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ASSESSMENT OF THE EFFECTS OF OIL PRICE VOLATILITY ON NIGERIA'S ECONOMIC GROWTH: 1988-2021

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Abstract

The study examines the effects of oil price volatility on Nigeria's economic growth spanning the period 1988 to 2021. The study used quarterly data obtained from CBN bulletins and adopted Vector Auto Regressive (VAR) model in its methodology using seven explanatory variables, namely oil price volatility, real GDP, real government expenditure, real exchange rate, inflation rate, real money supply and real imports. The result of the study reveals that there is direct effect of oil price volatility on real government expenditure, real exchange rate and real import, while, it has no effect on real GDP, real money supply and inflation through other variables, such as real government expenditure. The study recommends that there is the need for a mechanism that will enhance fiscal prudence, budget reform, diversification of import and export, investment in non-oil sector as well as maintain proper accountability and good corporate governance.

Keywords: Oil Price Volatility, Economic Growth

1. Introduction

In Nigeria, oil is the key factor that plays significant role in both the economic and political systems of the country. This sector has witnessed series of changes in the oil prices which have adverse effects on the economy. Oil price volatility and its attendant effects on Nigeria's economic growth has been a recurring decimal that has engaged the attention of scholars because of its effects on policy formulation and implementation. Some scholars have argued that there is likely evidence that oil price has positive effects on the economy while others argue that it is likely to inhibit economic growth. According to the former, for net-oil exporting countries, a price increase directly increases real national income through higher export earnings, whereas, the latter cites the cases of net-oil importing countries which experience inflation, increased input costs, reduced non-oil demand, lower investment, fall in tax revenues and ultimately an increase in budget deficit which will further reduce welfare level in advancing their arguments (.Ademiya, 2009)

Thus, the effects (positive or negative) of oil price volatility on any economy, depends on what part of the divide such economy falls into and of course the nature of the price change (rise or fall). However, Nigeria's economy uniquely qualifies as both an oil exporting and importing economy, due to the fact that it exports crude oil and imports refined petroleum products. Hence, making a categorical statement on the effects of oil price volatility on Nigeria's economy is, therefore, difficult.(IEA, 2006, Pinto, 1987)

Nigeria is the largest oil exporting country in Africa and it has a rapid growing economy also. Her primary productive base includes agriculture and crude oil which account for more than 90 per cent of foreign exchange earnings and 75 per cent of employment respectively. Nigeria has witnessed increases in its annual growth rate from 2008 to an all-time high 6.9% in 2011 when the oil price was good until a record low growth rate of -2.3% in September 2016. This period coincided with the period of decrease in oil price which resulted in a recession .The growth rate slightly

improved in 2018 as oil price improved (Adegbite, et.al, 2019)

Estimating the consequences of oil price shocks on growth is particularly relevant in the case of Nigeria. As a small open economy, it has no real influence on the world price of oil, whereas, it is greatly affected by oil price volatility both as an exporter of crude oil and importer of refined petroleum products. It thus implies by simple reasoning that oil price volatility of whatever kind (a rise or fall) can benefit or hurt the economy at the same time.

Basically, the crux of the problem lies in the fact that Nigeria has extremely relied on oil export over the years, making its economy a mono-product economy and this has triggered severe structural difficulties in its economy. For example, in 2008 when oil price fell from a peak of \$147 to about \$37.81 per barrel, Nigeria's budget witnessed a significant cut in budgeted revenue and expenditure. This cut had attendant effects on all aspects of the economy; apparently budgetary operations in Nigeria are strongly linked to happenings (price, demand and supply) in the international oil market. From 2009 to date, Nigeria has not witnessed substantial increase in oil increase even though the figures were slightly increased. It was \$81 and \$91 in 2009 and 2010 respectively, while it increased to \$113.39 which remains the highest in recent times. The price fluctuated in a downward trend to \$107 in 2014, \$54 in 2016, and \$66.30 in 2019 from the year high. These fluctuations have attendant effects on government activities and governance in general. The consequences on the economy include adverse effects on macroeconomic indicators like consumption, investment, employment, inflation, energy investment, government budgets and monetary policy.(Okonju, 2009)

It is against this background that this study examines the effects of oil price volatility on Nigeria's economic growth for the period 1988 to 2022. In order to achieve the aforementioned objective, the study hypothesizes that oil price volatility has no significant effects on Nigeria's economic growth (H_0)

This study will be of great significance in policy formulation and implementation as it draws the attention of government to the effects oil price changes are likely

to have on economic growth in Nigeria. The paper is divided into five sections which include introduction followed by literature review, methodology, and discussion of results, conclusion and recommendations

2. Literature Review

2.1.1 Concept of Oil Price Volatility

The term volatility has been given different definitions by different scholars across disciplines. In relation to crude oil price, volatility is the variation in the worth of a variable, especially price (Routledge, 2002) as cited in (Busayo, 2013). Volatility is the measure of the tendency of oil price to rise or fall sharply within a period of time, such as a day, a month or a year (Ogiri *et al.* 2013). Lee (1998) as cited in Oriakhi and Osazee (2013) defines volatility as the standard deviation in a given period. She notes that volatility has a negative and significant impact on economic growth instantly, while the impact of oil price changes delays until after a year.

She concludes by saying that, it is volatility/change in crude oil prices rather than oil price level that has a significant influence on economic growth. In a nutshell, volatility is a measurement of the fluctuations (i.e. rise and fall) of the price of commodity, for example, oil price over a period of time.

Several factors have been identified that trigger oil price volatility; these factors range from demand and supply of crude oil, OPEC decisions, crises, wars to economic downturn. Pirog (2004) opines that the long term explanatory factors leading to increase in oil price could be drop in the world reserve base; political unrest as that experienced by oil producing countries like Venezuela and Nigeria, OPEC quota system decisions as well as speculative buying and selling. All these factors affect prices which encourage financial traders to adjust their investment portfolios to reflect the market conditions. Merino and Ortiz (2005) adopt the traditional approach in assessing the tightness of the oil market, and state that the evolution of oil inventories should reflect the interaction between supply and demand forces, which should contribute in explaining oil price changes. The unexpected economic developments could, in standard, shake crude oil markets and increase volatility. As noted by Appenzeller (2004), there have been diverse

arguments about how much more of crude oil reserve the world has before the wells dry up. Although history has it that oil price shocks were mainly caused by physical disruptions of supply, the price run-up of 2007-2008 was caused by strong demand confronting world production (Hamilton, 2009 & Cale, 2004)

2.1.2 Concept of Economic Growth

Economic growth is the increase in the inflation-adjusted market value of the goods and services produced by an economy over time. It is conventionally measured as the percentage of increase in real gross domestic product, or real GDP. In economics, "economic growth" or "economic growth theory" typically refers to growth of potential output, i.e., production at full employment (Wikipedia, 2015). Economic growth is used to denote a steady and gradual change in the long run which comes through a general increase in the rate of savings and population in a dynamic economy. It is an increase in the capacity of an economy to produce goods and services, compared from one period of time to another. It can be measured in nominal terms, which include inflation, or in real terms, which are adjusted for inflation (Investopedia, 2015)

2.2. Empirical Review

Adeosun, Tabash and Anagreh (2022) examined causal relationship between oil price and economic performance in seven selected advanced economies: Australia, Canada, China, the US, the UK Japan and Germany using homoschedasticity and heteroschedasticity bootstrap time varying Granger causality to detect causal changes in the relationship between oil price and and GDP returns in the sample countries. The findings indicate bidirectional causality between oil price and economic performance for at least one month across all sample countries with notable global events such as the global financial crisis and the covid-19 pandemic. It also shows long periods of causality running from the economic performances of Canada, China, US, Germany and Japan to oil prices using GDP returns as a predictor.

Chien, F, Chali .K.Y, Jalees, T, Zang, Y (2021), examined the correlation between oil price fluctuations and absolute business development in Pakistan, focusing on three economic sectors, agriculture and livestock, manufacturing and electricity production and transportation from 1980 to 2018, using ARDL with linear regression to evaluate time series or panel data. It was found out that there is a negative impact of oil price on the economic development overall, and manufacturing, electricity production and livestock sectors individually, while there is a positive relationship observed with communication and transport sectors.

Akinsola, M.O, Odhiambo, N.M (2020) examined the impact of oil price on economic growth in seven low income, oil importing sub-Saharan African countries namely Ethiopia, Gambia, Mali, Mozambique, Senegal, Tanzania and Uganda using panel Autoregressive Distributed Lag (panel-ARDL) both in the short run and long run. It was found out that oil price does not have significant impact on economic growth in the short short run for the group, but it has a negative significant impact in the long run. However, the short run country coefficients show that oil price has a significant but mixed effect on economic growth in all the seven countries

Solangi (2019) investigates the short run and long run relationship between oil price fluctuations and real sector growth in Pakistan, focusing on manufacturing, electricity, transport and communication and livestock. The Classical normal linear regression model under autoregressive distributed lag (ARDL) was employed in the study and data from selected sector from 1976 to 2017 were used to establish the relationship between economic sectors and oil price fluctuations. The results reveal that in the short and long run, three out of the four selected economic sectors namely manufacturing, livestock and electricity are negatively influenced by changes in oil prices. In the context of transportation and communication sectors, oil price changes have positive influence. Oil price increments affect the economic sectors through supply and demand channels as rise in oil prices cause increase

in the cost of production and consumption of goods to decline.

Tehranchiava and Seyyedkolaee (2017) investigate the relationship between volatility in oil prices and economic growth in an oil exporting country, Iran, using the threshold regression model on time series data from 1980 to 2014, sourced from the Central Bank of Iran. It was found that in estimating time series data using GARCH to estimate the threshold value for Oil Price Volatility, the results show that the effectiveness of the amount of oil price volatility on economic growth has decreased over time.

Abdulkareem and Abdulhakeem (2016) also examine oil price and macroeconomic volatility in Nigeria with a view to finding the relationship between oil price volatility and macroeconomic variables in Nigeria. The GARCH Model and its variants GARCH-M, EGARCH AND TGARCH were employed using daily, monthly and quarterly data. Their findings reveal that all macroeconomic variables considered (real gross domestic product, interest rate, exchange rate and oil price) are highly volatile, the asymmetric models (TGARCH and EGARCH) outperformed the symmetric models (GARCH(1 1) and GARCH-M) and oil price is a major source of macroeconomic volatility in Nigeria. By implication, the Nigerian economy is vulnerable to both internal shocks (interest rate volatility, real GDP volatility) and external shocks (exchange rate volatility and oil price volatility). Hence, credence should be given to asymmetric models in dealing with macroeconomic volatility in Nigeria and oil price volatility should be considered as a relevant variable in the analysis of macroeconomic fluctuations in Nigeria.

In the same vein, Nwanna and Eyedayi (2016) investigate the impact of crude oil price volatility on economic growth in Nigeria. Multiple regressions were used as a tool for data analysis using secondary data sourced from 1980 to 2014. The findings of this study reveal that there is a positive and significant relationship between oil price and Nigeria's economic growth. They conclude that oil price volatility has no positive impact on the economy, contrary to the findings of some earlier studies, but oil price itself does.

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In their study, Donwa, Mgbane and Onibun (2015), examine the relationship between Oil price volatility and Nigeria's economic growth from 1970 to 2013 to find out if global oil price volatility is directly linked to the rate of economic growth in Nigeria and its influence on macroeconomic variables that affect economic growth in Nigeria. The methodology was based on empirical and conceptual literature review of the works of other researchers, using macroeconomic variables as the determinants of economic growth. Their findings reveal that in the short run, Nigeria experienced increasing economic growth rate because of the high global oil prices, but in the long run, the inconsistency of oil prices and lack of diversification of the productive base of the economy had a negative effect on government revenue and expenditure and thus the level of employment, rate of inflation, level of consumption and exchange rate movement.

Taofik (2015) investigates the relationship between oil price fluctuations and output performance in Nigeria spanning the period 1970-2015. The 2SLS estimation technique was used along

with unit root and Johansen co-integration tests to determine the time series properties of the data. The result suggests that oil price impacted positively on aggregate output but negatively on agricultural, manufacturing and service sectors suggesting that fluctuation in oil price creates uncertainty in the production capacity of the productive sectors and it also undermines the effectiveness of government fiscal management of crude oil revenue.

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2.4 Theoretical Review

a. Linear/Symmetric Relationship Theory of Growth

The Linear/Symmetric relationship theory of growth which has as its proponents, Hamilton (1983), Gisser (1985), Goodwin (1985), Hooker (1986) and Laser (1987) postulated that volatility in GNP growth is driven by oil price volatility. They hinged their theory on the happenings in the oil market between 1948 and 1972 and its impact on the economies of oil-exporting and importing countries respectively. Hooker (2002), after rigorous empirical studies demonstrated that between 1948 and 1972 oil price level and its changes exerted influence on GDP growth significantly. Laser (1987),

who was a late entrant into the symmetric school of thought, confirms the symmetric relationship between oil price volatility and economic growth. After an empirical study of her own, she submitted that an increase in oil prices necessitates a decrease in GDP, while the effect of an oil price-decrease on GDP is ambiguous, because its effects varied in different countries.

b. Asymmetry- in- Effect Theory of Economic Growth

The Asymmetry-in-effects theory of economic growth used the U.S economy as a case study. The theory posits that the correlation between crude oil price decrease and economic activities in the U.S economy is significantly different and perhaps zero. Mark *et al* (1994), a member of this school of thought in a study of some African countries, confirmed the asymmetric effect of oil price volatility on their economic growth. Federer (1996), another member of this school explains the asymmetric mechanism between the influence of oil price volatility and economic growth by focusing on three possible ways: Counter-inflationary monetary policy, sectoral shocks and uncertainty. He finds a significant relationship between oil price increase and counter-inflationary policy responses. Balke (1996) supports Federer's position. He posits that monetary policy alone cannot sufficiently explain real effects of oil price volatility on real GDP.

There exist other theories on the oil price volatility effect on economic growth in the literature such as the decoupling theory and Income transfer model of growth etc. The reviewed theories are still at their crude stage, this is vivid from the quality of their analysis, ambiguity in conclusions and submissions and a clear absence of an econometric face. This is not unconnected to the background of the proponents of these theories, many of whom are scientists, ecological and environmental economists. The submissions of these theories, however, provide analytical foundations on which to compose this study's empirical investigation.

3. Methodology

3.1. Model Specification

The study adopts the model used by Oriakhi and yola (2013). The model uses oil prices and real GDP figures, since the main objective is to analyze the effects of

$$Y_t = A_1 Y_t + \dots + A_p Y_{t-p} + B_{zt} + E_t \quad (1)$$

$Z_t = [\text{constant}, D_1, D_2, D_3, D_4, D_5, D_6, D_7]$

Where;

Y_t = the vector of endogenous variables

Z_t = the vector of exogenous variables

A_i and B = are coefficient matrices

p = the lag length

Using the model used by Cholesky (1977) and Oriakhi and Iyola (2013), this study assumes the following ordering of the seven variables used in the VAR: Oil price volatility (OPRV), Real GDP (RGDP), Real government expenditure (RGOVEX), Real exchange rate (REEX), Inflation rate (INFL), Real money supply (RMS), Real imports (RIMP). In this analysis, real money supply represents the monetary sector, while real imports represent the external sector, so that the three broad sectors of the economy are captured in the model. This is necessary because the orthogonalization method involves the assignment of contemporaneous correlations only to specific series.

Table 1:

Result for Unit Roots Test of Variables

Variables	ADF Lag	ADF test Statistic	95% critical value for the ADF Statistic	Remark
OPRV	1	-0.933478	-2.8801	Non-Stationary
RGDP	1	-2.079468	-2.8799	Non-Stationary
RGOVEX	1	-0.091294	-2.8799	Non-Stationary
REEX	1	-0.069071	-2.8799	Non-Stationary
INFL	1	-4.109861	-2.8799	Stationary
RMS	1	1.637732	-2.8799	Non-Stationary
RIMP	1	-0.442549	-2.8799	Non-Stationary
DOPRV	1	-5.025705	-2.800	Stationary
DRGDP	1	-6.820084	-2.800	Stationary
DRGOVEX	1	-6.253270	-2.800	Stationary
DREEX	1	-4.557885	-2.800	Stationary
DINFL	1	-5.486349	-2.800	Stationary
DRMS	1	-26.15264	-2.800	Stationary
DRIMP	1	-6.117871	-2.800	Stationary

Source: Author's Results Using E-views 10

change in the former on the latter and as such this model is more appropriate for this study. This study uses real GDP as the measure of economic growth and the unrestricted VAR model of order P is presented in equation 1;

E_t = an unobservable zero-mean white noise process.

$D_1 - D_7$ = are the variables chosen from 1988-2018 for the VAR model.

OPRV = measured by deriving the standard deviation of international oil prices between 1988 and 2018 over four quarters. (Oriakhi &Iyola, 2013)

Data employed in the analysis were obtained from the Central Bank of Nigeria (CBN). The VAR method allows the assessment of the relative importance of a particular variable in the changes in other variables. Another advantage of this technique is that it circumvents the problem involved with the specification and estimation of structural simultaneous equations. This is because the VAR model considers all variables as endogenous. The analysis of the study is made up of 3 steps; Unit root test for the variables, Granger causality test and Forecast Error Variance Decomposition (FEVD).

4. Results sand Discussions

The result of the ADF unit root test presented in table 1 establishes the existence of non-stationarity in all the data series except inflation in level as the absolute values of ADF test statistic of the variables (in level) were less than the absolute values of the 95% critical value of the ADF statistic, thus signaling the non-stationarity of six

(6) of the variables. However, upon 1st differencing, non-stationarity in the data series of these 6 variables is gotten rid of and stationarity was attained. It means that the hypothesis of unit root could not be rejected at the 1% level.

Testing of Granger-Causality

Table 2

Granger Causality tests results

Null Hypothesis:	Obs	F-Statistics	Probability
OPRV does not Granger Cause INFL	118	4.20127	0.03030
INFL does not Granger Cause OPRV		0.36461	0.77865
REEX does not Granger Cause INFL	118	0.08201	0.96973
INFL does not Granger Cause REEX		1.00097	0.39424
RGDP does not Granger Cause INFL	118	0.38459	0.76425
INFL does not Granger Cause RGDP		0.26057	0.85370
RGDP does not Granger Cause REEX	118	2.23235	0.08681
REEX does not Granger Cause RGDP		1.74304	0.16065

Source: Author's Results Using E-views 10

Table 2 reports the results of the Pairwise Granger Causality Tests. The first line results display the Granger causality test of the response of inflation to oil price volatility. The result from table 2 indicates that at an F-ratio of 4.201, the null hypothesis cannot be accepted. Thus oil price volatility significantly granger causes inflation rate even at the conservative 1% level of significance. Similarly, the 7th line results follow similar analysis. With the F-ratio of 4.071, it is difficult to accept the given null hypothesis, leaving the option of accepting the implied alternative hypothesis that oil price volatility granger causes real exchange rate in Nigeria. Focusing on the direction of causality between oil price volatility and real government expenditure, the 9th line of the result reports this causality. At 1% significant level, the F-statistic value of 3.74 passes the

significant test and gives enough evidence to accept the alternative hypothesis that oil price volatility granger causes government expenditure. Expectedly, line 18 indicates that with an F-value of 4.99, causality that runs from real money supply to real GDP is significant, thus real money supply granger causes real GDP in Nigeria. By way of summing up, the results show that the interaction between oil price volatility and major macroeconomic variables in Nigeria is generally significant with the direction of causality running to at least one direction across all the oil price specifications. Interestingly, however, the results reveal that the hypothesis of non-causality running from oil price volatility to real GDP, cannot be rejected.

Forecast Error Variance Decomposition

Table 3

Results for the Forecast Error Variance Decomposition

Variance Decomposition of OPRV

Period	S.E	Oprv	Rgdp	Rgovex	Reex	Infl	Rms	Rimp
1	0.00999	100.000	0.00000	0.00000	0.00000	0.00000	0.000000	0.00000
5	0.04724	93.4950	0.86195	4.74657	0.05702	0.25578	0.145435	0.43820
10	0.0553	74.9695	3.95795	16.0144	0.62715	0.21954	3.382599	0.82880
15	0.56891	72.0659	4.30228	17.2084	1.10509	0.34607	3.811691	1.16062
20	0.05721	71.5168	4.44043	17.0379	1.20269	0.74245	3.778070	1.28171
25	0.057351	71.19355	4.548817	16.95786	1.229016	0.769830	3.8082214	1.492710

Source: Author's Results Using E-views 10

Variance Decomposition of RGDP

1	0.075749	0.116533	9.88347	0.00000	0.000000	0.000000	0.000000	0.000000
5	0.242637	0.058540	91.99949	3.342377	0.189656	0.008895	3.794889	0.606153
10	0.270366	4.292087	0.052889	0.84402	3.377134	2.621404	3.284385	5.528080
15	0.325902	3.705664	0.077303	76.02527	6.949374	3.437225	4.724856	5.080309
20	0.378984	4.727300	0.098548	72.91848	10.78233	2.824173	4.513374	4.135791
25	0.425522	6.670427	0.201876	69.05926	13.90276	2.249247	4.335029	3.581404

Source: Author's Results Using E-views 10

The variance decomposition suggests that shocks to oil prices as presented in table 3 have the greatest effect on real exchange rate throughout the period of the investigation. It increased steadily and significantly overtime. Oil price volatility accounted for about 4% of shocks to real exchange rate in the fifth quarter, increasing in effect to about 15% in the tenth quarter and further to about 19% in the fifteenth quarter. It increased further to about 22% in the twentieth quarter and peaked at about 24% in the twenty-fifth quarter. Other variables which had significant impacts on variations in real exchange rate are; real government expenditure and change in commodity prices (inflation). Real government expenditure accounted for about 10% of variations in real exchange rate in the first quarter; it however declined minimally to about 9% in the fifth quarter and further to about 7% in the tenth quarter. By the fifteenth quarter, its contribution had fallen further to about 6% and then averaged about 5% through the twenty-fifth quarter. However, inflation rate has an increasing effect on real exchange rate. Its contribution increased from 0 in the first quarter to about 2% in the fifth quarter and also increased to about 5% in the tenth quarter. From the fifteenth quarter to the twenty-fifth quarter the contribution of inflation to variations in real exchange rate averaged about 7%. The error decomposition of real government expenditure shows that in the first ten quarter period of the analysis, real government expenditure variations were mostly explained by itself, after which the effect declined over time. The two other variables that have considerable impact on its variations were real exchange rate and oil price volatility. Real exchange rate contributed about 3% to variations in real government expenditure in the tenth quarter after having not contributed in the first and fifth

quarters. This rise continued to about 6% in the fifteenth quarter and then about 10% in the twentieth quarter, its contribution finally peaked at about 14% in the twenty-fifth quarter. Expectedly, the result shows that the response of real government expenditure to shocks in oil prices was significantly different from zero. In the fifth quarter it accounted for about 1% and increased considerably to about 4% in the tenth quarter and then declined to about 3% in the fifteenth quarter, by the twentieth quarter its effect had risen to about 4%, with a further rise to about 6% in the twenty-fifth quarter.

However, the empirical result indicates that real GDP largely explains itself for the first ten quarter period of the analysis, after which its explanatory power declines substantially. Specifically, the empirical result indicates that real government expenditure accounts for the largest variations in real GDP. For instance about 3% of the shocks in real GDP in the fifth quarter were as a result of variations in real government expenditure and it rose to about 12% in the tenth quarter and then about 15% in the fifteenth quarter. By the twentieth quarter, it accounted for about 17% of variations and finally, 19% in the twenty-fifth quarter. The contribution of oil price volatility is insignificant over the period of the analysis, averaging just 1%. Furthermore, the contributions of real exchange rate, inflation rate and real imports are also significant. While real exchange rate accounted for about 15%, 16% and 18% of variations in real GDP in the fifteenth, twentieth and twenty-fifth quarters respectively, inflation rate persistently increased its contribution to variations in real GDP from about 6% in the fifteenth quarter to about 7% in the twentieth quarter and then about 9% in the twenty-fifth quarter. The contribution of real import to variations in real GDP is not different, averaging about 9% through the fifteenth

to twenty-fifth quarters of the analysis. The real import response to a shock in oil prices is positive and significantly different from zero. This positive response of real imports to oil price volatility lasts until the end of the period of analysis. As indicated by the table its contribution declined to about 2% in the fifth quarter from about 3% in the first quarter. It deepens further to about 1% in the fifteenth quarter, but rises to about 3% in the twentieth quarter and further to 5% in the twenty-fifth quarter. Government expenditure accounts largely for variations in real imports. It accounts for about 16% of variations in the first quarter, and then about 24% in the fifth quarter. This rise continues to about 45% in the fifteenth quarter and by the twenty-fifth quarter, real government expenditure accounts for about half of the variations in real imports. Real exchange rate also has a significant impact on real imports, accounting for about 11% of variations in the fifteenth quarter and about 22% in the twenty-fifth quarter. This confirms the strong linkage between government, real exchange rate and real imports in the Nigerian economy. Finally, real GDP and oil price volatility account for the largest share of variations in inflation rate. Real GDP accounts for about 6% of changes in commodity prices in the first quarter, increasing to about 10% in the fifth quarter and then to about 14% through the twenty-fifth quarter. Oil price volatility explains only 0.88% of changes in inflation rate in the first quarter. However it rose to about 13% in the tenth quarter and its contribution to variations in inflation rate averaged about 13% through the twenty-fifth quarter. Similarly, real government expenditure also has significant impact on variations in inflation rate within the period of analysis. It accounts for about 2% of total variations in the first quarter and then about 3% in the fifth quarter. It steadily increased to about 10% in the fifteenth quarter, and then averaged about 11% through the twenty-fifth quarter. Other variables are not significant in explaining variations in inflation rate in Nigeria within the period of analysis.

An interesting aspect of the result is that variations in real money supply are almost totally explained by real government expenditure. Government expenditure accounts for about 30% of variations in money supply in the first quarter and rose to about 44%

in the fifth quarter. It further increased to about 67% in the fifteenth quarter and by the twenty-fifth quarter, its contribution averaged 69%. Also, the contribution of oil price volatility is significantly different from zero. Oil price volatility accounts for 0.02% of variations in real money supply in the first quarter; it increased to about 2% in the tenth quarter and then accounts for about 6% in the twentieth quarter, through the twenty-fifth quarter. Inflation also contributes significantly, fluctuating between 3% and about 6% within the first and tenth quarter. It then settles at about 3% through the twenty-fifth quarter. The contributions of the other variables are insignificant.

The estimates of the models that are outlined in the previous sub-sections give us results that are instructive and far-reaching in policy implications. Firstly, the Forecast Error Decomposition result suggests that shocks to real exchange rate in all twenty-five quarters were considerably accounted for by oil price volatility. As a net-oil exporter, Nigeria's real exchange rate appreciates when oil price hike facilitates higher inflow of foreign exchange into the economy. Although, this may sound good for the economy, it, however, has serious implications on real economic activities and the foreign scene due to the heavy reliance of the economy on foreign inputs. This finding is consistent with the findings of Amano and Norden, 1998 and Olomola, 2006. Specifically, the introduction of SAP in the 1980s marks a new era in Nigeria's exchange rate policy. In other words, exchange rate policy was deregulated in Nigeria. Post-SAP period witnessed a steady depreciation of the Naira exchange rate, leading to very high cost of production in Nigeria relative to other countries simply because, amongst other reasons, the dollar value of imported (both intermediate and final) technology required for production in terms of the Naira is extremely high. As a result of this, Nigeria becomes a dumping ground for foreign goods which are far cheaper than the Nigerian made goods. Considering this fact, the country rolls out a number of policies aimed at protecting and promoting locally made products. These policies, however, have been academic, as imported goods predominantly from China have continued to flourish in Nigeria's markets, basically because of their

affordability. Secondly, the result shows that oil price volatility has a significant effect on real government expenditure. Increase in oil prices leads to increase in government expenditure. The result confirms the huge monetization of crude oil receipts and subsequent increase in government expenditure explained earlier. This finding however, contradicts the findings of Farzanegan and Markwardt (2007) where positive oil shocks account for an insignificant variation in government expenditure. Another finding from the result of the study is that real exchange impacts heavily on real government expenditure; which might not be unconnected with the over-dependence of Nigeria's government budget on oil prices (oil benchmarking). Hence, the prevailing exchange rate of the dollar to the Naira on receipt of the dollar value of its oil influences government ability to meet its domestic capital expenditure and re-current expenditure obligations. The implication of this development is that oil price volatility has a direct as well as indirect effect on Nigeria's government expenditure, with the latter effect being through real exchange rate.

The third aspect of the result is the indirect and marginal impact of oil price volatility on real GDP in Nigeria. This contradicts the expectations that oil price shocks tend to lower real GDP (Gordon, 1989) and impacts significantly on it (Farzanegan & Markwardt, 2007), rather it confirms the findings of Barsky and Kilian (2004) as well as of (Akpan, 2009), that oil price shocks have marginal impact on real GDP. An explanation for the rather weak causality between oil price volatility and real GDP as demonstrated by the result is necessary. Oil price volatility may not have direct impact on real GDP in Nigeria; rather it works through real government expenditure and real exchange rate as indicated by the result. Characteristically, government remains the major driver of the Nigeria's economy; therefore, through its expenditure it dictates the growth trend and speed of the economy. The implication of this result, therefore, is that at the prevailing exchange rate, oil prices determine government's expenditure which in turn determines growth in Nigeria.

Another explanation which can be put forth is the difference in estimation periods. Some related studies such as Akpan (2009) and Aliyu (2009), which employ estimation periods of 1980-2009 and 1981-2008 respectively, report a direct significant impact of oil price volatility on GDP. But the study carried out by (Olomola, 2006) which used an estimation period similar to this study, reports a weak significant impact of oil price volatility on real GDP. This implies that the period chosen for the analysis could be considered as a likely factor. Another likely explanation is economic diversification goal being pursued by policy makers at all levels in the country. There has been a lot of efforts geared towards reducing Nigeria's dependence on oil. Some state governments have improved their tax collection mechanisms in order to improve their internally generated revenue (IGR), as well as to reduce their reliance on oil determined revenue allocations from the Federal government. If these efforts are anything to go by, the implication ordinarily will be that the direct causality between oil price volatility and real GDP should expectedly fade away in years to come. A fourth consideration in this direction is the significant impact of oil price volatility on inflation rate. The results of the VDC show an increasing effect of oil price volatility over the period; from 0.88% in the first quarter to 13% by the tenth quarter. This implies that oil price changes stir up price instability in the country. This can be attributed to Dutch disease and Spending effect. The findings of Barker and Paul in their study (2004), that oil price changes can significantly affect inflation rate confirms the results of this study.

5. Conclusion and Recommendations

This study assesses the effect of oil price volatility on Nigeria's economic growth between 1988 and 2018. Results from the Granger-causality tests and VAR help to establish that the effect of oil price volatility and macroeconomic variables on Nigeria's economic growth is significant, with the direction of causality running to at least one direction. However, an interesting observation emerged in the nature of causality between oil price volatility and real GDP. Oil price volatility is found to impact on real GDP, through other variables in

the economy. The variables are real government expenditure and real exchange rate, simply referred to as impact variables in Economics. This finding is confirmed by other related studies such as

From the findings, it is observed that oil price at the prevailing exchange rate determines the level of government spending, which in turn determines real GDP. Overall, it can be said that there is a crucial relationship between oil price volatility and Nigeria's economic growth due to the fact that Nigeria's economy is highly vulnerable to oil price changes and expected growth targets are hardly met.

Given the findings, the study recommends that: First, since real government expenditure significantly impacts on virtually all the other variables, it is important that government spending should not be increased rapidly to levels which may become unsustainable when oil prices fall in future. Fiscal

prudence should be expressed through spending plans, with the citizenry's welfare as its main objective.

Second, the current practice whereby the Federal government solely controls exploration rights of mineral resources in the country should be reviewed with a view to giving the states some autonomy.

Third, monetary sector should be more vibrant as the watch dog of the economy and considering the fact that Nigeria possesses an under-developed capital market, a very large informal sector and a porous/loose financial system. Fourth, the diversification policy drive of Nigeria's government should not focus on agriculture alone; rather Nigeria's rich untapped solid mineral deposits should also be exploited.

Lastly, accountability, corporate governance and responsibility should be cultivated as core values by all stakeholders to ensure that Nigeria's growth ambition remains firmly on track.

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