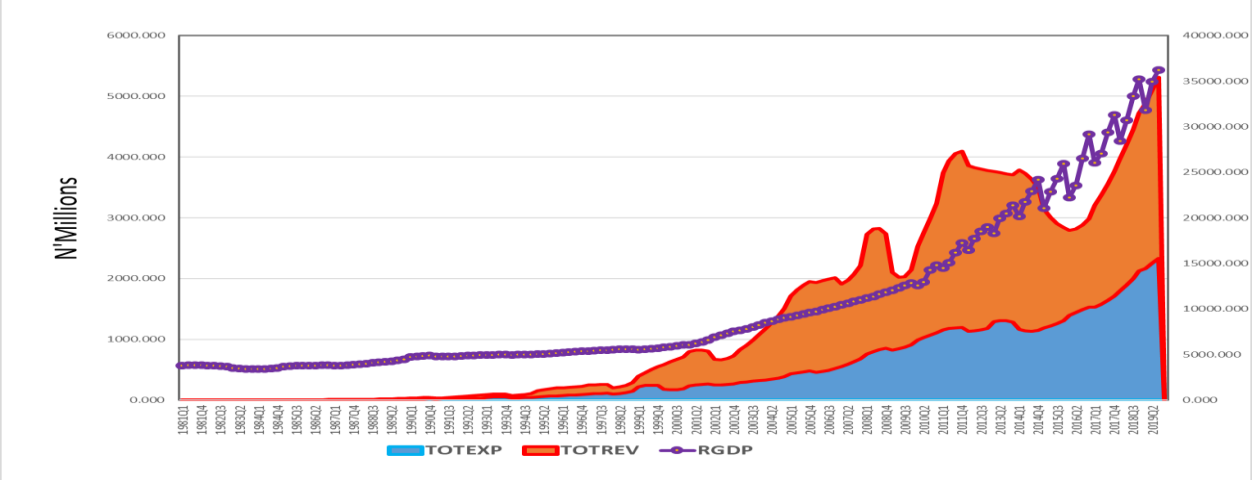
availability of futures exchanges in the market have increased the uncertainty and increased volatility. Similarly, political cycle, weather condition, provocative comments by member countries as well as unrest could trigger volatility in oil prices.

From 1970 to date, five major negative oil shocks have been recorded. The first one was in 1973-74 which arose as a result of the OPEC oil embargo while the second shock occurred in 1978-79 due to OPEC restraint on production quota. This upward flow together with Iran and Iraq in the early 80s exacerbated the shock in oil prices. However, in 1986, the downward trend in oil price was noticed arising from Saudi Arabia's increase in its crude oil production quota. In 1990, the invasion of Kuwait by Iraq led to another price shock but, it receded in the following year due to the Asian financial crisis. In 1999-2000, the OPEC cut its production quotas which led to another price shock. Finally, the fifth major oil price shock began in 2003 and rose astronomically to $137/pbl in July 2008 but muted afterwards.



Fiqure 1: Trend of Gross Domestic Product (GDP), Government Expenditure (GEXP) and Government Revenue (GREV)

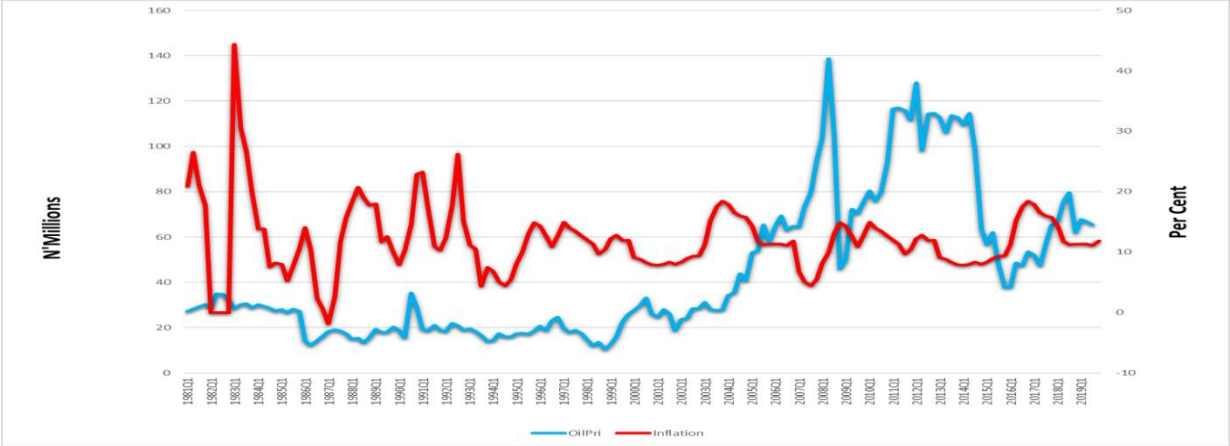


Fig. 2: Relationship between Oil Prices and Inflation rate in Nigeria.

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Figure 1 shows a clear positive correlation among government expenditure, government revenue and Real GDP. In Figure 2, the relationship between inflation rate and oil prices portrays the existence of co-movement from late 1990s up to 2003. But, since 2005, the rise in oil prices correspond to periods of decreasing inflation rate.

In Nigeria, government expenditure is classified capital and recurrent. Although the key source of government revenue is proceeds from oil exports, however, government has no control whatsoever over its price. Nigeria is a price taker commodity market because its price is determined by the forces of demand and supply worldwide. Hence, oil price shock disrupt government spending and its quasi fiscal activities.

Variations in the price of crude oil often than none make government to fine-tune its expenditures outlay to accommodate such variations. This Phenomenon usually creates a impasse for capital expenditures arising from shortfalls in oil revenues. For instance, as documented by World Bank (2001), between 1972 and 1975, government spending rose from 8.4 per cent to 22.6 per cent of Gross Domestic Product while by 1978, it trended downward to 14.2 per cent. Many public projects, as a result has remained in jeopardy. It could be recalled that Nigeria was a victim of the 'Dutch oil disease' between 1970 and 1980. During this period, emphasis was placed at oil at the expense of the development of tradables goods and services.

Sequel to the above development, Nigeria, which used to be a net exporter of agricultural products in the early 1970s, became a net importer of food stuffs worth more than US$ 2 billion annually. This astronomical reverse trend in the importation of agricultural products were worsen by the abundant deposits of crude oil reserves. Estimates of Nigeria's proven oil reserves range from 24 billion to 31.5 billion barrels, which could last for at least 35 years.

According to Knoema (2020), Nigeria with an approximate total of 198.71 trillion cubic feet of proven gas reserves is ranked 9th largest in the world while Russia is ranked first followed by Iran and Qatar respectively. The demand for natural gas is expected to rise fast bearing in mind government lofty target of increasing production capacity to 4 million barrels per day as well as increase reserves to 40 billion barrels, in 2010. If these milestones are achieved, the role and relevance of oil price shocks will be indispensable in Nigeria. Therefore, the reliance of government on volatile revenue on oil proceeds muddles fiscal policy management in the short to long runs in Nigeria.

3. Theoretical Framework and Literature Review

This study leveraged on the dispersion hypothesis theory proposed by Liliens (1982) on oil price shocks as the underpinning theoretical framework. The theory posists that sectoral shifts in request that needs time for reallocation of labour accounts for huge chunk of amount of the unemployed. The procedure takes into cognizance external allocative distortions hindering allocation of specialised capital and labour as well as fiscal variables. In line with Davis (1987), the type of distortions inherent at any point in time, can affect the speed of allocation. Also, Loungani (1986) argued that when changes in the price of oil is fixed, such dispersion of fiscal and unemployment rate indicators has minimal residual explanatory power for the observe changes in the indicators. Hence, he suggested the outcome might infer that oil price shocks

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could have key reallocative shocks affecting the US economy. Furthermore, the author observed that a great chunk of reallocation between industries of labour and fiscal variables may have played key roles in the oil price shocks of 1950s and 1970s.

Long and Plosser (1987) asserts that independence in the sector and random productivity surprises could cause co-movement of activities across various sectors.

The relevance of the dispersion hypothesis is very glaring in its ability to modify known macroeconomic model specification that the direction and magnitude of shocks in oil price play significant roles.The hypothesis is of the view that the direction of the change is of minimal importance since, both positive and negative changes increase the quantum of amount of labour and fiscal reallocation.

In the work of Pieschacon (2009), the author deployed the vector autoregressive (VAR) methodology to evaluate the effects of oil price shocks on output, real exchange rate, and private consumption between two countries. The outcome of the study reveals that the impulse responses of oil price shocks to output, the real exchange rate and private consumption differ significantly between the two countries.

The pioneer work on the effect of oil price shock on output, exchange rate, inflation and money supply in Nigeria between 1970 and 2003 were carried out by Olomola and Adejumo (2006) leveraging on the VAR methodology. Inferences drawn from the study showed that shocks greatly impact on the real exchange rate which could lead to wealth effect capable of appreciating the real exchange rate.

4.0 Model Specification:

4.1 Structural Vector Autoregressive (SVAR) Model

As documented in extant literature, studies that evaluated the effects of oil price shocks on fiscal policy impact abound. Preschacon (2009), leveraged on the structural vector autoregressive methodology to examined the effect of oil price shocks in the economies of Norway and Mexico where proceeds from oil price constitute a great chuck of government revenue.

The Structural Vector Autoregressive model is a side-shoot of the unstructured Vector Auto Regressive technique that tries to identify a set of autonomous disturbances using restrictions from economic theory as against atheoretical restriction used in unstructured Vector Autoregressive models (McCoy, 1997). The bastion of this methodology over other techniques resides in its capability to capture feedback and shock transmission based on dynamic relationships among macroeconomic variables and economic concerns (Tule et al, 2020; Hakro and Omezzzine, 2010; Mehrara and Oskoui, 2007).

The main objective of this study is to evaluate the effects of shocks in oil price (OIL) on government revenue (GREV), Government expenditure (GEXP), Money supply (MS2) and the real economic growth (RGDP) in Nigeria. Hence, the study is on five n endogenous macroeconomic variables and p lags SVAR_p , stated as :

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$$A_0 Y_t = a + A_1 Y_{t-1} + A_2 Y_{t-2} + \cdots + A_p Y_{t-p} + \varepsilon_t \quad (1)$$

Where the letter a denote the deterministic variable constant /dummy variable $A_0, as\ A_1, \ldots, A_p$ is the coefficient matric of an $n * n$dimension that represents the contemporaneous relations between the components of Y_t

ε_t = the random error, which is an$n * 1$ dimensional vector of the innovation in policy and non-policy variables (0,I_p)

Similarly, the variance-covariance identity matrix ($E\varepsilon_t\varepsilon_t' = I$) is also depicted as being independently identically distributed with mean 0and variance Φ ($i.i.d \sim N(0, \Phi)$ (Ogun and Akinlo, 2006; Tule et al, 2020) andΦ is the variance-covariance measure of the random error(ε_t).

Y_t= $(OIL, GREV, GEXP, MS2, RGDP)$ is an$n * 1$ dimensional vector of endogenous variables.

Following Gottschalk (2001 p. 24) and Bagliano and Favero (1998 p.1074), the above ordering was achieved. Worthy of note is the constraint that, less significant endogenous variables are first considered in the free estimation of transmission variables. However, in the ordering and restriction of the variables, the study relied on the causality test and economic correlation analysis as documented by Hoover (2004) and Rubio-Ramírez et al (2010).

Rubio-Ramírez et al (2010) opined that the number of the endogenous variables in a given model should be equal to the number of restrictions imposed. Also, Lűtkepohl (2005) and Sims (1980, 1988) averred that the conditionality for imposing restrictions are although critical but are merely based on technicality and not on economic reasoning.

Hence, under the assumption that there exists an inverse matrix for matrixA_0, the $SVAR_p$ can be expressed in a reduced VAR representation framework as:

$$Y_t = b + B_1 Y_{t-1} + \cdots + B_p Y_{t-p} + u_t \quad (2)$$

Where$B_1 = A_1 A_o^{-1}$, b=$A_o^{-1}.a, B_p = A_p A_o^{-1}, u_t$ =$A_o^{-1}\varepsilon_t$. Assuming $u_t \sim N(0, \Sigma)$ and the covariance of $u_t$is, cov(u_t) represented as Var(u_t)=$(A_o^{-1})'$Var(ε_t)A_o^{-1} and Σ= $(A_o^{-1})'\Phi A_o^{-1}$.

In the estimation of the traditional vector autoregressive model (equation (1)), the contemporaneous causal dependence information is included completely in the residuals. Thereafter, the SVAR model is identified by imposing the sufficient and necessary restrictions.

In order to reproduce the SVAR in equation (1), from the reduced form in equation (2), the necessary condition of the number of parameters being less than or at least equal to the parameters in the reduce form in equation (2) must be observed (McCoy, 1997).

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However, often times, restrictions are imposed because the equations may not follow a unique form. Hence the number of restrictions to be imposed becomes at least $\frac{n(n-1)}{2}$on the system, were n is the number of variables (Arias et al, 2018).

For the reduced-form VAR of (2), there are n, n^2p and n(n+1)/2 parameters in the deterministic term, coefficient matrixB_i and cov(u_t) represented as $\Sigma= (A_o^{-1})'\phi A_o^{-1}$matrix that is symmetric and positive definite.

Therefore equation (2) is $\left[n + n^2p + n\frac{(n+1)}{2}\right]$

Comparing the Structural vector autoregressive model of order p with that of the reduced form model, gave rise to the following expression:

$$[n + (p + 1)n^2 + n(n + 1)/2] - \left[n + n^2p + n\frac{(n+1)}{2}\right] = \qquad n^2$$

Observe that the coefficient matrix is the key difference between the structural vector autoregressive model and the reduced form model, hence the existence of an identification problem. This implies that equation (1) is under-identified. Hence, the imposition of the n^2 restrictions (Sims, 1980). Hence, the identification of the $SVAR_p$ requires minimum restriction of the covariance matrix (Φ) to n(n-1)/2 Hoover (2004).

According to Arias et al (2018), the unobservable structural shocks, the residuals are assumed to be normally distributed and mapped into structural shocks. Hence, in normalizing the variance to one standard deviation innovation and imposing orthogonality across the structural shocks, then $\Sigma= A_o^{-1}(A_o^{-1})'$. The inverse of A_o could beΔ, and $\Sigma= \Delta\Delta'$ (Ogun and Akinlo, 2006).

In line with Breitung et al (2004), the relation between the reduced form disturbances and the structural form innovations is expressed in a general equation as:

$$AY_t = A_1^*Y_{t-1} + \cdots + A_p^*Y_{t-p} + B\lambda_t \qquad (3)$$

The aim of equation (3) is to place the structural and the reduced VARs in a nested system.

According to Coric, Hrvoje and Deskar-Skrbic (2015), the $A'sB's$and are$n * n$ coefficient matrices.

Also,

$Yt = (y1t \ldots ynt)'$ is the vector of the variables captured in an $n * 1$ observable in the model and λ_t captures the disturbance, the random error process (0, I_n)

Hence, from equation (3), the reduced model could be deduced based on the existence of the inverse of matrix A. i.e equation (3) multiply by (A^{-1})

$$Y_t = z_0 + z_1 Y_{t-1} + \cdots + z_p Y_{t-p} + v_t \quad (4)$$

$z_i = A^{-1} A_i^* \ (i = 0, 1 \ldots p)$ and $v_t = B\lambda_t A^{-1}$

The AB-model is used to measure the relationship between the SVAR residual ($B\lambda_t$) and the reduced VAR residual(v_t). Where $v_t = A^{-1} B\lambda_t$

The estimator of the reduced model (maximum likelihood) is stated as:

$\Sigma = A_o^{-1} BB' (A_o^{-1})'$ or BB' given that $A = A_0$ and that $A_o^{-1}(A_o^{-1})' = 1$.

Hence, restrictions are imposed on the assumed non-singular matrices A and B.

When matrix B is an identity matrix, i.e $B = I_n$, the actual model becomes the matrix A model and the required restrictions are imposed on its contemporaneous residual.

Therefore, the endogenous variable matrix is shown below:

$$\begin{bmatrix} GREV \\ GEXP \\ GMS2 \\ RGDP \\ OIL \end{bmatrix} = \begin{bmatrix} h_{11}(k) & h_{21}(k) & h_{31}(k) & h_{41}(k) & h_{51}(k) \\ h_{12}(k) & h_{22}(k) & h_{32}(k) & h_{42}(k) & h_{52}(k) \\ h_{13}(k) & h_{23}(k) & h_{33}(k) & h_{43}(k) & h_{53}(k) \\ h_{14}(k) & h_{24}(k) & h_{34}(k) & h_{44}(k) & h_{54}(k) \\ h_{15}(k) & h_{25}(k) & h_{35}(k) & h_{45}(k) & h_{55}(k) \end{bmatrix} \begin{bmatrix} L_{1t} \\ L_{2t} \\ L_{3t} \\ L_{4t} \\ L_{5t} \end{bmatrix} \vdots \quad (5)$$

The uncorrelated random errors (L_{it}) and the associated coefficients are denoted as $S_{ij}(k)$.

Hence, equation (5) could be represented as:

$$Y_t = h(k) l_t \quad (6)$$

The normalized shock l_t in an SVAR model is given as:

$$(Var(l_{1t}) = Var(l_{2t}) = Var(l_{3t}) = Var(l_{4t}) = Var(l_{5t}) = 1 \quad (7)$$

Equation (7) above could be clearly represented in matrix form as:

$$E(A_t A'_t) = \begin{bmatrix} \boldsymbol{Var(l_{1t})} & Cov(l_{1t} l_{2t}) & Cov(l_{1t} l_{3t}) & Cov(l_{1t} l_{4t}) & Cov(l_{1t} l_{5t}) \\ Cov(l_{2t} l_{1t}) & \boldsymbol{Var(l_{2t})} & Cov(l_{2t} l_{3t}) & Cov(l_{2t} l_{4t}) & Cov(l_{2t} l_{5t}) \\ Cov(l_{3t} l_{1t}) & Cov(l_{3t} l_{2t}) & \boldsymbol{Var(l_{3t})} & Cov(l_{3t} l_{4t}) & Cov(l_{3t} l_{5t}) \\ Cov(l_{4t} l_{1t}) & Cov(l_{4t} l_{2t}) & Cov(l_{4t} l_{3t}) & \boldsymbol{Var(l_{4t})} & Cov(l_{4t} l_{5t}) \\ Cov(l_{5t} l_{1t}) & Cov(l_{5t} l_{2t}) & Cov(l_{5t} l_{3t}) & Cov(l_{5t} l_{4t}) & \boldsymbol{Var(l_{5t})} \end{bmatrix} \quad (8)$$

4.2 Measurement of Variable.

This study used time series data of five macroeconomic variables to estimate the effects of oil price shocks on fiscal policy in Nigeria. They include: government Revenue (GREV), Government Expenditure (GEXP), Money Supply (MS2) and the Gross Domestic Product

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(GDP) and Oil Price (OP) ranging from the first quarter of 1981 to the third quarter of 2019 (1981Q1-2019Q3). In line with Gandolfo (1981), the variables that their frequencies were not initially presented in quarters were interpolated. This technique is justified on the premise that these data are not available, the methodology is robust and satisfied ordered statistical theory.

4.2.1 Gross Domestic Product (GDP)

The Gross Domestic Product (GDP) quantified in monetary terms as the value of goods and services produced in an economy within a given period irrespective of the nationality of the people producing the goods and services. The GDP data were sourced from Central Bank of Nigeria (CBN, 2020) statistical database and the National Bureau of Statistics (NBS, 2020) database.

4.2.2 Government Revenue (GREV)

Government Revenue refers to the total sum of revenue generated by government from different sources. This data was sourced from the Central Bank of Nigeria (CBN, 2020).

4.2.3 Government Expenditure (GEXP)

Government Expenditure refers to the total sum of both capital and recurrent expenditures as well as other obligations incurred in a given period. This data was sourced from the Central Bank of Nigeria (CBN, 2020).

4.2.4 Oil Price

This refers to the price of Nigeria's Brent crude at the international market. The data was sourced from Central Bank of Nigeria (CBN, 2020) statistical database.

According to Arias et al (2011), in estimating the Structural Vector Autoregressive model, we first estimate the Vector Autoregressive model after specifying the model and calculating the Lag lengths and the unit root tests. The VAR model is estimated using the ordinary least square if the non-stationarity hypothesis is rejected. The Vector Error Correction Method (VECM) is estimated where there is a unit root and cointegration relationship. However, if there is non-existence of cointegration, the VAR model is estimated by taking first difference.

According to Benkwitz, Lütkepohl and Wolters (2001), small sample properties of bootstrap confidence intervals outperforms other asymptotic methodologies. Hence, the 95% confidence intervals of the Bootstrap percentile were computed to illustrate parameter uncertainty with 1000 replications (Hall, 1992).

According to Pesaran and Pesaran (1997), the VAR model can be used on series at levels or in first differencing.

This study leveraged on the structural vector autoregressive technique to estimate the effects of oil price shocks fiscal variables in Nigeria.

In the estimation of the Cholesky recursive order in model B, the study leveraged on Hoover (2004) as stated in equation (9). In the model, the Cholesky recursive order is assumed to be normally distributed. The Cholesky recursive order places a restriction on the upper triangle of

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the major diagonal while the lower triangle of major diagonal of the matrix is estimated without restriction after selecting the order of the variables Y_t. Although the ordering seems atheoretical, however, its economic connotation is inferred from the variable ordering.

$$\begin{bmatrix} GREV \\ GEXP \\ GMS2 \\ RGDP \\ OIL \end{bmatrix} .. \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ * & 1 & 0 & 0 & 0 \\ * & * & 1 & 0 & 0 \\ * & * & * & 1 & 0 \\ * & * & * & * & 1 \end{bmatrix} \quad (9)$$

While the impulse response functions generated from equation (9) helps to trace the response of future values of the variable freely estimated to a one-standard error shock in the current value of one of the VAR errors, the forecast error variance decompositions on the other hand is used to measure the percentage of the variance of the error made in forecasting a variable arising from a given shock within a given period.

5 Analysis and Discussion of Results

5.1 Unit Root Test

The Phillips Peron and the Augmented Dickey Fuller (ADF) tests were deployed to evaluate the unit root test and order of integration of the data with constant and with constant & trend as shown in Table 1 below.

Table 1: Test for Stationarity of Variables

Variable	Augmented Dickey-Fuller (ADF)		Phillips-Peron (PP)		Decision
	With Constant	With Constant & Trend	With Constant	With Constant & Trend	
GEXP	-1.5635	-2.9127	-1.5635	-2.9127	
D(GEXP)	-7.1123	-7.0904	-7.1123	-7.0904	1(1)
GREV	-0.7937	-1.3994	-0.7937	-1.3994	
D(GREV)	-5.5374	-5.5055	-5.5374	-5.5055	1(1)
MS	6.5825	3.8668	6.5825	3.8668	1(0)
D(MS)	-8.7885	-10.8362	-8.7885	-10.8362	
GDP	1.3552	-1.0015	1.3552	-1.0015	
D(GDP)	-4.1175	-3.9520	-4.1175	-3.9520	1(1)

ADF and PP central values: 5%= -3.4478and 1% = -4.0373

Source: Authors' Computation

The variables (GEXP, GREV, GDP) are stationary at first level, I (1) integral, except Money Supply which is stationary at levels, I (0).

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Table 2: Vector-Autoregressive Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
1	-4459.4030	NA	6.38e+19	59.7920	60.2938	59.9959
2	-4371.2930	164.4708	2.75e+19	58.9506	59.9541	59.3583
3	-4294.7420	137.7918	1.39e+19	58.2632	59.7686	58.8748
4	-4111.6500	317.3603	1.69e+18	56.1553	58.1624	56.9708
5	-4022.9720	147.7968*	7.31e+17 *	55.3063*	57.8152*	56.3256*

** indicates lag order selected by the criterion*
LR: Sequential modified LR test statistic (each test at 5% level); FPE: Final prediction error
AIC: Akaike information criterion; SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Source: Authors' Computation

Results from Table 2 above, shows the five popular lag order selection criteria. It reveals lag 5 is the optimal lag length for the model.

Table 3: Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.337981	147.9378	88.80380	0.0000
At most 1 *	0.213690	85.24373	63.87610	0.0003
At most 2 *	0.154503	48.70236	42.91525	0.0119
At most 3	0.097204	23.19215	25.87211	0.1040
At most 4	0.049077	7.648902	12.51798	0.2817

Trace test indicates 3 cointegrating in(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

From Table 3 above, our Johansen cointegration test identifies three cointegrating relationships.

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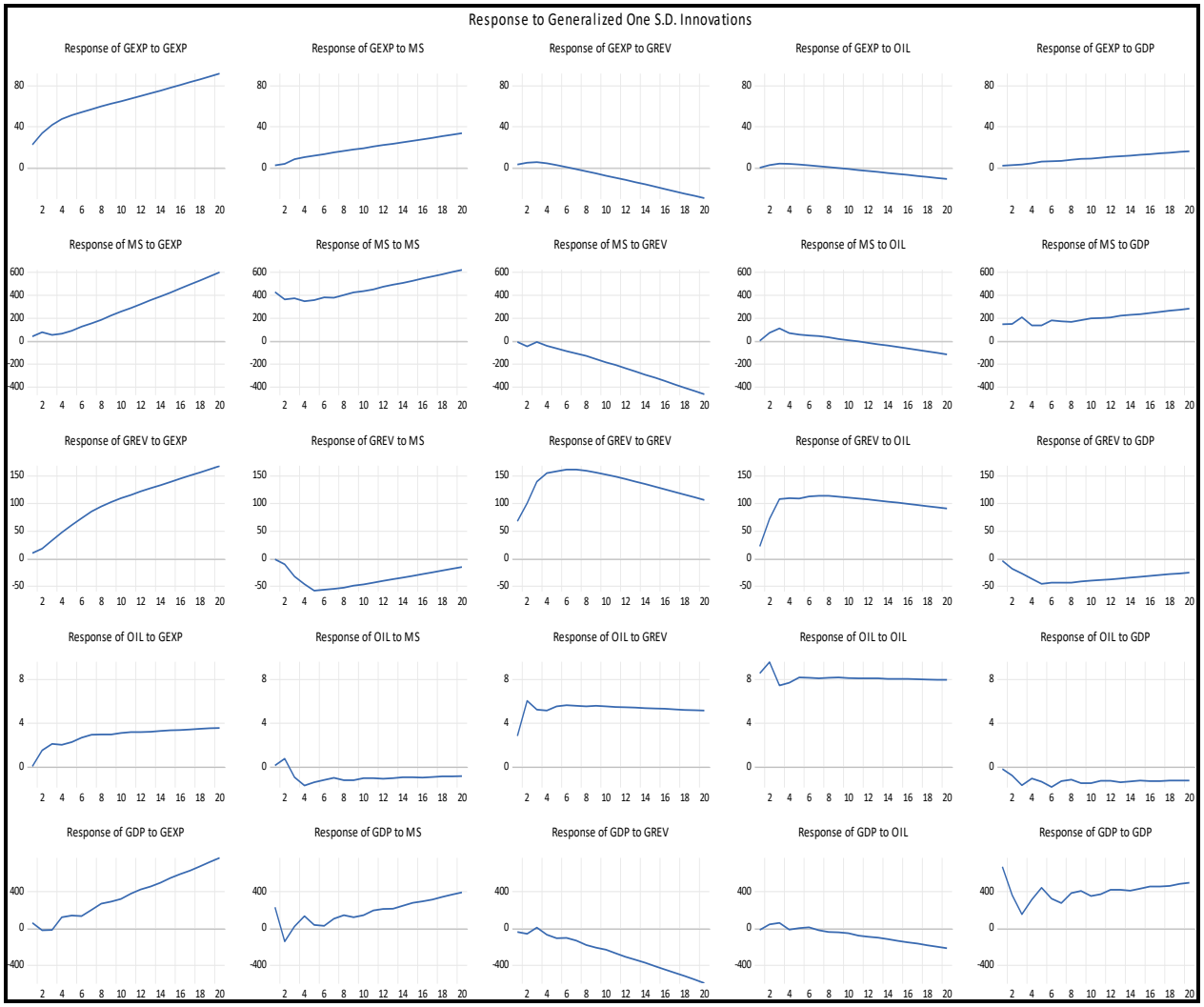

Figure 3: VAR Forecast Error Impulse Responses

Figure 3 shows the outcomes of shocks in oil prices to Government Revenue, Government Expenditure, Money Supply and Gross Domestic Product. The outcomes indicate that a shock to oil price in the short-run could have a positive relationship on Government Revenue, Gross Domestic Product, Government Expenditure, and Money Supply, while in the long run it could have a negative relationship. This is true with expectations because increases in oil price would translate to increase in government revenue, 'other things being equal', which is the country's major earner. However, a shock to government expenditure GEXP, government revenue GREV, gross domestic product GDP, and Money Supply MS could lead to a positive relationship in the movement. In line with expectations, government tends to drive GDP by increasing expenditure in areas like capital projects and in interventions. Also, oil price shocks to Government Expenditure exhibits a negative relationship with some lags. This could suggest that oil price shocks tend to produce some cyclical effect on Government Expenditure and Government

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Revenue, but the latter appears to condition the level of government expenditure. Whenever there is a rise in government revenue, this could be immediately followed by an increase in government expenditure. Therefore, evidence from the variance error impulse responses points to the obvious that oil price shocks tends to greatly affect Government Expenditures and Revenues. This inference corroborates the finding of Davis (1987) that stipulates that oil price shocks accounts for greater part of variations in time series variables.

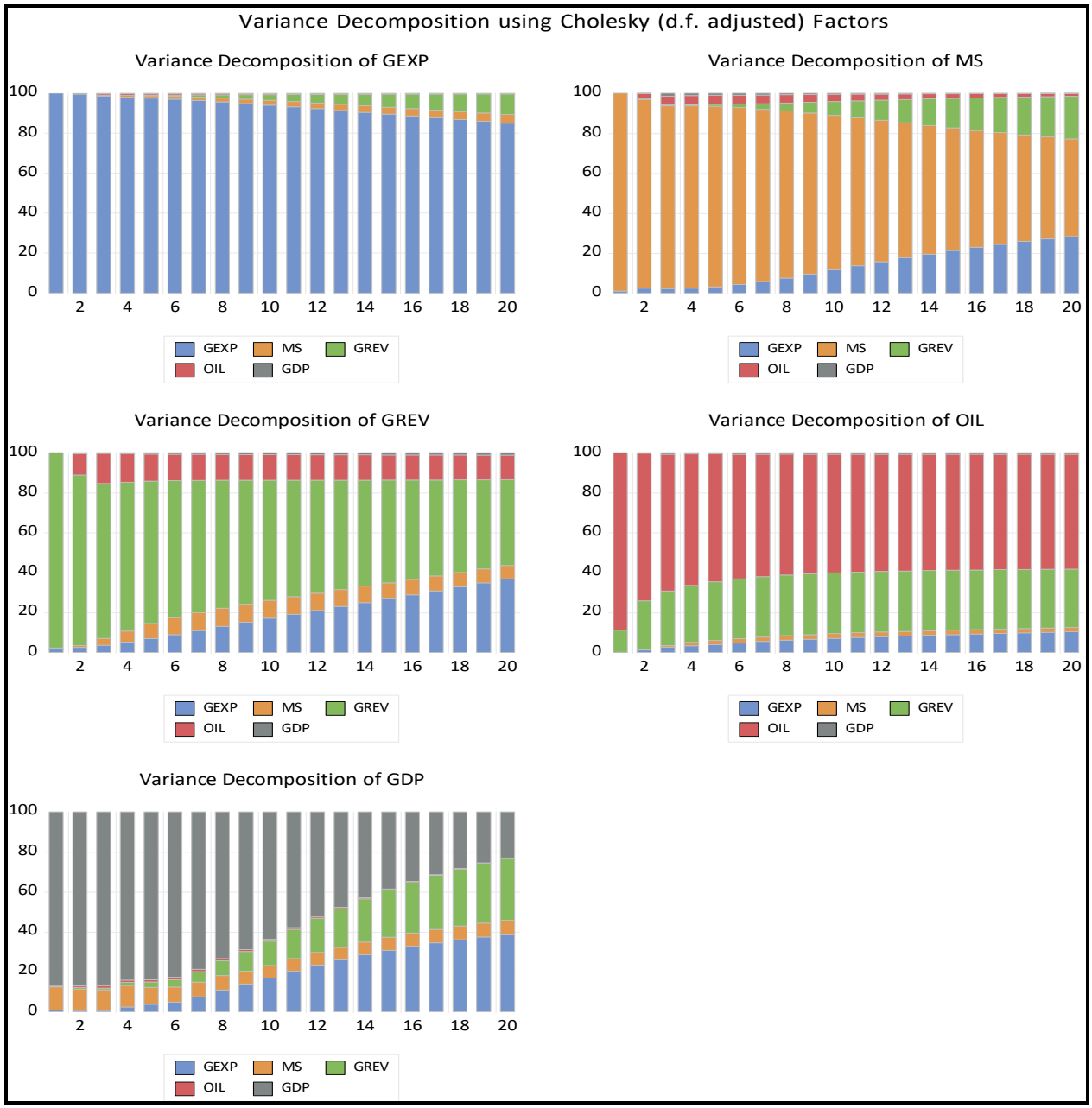

Figure 4: VAR FORECAST ERROR VARIANCE DECOMPOSITION

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The results of Forecast Variance Decomposition (FVED) are presented in figure 4. They indicate the very low contribution of oil price in the variance decomposition of government expenditure. This proportion seems to be very paltry signaling the possibility that revenue accruing from the sales of oil price increase could have possibly be corruptly diverted without impacting on the economy. Similarly, this could be a barometer for possibly measuring the level of endemic corruption in the economy. Other variables like money supply and government revenue contribute marginally better than the oil price at least in the long run. Similarly, the results of the contributions of oil price to government revenue shows that the variance is rather very high and contributes to a reasonable extent to government revenue, which is in line with apriori expectations. This could probably reflect the mono-cultural nature and the level of volatility of the Nigerian economy.

6. Conclusion and Policy Implication

The issue of oil price shocks and its effects on fiscal policy management for a crude oil exporting and refined oil importing nation like Nigeria will always remain topical and relevant in the frontier of knowledge. This is ardently underscored by the fact that oil revenue accounts for over 90 per cent of Nigeria's total revenue. Hence, empirical findings from studies like this are germane and useful in fiscal policy management and charting the way forward for economic prosperity of any nation. This study tests the effects of oil price shocks on fiscal policy management using the following variables as proxy: Government Expenditure (GEXP), Money Supply (MS2), Gross Domestic Product (GDP) and Government Revenue (GREV)). The outcomes indicate that oil prices have momentous impact on fiscal policy in Nigeria within the study horizon. Furthermore, the finding divulges that the impacts of oil price shock were first felt by Government Revenue and Gross Domestic Product before impacting on Government Expenditure. Also, our findings indicate that government should not rely solely on the shocks from oil to make economic forecast as this could be harmful to the economy, but rather explore alternative sources of revenue to supplement the revenues from oil price shocks. Besides, government should initiate suitable mechanisms to guarantee that additional revenues accumulated from the shocks from oil are effectively deployed to developmental goals. Hence, for policy purposes, the study opines that the economy should be diversified with a view to curtail the effects of external shocks on Nigeria's economy. Finally, any policy directed towards volume of crude oil production in Nigeria and quantity of crude oil sales is expected to have a spill-over effect on revenue. This spillover will either by omission or commission affect fiscal policy management effectiveness. Hence, this extension of the study is a subject for future research.

REFERENCE

Agbede, M. O. (2013) "The Growth Implications of Oil Price Shocks in Nigeria." Journal of Emergency Trends in Economics and Management: Pg. 343-349.

Akpan, E. O. (2009) "Oil Price Shocks and Nigeria's Macroeconomy". A Paper Presented at the Annual Conference of CSAE Conference, Economic Development in Africa, Oxford.

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Arias, J.E., Rubio-Ramírez, J.F., and Waggoner, D.F., (2018). Inference based on structural vector autoregressions identified with sign and zero restrictions: Theory and applications. Econometrica 86(2), 685-720.

Auty, Richard M., ed. (2001), Resource Abundance and Economic Development. New York: Oxford University Press.

Bagliano, F. C. and Favero (1998 p. 1074), Measuring Monetary Policy with VAR Model: An Evaluation. European Economic Review 42 (6): 1069-1112.

Benkwitz A, Lütkepohl H, Wolters J. (2001), Comparison of bootstrap confidence intervals for impulse responses of German monetary systems. Macro Dynam 2001; 5: 81-100.

Breitung J, Bruggemann R, Lütkepohl H. (2004), Structural vector autoregressive modelling and impulse responses. In: Lütkepohl H, Kratzig M. Eds. Applied time series econometrics. Cambridge: Cambridge University Press; pp. 159-96.

Central Bank of Nigeria (2020) Statistical Data Base for Money Supply, Government Expenditure, Government Revenue and Oil Price.

Collier, P. and Hoeffler, A (1998) 'On economic causes of civil war' Oxford Economic Papers Volume50, Issue4 Pp. 563-573.

Coric, T., Hrvoje, S., & Deskar-Skrbic, M. (2015). Monetary and fiscal policy mix in a small open. Economic Research-Ekonomska Istraživanja, 28-1, 407-421.

El-Anshasy, A., Bradley, M.D. and Joutzl, F. (2005) "Evidence on the Role of Oil Prices in Venezuela's Economic Performance: 1950-2001". Working Paper, University of Washington.

Gandolfo, G. (1981). Quantitative Analysis and Econometric Estimation of Continuous Time Series Dynamics Models (Amsterdam: North Holland Pub. Coy) pp. 114 - 125

Gottschalk J. (2001), An Introduction into the SVAR Methodology: Identification, Interpretation and Limitations of SVAR Models, Kiel Institute of World Economics, Duesternbrookerweg 120 24105 Kiel, jan.gottschalk@ife.uni-kiel.de, (Germany)

Gylfason, Thorvaldur (2001) "Nature, Power, and Growth," Scottish Journal of Political Economy 48 (5), 558-588.

Hakro, A.N and A.M Omezzine (2010). 'Macroeconomic Effects of Oil and Food Price Shocks to the Oman Economy'. Middle Eastern Finance and Economics, Issue 6. Euro Journals Publishing, Inc.

Hall P. (1992), The bootstrap and Edge worth expansion. New York, USA: Springer-Verlag

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ISSN: 2456-7760

Hoover K. D. (2004), Automatic Inference of the Contemporaneous Causal Order of a System of Equations; Department of Economics, University of California, E-mail kdhoover@ucdavis.edu

Husain, A.M, K. Tazhibayeva, and A. Ter-Martirosyan (2008). 'Fiscal Policy and Economic Cycles in Oil-Exporting Countries'. IMF Working Paper, No. 253, November.

Leite, C. and Weidemann, J. (1999), "Does Mother Nature Corrupt? Natural Resources, Corruption, and Economic Growth," IMF Working Paper WP/99/85.

Lilien, D. M. (1982) Sectoral shifts and cyclical unemployment, Journal of Political Economy, 90(4), 777-793.

Lűtkepohl, H. (2005), New Introduction to Multiple Time Series Analysis. Berlin: Springer Science & Business Media.

Manzano, O and Rigobon, R. (2001) 'Resource Curse or Debt Overhang? NBER Working Paper No. w8390, July.

McCoy, D. (1997), "How Useful is Structural VAR Analysis for Irish Economics?," Research Technical paper, Central bank of Ireland.

Mehrara M and Oskoui K.N (2007) 'The sources of macroeconomic fluctuations in oil exporting countries: A comparative study' Economic Modelling, Volume 24, Issue 3, May, Pages 365-379

Merlevede B. Schoors, K. J. L. and Van Aarle, B, (2009) 'Russia from Bust to Boom and Back: Oil Price, Dutch Disease and Stabilization Fund' *Comparative Economic Studies, Vol. 51, No. 2, pp. 213-241,*

Mulyadi, M. I. A. (2012) "Oil Price, GDP, Inflation and Exchange Rate: Evidence from Indonesia as a Net Oil Exporter Country and a Net Oil Importer Country". International Institute of Social Studies. Pg 9-23

National Bureau of Statistics (2020) Statistical Data for Real Gross Domestic Product.

Ogun, T. P. and Akinlo, A. E. (2006), The Effectiveness of Bank Credit Channel of Monetary Policy Transmission: the Nigerian Experience; Obafemi Awolowo University, Nigeria. African Economic and Business Review Vol. 8, No. 2, Fall 2010, ISSN 1109-5609, © 2010 The African Education and Business Research Institute, Inc.

Olomola, P.A. and Adejumo, T. (2006). "Oil price shock and Macroeconomic Activities in Nigeria". International Research Journal of Finance and Economics. Issue 3.

Olusegun, O.A., 2008. Oil price shocks and the Nigerian economy: A forecast error variance decomposition analysis. J. Econ. Theory, 2: 124-130.

Vol. 4, No. 06; 2020

ISSN: 2456-7760

Omisakin, O., O. Adeniyi and A. Omojolaibi (2009) 'A vector Error Correction Modelling of Energy Price Volatility of a Dependent Economy: The case of Nigeria'. Parkistan Journal of Social Sciences, 6(4), 207-213

Pesaran, M. H., and Pesaran, B.,1997. Working with Microfit 4.0 interactive econometric anlaysis. Oxford: Oxford University Press.

Pieschacon A. (2009). "Oil Booms and their Impacts through Fiscal Policy". JEL classification. E32, E62, E41, H30, Q30, Q33, Q43.

Ross, M. L. (2001a) "Does Oil Hinder Demogurcracy?" World Politics 53 (3, April), 325-361.

Rubio-Ramírez, J.F., Waggoner, D. F. & Zha, T. (2010). "Structural Vector Autoregressions: Theory of Identification and Algorithms for Inference," Review of Economic Studies, Oxford University Press, vol. 77(2), pages 665-696

Sachs, J. D. and Warner, A. M. (1997), "Natural Resource Abundance and Economic Growth," Development Discussion Paper No. 517a, Harvard Institute for International Development, Cambridge.

Sachs, J. D. & Warner, A. M. (1999) "The big push, natural resource booms and growth," Journal of Development Economics, Elsevier, vol. 59(1), pages 43-76.

Sachs, J.D. & Warner, A. M. (2001), "The curse of natural resources," European Economic Review, Elsevier, vol. 45(4-6), pages 827-838, May.

Sims, C. A. (1980), Macroeconomics and Reality in Econometrica.Vol. 48, No. 1pp. 1-48.StableRL:http://links.jstor.org/sici?sici=00129682%28198001%2948%3A1%3C1%3AMAR%3E2.0.CO%3B2-AEconometrica is currently published by The Econometric Society.

Sims, C. A. (1988), Identifying policy effect in R. C. Bryant, ed., `Empirical Macroeconomics for Interdependent Economies', Brookings Institution, Washington DC, pp. 305-321.

Tule, M. K., Onipede, S.F. and Ebuh, G. U (2020), Monetary and Fiscal Policy Mix in a Small Open Economy: The Case of Nigeria. Journal of Business and Economics, Scientific African (in Press).

United Nations (2005) 'The Exposure of African Governments to International oil Volatility and what to do about it'. United Nations Conference on Trade and Development. Geneva.

World Bank (2001), World Development Report 2000/2001: Attacking Poverty. New York: World Bank and Oxford University Press.