The Effect of Oil Price Fluctuation and Selected Macroeconomic Variables on Economic Growth in Nigeria: 1980-2015

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Abstract: *The effect of oil price fluctuation on selected key macroeconomic indicators is the focus of the study. The selected macroeconomic variable are: foreign reserve, foreign exchange allocation, annual budget allocation and Gross domestic products. Unit root tests show stationarity of time series data from 1980-2015. OLS regressional analysis indicates a short run positive relationship between oil price and economic growth. Johanson co-integration tests result established that a long run relationship among the variables in the model exists. The result of the parsimonious vector error correction model established that increases in the model variables will stimulate economic growth. The study recommended that government should diversify the economy as a means of absorbing oil price shocks on the economy.*
Keywords: *Fluctuation, Growth, Oil, Price.*

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I. Introduction

In the international community of nation Nigeria is known as an oil nation with huge petroleum reserves; these huge petroleum reserves has made Nigeria a key participant in oil trades since the 1980's till present. Clearly, receipts from sale of crude oil shows that Nigeria economic growth and development is significantly influenced by activities relating to the stability of the international oil market. [1] reported that oil receipts accounted for 82.1% and about 90% of the nation's foreign exchange earnings in 1974, 2008 and 2010.; [2] also reported that oil still account for 92% of Nigeria earnings.

The reliance of the Nigerian economy over the years on oil has led to her remaining a mono-product economy with notable inherent structural deficiencies that are highly susceptible to change in the prices of crude oil. Consequently, changes in the indicators of economic growth and development in Nigeria has been said to be due to high rate of oil price fluctuations in the world market. Hence, the provision of empirical evidence showing the oil price-macroeconomic relationship has occupied the attention of researchers and policymakers over the recent years [3].

The down-spiral fluctuation of the oil price in the global market is a major concern for oil economies such as Nigeria, because, an increase or a positively stable oil price is a transfer of wealth from importing countries to exporting countries, however, in recent times, the price of crude oil has continued to fluctuate downwards, this can be attributed to the discovery and exploration of deep seas oil reservoirs in Europe and other places outside Africa. Thus, the dependence of countries from Europe on Nigeria for its supply of crude oil reduced thus affecting the price of crude oil. [4] noted that the price of crude oil have drop from a peak of $104 per barrel in 2014 to $54.4 in march 2015 thus accounting for a significant drop in oil revenues.

Despite the fact that Nigeria is the 6th largest oil producer , due to in effective policies and lack of infrastructure, Nigeria is both an exporter and importer of crude oil (since Nigeria imports refined petroleum products). Thus indicating that the volume of international trade carried out by Nigeria is oil dependent. Furthermore, since Nigeria is an oil economy, capital goods and other projections for economic growth and development are usually based on the oil price benchmarks set by the government. However, with sudden and sharp negative fluctuation of the oil price in the global market, it often leads to inability of the Nigerian government to plan and implement her policies and strategies developmental goals. In other words, a sudden drop in oil price will lead to a shortage of capitals goods that will generate employment and drive the economy.

Similarly, another major problem associated with the oil price fluctuation and peculiar to Nigeria involves the resultant huge balance of payment deficits it tends to create. Huge balance of payment deficits often neccesitates the need for external borrowing which in turn affects capital formation thus negatively impacting on the growth and development of the Nigeria economy.

Deducing from the above, the study seeks to answer the following questions
- What are the effect of oil price fluctuations on economic growth in Nigeria over the period of 1980-2015?
- What is the effect of foreign reserve on economic growth in Nigeria?
- What is the effect of foreign exchange allocation on economic growth in Nigeria?
- What is the effect of annual budget allocation on economic growth in Nigeria?

1.2 Objectives of the Study

The objectives of this study are as follows:
- determine the effect of oil price fluctuation on economic growth in Nigeria over the period in review.
- examine the effect of foreign reserve and economic growth in Nigeria over the period in review.
- analyze the effect of foreign exchange rate on economic growth in Nigeria over the period in review.
- examine the effect of annual budget on economic growth in Nigeria over the period in review.

1.3 Statement of Hypothesis
The study was guided by the following:
H_{o1}: there is no significant relationship between oil price fluctuation and economic growth in Nigeria.
H_{o2}: there is no relationship between foreign reserve and economic growth in Nigeria.
H_{o3}: there is no relationship between foreign exchange rate and economic growth in Nigeria.
H_{o4}: there is no relationship between annual budget allocation and economic growth in Nigeria.

1.4 significance of the study
Macroeconomic indicators are carefully set such that they provide an enable environment for economic growth and development. This study seeks to provide empirical evidence of the effect of oil price fluctuation on these indicators. This knowledge is necessary for policy makers to plan and provide means of avoiding such causative shocks in order to achieve stable economic growth and development.

II. Literature Review
The importance of crude oil revenue to the Nigeria economy has necessitated the need to provide ample empirical evidence to unravel the relationship between crude oil price fluctuation and macroeconomics indicators. This is due to the highly volatile nature of oil price since World War II (Taiwo *et al.* 2012).

[4] examined the relationship between oil price and economic growth in Nigeria using annual time series data for the period 1974-2014. The study focused on empirically determining how changes in oil price affects selected key macroeconomic variables. Descriptive and inferential methods of data analysis were used for the study. Vector autoregressive (VAR) model was used to establish the short-run relationship and the direction of casualty on the impact of oil price on economic growth using the selected key macroeconomic variable. Results revealed that oil price increase presents a positive correlation to economic growth.

[5] in their study of oil price shocks and the Nigeria economic growth; they employed the general method of moment (GMM) to study the impact of oil price shock, on the country from 1981-2012 using data from EIA, CBN statistical bulletin. Their research revealed that the shocks of oil price insignificantly hold back or slowdown economic growth while oil price itself significantly improves it.

[6] investigated the impact of fluctuation price of oil of OPEC countries from 2001-2014, data were collected from annual bulletin of OPEC. The crude oil spot price of Brent FOB (barrel per dollar) was used as independent variable and Gross Domestic Product (GDP), exports current account and exchange rate as the dependent variables. The findings revealed that fluctuation in the prices of oil do not significantly impact the economic indicators of OPEC economies as low oil prices reduce energy cost and importation costs. The rises in prices of oil have been followed by rising inflation and recession in many countries.

[7] conducted a research on Oil Price volatility and economic growth in Nigeria from 1970 to 2014. The study investigated the impact of crude oil price volatility on economic growth. The study aimed at extending the frontier of know ledge by estimating the impact of the oil price volatility on the Nigerian economic growth using aggregate demand framework that theoretically connect analytical variables, rather than just explaining output behaviour by oil price and host of arbitrarily variables as done by earlier studies. 'The study adopted Engel-Granger co-integration test and Granger Representation theorem in testing the long run and short run relationships between crude oil volatility and economic growth respectively. The study found that, oil price volatility (OPV) has negative impact on the economic growth while variables such as crude oil price, oil revenue and oil reserves have positive impact on the Nigeria economy. Based on the findings, the study recommended that-the country should diversify its export revenue base as a means of minimizing reliance on crude oil outputs. The study further proffered that Government should adopt a prudent fiscal policy in relation to

oil prices. This could be done through the elimination of some taxes on crude oil and the gradual removal of oil price subsidies

[8] investigated the impact of global fall in oil prices on the Nigeria National Petroleum Corporation (NNPC) using CBN statistical bulletin. His analysis was done with the ordinary least square (OLS) regression method and the findings revealed that international financial breakdown have a significant impact on the revenue of oil crude and their prices in the country which notably were positively related to one another; also, small shift in oil price causes increased sensitivity to the revenue of crude oil.

[9] evaluated oil revenue public spending and economic growth relationship in Nigeria from the 1980-2012. The study adopted OLS method, the test of cointegration, Vector Error correction (VEC) and Granger causality test to ascertain the way of causality and the degree of the impact of the variables. Their results reveal that the oil revenue Granger caused both total government spending and growth, whereas there was no causality among the Government spending and economic growth in Nigeria.

[10] in their study attempts to verify the direct and indirect impact of volatility of oil price impact on the economy evaluated the impact of the volatility of the oil price on selected macroeconomic variable through public expenditure while the direct impact forecasting tied the same selected macroeconomic variables directly on oil volatility. The study utilized the methodology of Vector Auto Regression (VAR), dynamic simulations error variance decomposition and the pairwise Granger causality test. Their findings reveals that oil volatility significantly stimulate most of the macroeconomic variables and Nigeria public expenditure, also public expenditure impact on most of the macroeconomic variables.

[11] assessed the oil price volatility and macroeconomic indicators in Nigeria using time series data from 1980-2012. The study distinguishes between oil prices and macroeconomic indicators and also the impact of oil prices on macroeconomic indicators. The study employed the Granger Causality test and Ordinary least Square (OLS) regression method. The result revealed that there are positive but insignificant relationships between oil price and the country GDP.

[12] researched on the relationship between price of oil and the changes of exchange rate in Nigeria 1970-2011. Their data were sourced from BP statistical review of Energy 2011 and the Central Bank of Nigeria (CBN) statistical bulletin 2011 respectively. They adopted the econometrics techniques which were based on the Johansen maximum likelihood estimation procedures and conduction the Augmented Dickey Fuller (ADF) and Philips Perron test. The researchers noted that equal change in oil price leads to a more than equal change in exchange rate volatility in Nigeria which implies that exchange rate is susceptible to change in oil prices.

[13] conducted a work on Analysis of the Effect of Oil Price Shock and Exchange Rate Instability on Economic Growth in Nigeria. The study was to assess the impact of oil price shock and real exchange rate instability on real economic growth in Nigeria on the basis of quarterly data from 1986 to 2012. Time series data was used to examine the nature of causality among the variables. The Johansen Vector Autoregressive (VAR)-based co-integration technique was applied to examine the sensitivity of real economic growth to changes in oil prices and real exchange rate volatility in the long-run while the short run dynamics was checked using a Vector Error Correction Model (ECM). Results from Augmented Dickey-Fuller (ADE) and PP tests show evidence of unit root m the data and Granger pairwise causality test revealed unidirectional causality from oil prices to real Gross Domestic Product (GOP). The findings of the study shows that oil price shock and appreciation in the level of exchange rate exert positive impact on real economic growth in Nigeria. It recommends greater diversification of the economy through investment in key productive sectors of the economy to guard against the vicissitude of oil price shock and exchange rate volatility.

[14] examined the consequences of oil price volatility on the growth of the Nigerian economy within the period 1970 to 2010. Using quarterly data and employing the VAR methodology. Their study found that, of the six variables employed, oil price volatility impacted directly on real government expenditure, real exchange rate and real import, while impacting on real GDP, real money supply and inflation through other variables, notably real government expenditure. This implied that oil price changes determine government' expenditure level, which in turn determines the growth of the Nigerian economy.

III. Methodology
The study employed the analytical method of ordinary least square (OLS) of multiple regressions to test the relationship and ascertain the actual impact of the variables. The study also employed unit root test, co-integration test, parsimonious error correction model (VEC), and Granger causality tests on the economic growth model. The E- view statistical software version 9.0 was used in running the regression.

Model Specification

The Model is specified thus:

GDP=F(OPF, FERX, FEXA, ABA)   (1)

$Gdp = A_0 + A_1 OPF + A_2 FERX + A_3 FEXA + A_4 ABA + U_t$ (2)

However, in order ti estimate the model using ordinary least squares equation (2) was transformed into a long-linear form. Thus:

$L_n GDP = L_n a_0 + a_1 L_n OPF + a_2 L_n ERX + a_3 L_n FEXA + a_4 L_n ABA + U_t$ (3)

Where

GDP	-	Gross domestic product as a substitute for economic growth.
OPF	-	oil price fluctuations
FERX	-	Foreign reserve
FEXA	-	foreign exchange allocation of naira to the united states dollar
Aba	-	annual budget allocation,
U_t	-	stochastic or error terms that takes care of variable not included in the model that affect oil price.

IV. Results

The unit root result is presented in table 1 below.

Unit Root Results

Table 1: Unit Root Results

Variables	adf. Test Statistic	1% critical level	5% critical level	10% critical level	Order of integration
LOG(GDP)	-3.619907	-4.262735	-3.553973	-3.209642	1(1)
LOG(OPF)	-3.844766	-2.636901	-1.951332	-1.610717	1(1)
LOG(FERX)	-4.559897	-3.672334	-1.751231	-1.899023	1(1)
LOG(FEXA)	-4.620855	-4.262735	-3.552973	-3.209642	1(1)
LOG(ABA)	-6.281433	-3.105321	-2.322572	-2.377693	1(1)

The stationary test results reported in table 4.3 shows the variable under consideration – economic growth (GDP) oil price (OPF), Foreign reserve (FERX) , foreign exchange allocation (FEXA) and annual budget (ABA) displayed at levels attained stationary after first difference. This implies that the variables are integrated of order one i.e. i (1), a;ll test were conducted using the 5 percent level of significance.

Ordinary Least Square Results

Table 2 Short Run Result

Dependent variable: LOG (GDP)

Variable	Coefficient	Std. Error	T-Statistic	Prob.
LOG (OPF)	-1.517967	0.508766	-2.983623	0.0066
LOG(OPF)	0.609105	0.429280	1.418898	0.1693
LOG(FERX)	0.397568	0.503189	0.790098	0.4375
LOG (FEXA)	-0.169951	0.449954	1.815729	0.0825
LOG(ABA)	-0.189236	0.467758	-0.404560	0.6895
C	-2.733163	0.813259	2.454544	0.0221
R-Square	0.819169	mean dependent var	1.861090	
Adjusted R-squared	0.771996	S.D. dependent var	1.806375	
S.E. of regression	0.384976	Akaike info criterion	1.955037	
Sum squared resid	0.384976	Schwarz criterion	1.987732	
Log likelihood	-28.62556	Hannan-quinn criter.	1.965497	
F-statistic	17.36515	Durbin-watson stat	1.839602	

Source: Computed Result

The short run result in table 4.1 shows that foreign exchange and annual budget are significant at 5 percent level and appropriately signed. Again, the significance of the model as indicated by F-statistic and the low level of Durbin Watson statistics all supported the reliability of the short result.

Co-Integration Test Result

Table 3: Co-integration Test Result

Series:LOG (GDP)LOG(OPF)LOG(FERX)LOG(FEXA(LOG(ABA)
Lags interval (in first differences): 1 to 2
Unrestricted Co-integration Rank Test (Trace)

Hypothesized No.of CE	Eigenvalue	Trace statistic	0.05	Prob.**
None*	0.865320	74.16641	41.3275	0.0000
At most 1*	0.247703	11.09523	15.49471	0.2057
At most 2*	0.757702	43.02633	33.84146	0.0025
At most 3	0.358112	25.72030	29.79707	0.1373
At most 4	0.450287	18.58339	21.59344	0.1853

Max-eigenvalue test indicates 2 co-integration equal (s) at 0.05 level
*denotes rejection of the hypotheses at the 0.05 level
** Mac kinnon- Haug- Michelis (1996) p-value.

Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE	Eigenvalue	Max-Eigen Statistic	0.05 Critical value	Prob.**
None*	0.865320	74.16641	41.3275	0.0000
At most 1	0.247703	11.09523	15.49471	0.2057
AT most 2*	0.757702	43.02633	33.84146	0.0025
At most 3	0.358112	25.72030	29.79707	0.1373
At most 4	0.450287	18.58339	21.59344	0.1853

Max-eigenvalue test indicates 2 co-integration equ(s) at 0.05 level
*denotes rejection of the hypotheses at the 0.05 level
** Mac Kinnon-Haug Michelis (1996) p-value.
Source: Compute (E-View 9.0)

The johansen co-integration test indicate that trace statistics and maximum eigenvalue shows the existence of three (3) and two (2) co-integrating equation/relationship respectively between economic growth and the variables influence it at 5 percent level of significance. This means that there exists a long run relationship between economic growth, oil price foreign reserve.

Vector Error Correction Model (VECM) Results

Table 4: Parsimonious Vector Correction Model
Dependent Variable: DLOG(GDP)
Method: Least Squares Sample (adjusted): 1983 2015 Included observations: 33 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(GDP-l)	0.262742	0.349934	2.751209	0.0109
DLOG(ABA-l)	0.025260	0.032819	-0.769676	0.4487
DLOG(FEXA-l)	-0.775882	0.226846	0.864421	0.3956
DLOG(FERX-l)	0.488207	0.396450	1.449469	0.1596
DLOG(FERX-2)	-0.567442	0.216656	-3.153672	0.0042
DLOG(OPF-l)	-1.722039	1.267357	-1.358764	0.1864
ECM(-l)	-0.363413	0.410472	-3.321577	0.0028
C	0.298075	0.135210	0.959897	0.3463
R-squared	0.837098	Mean dependent	var	0.085424
Adjusted R-squared	0.279486	S.D. dependent var		0.362768
S.E. of regression	0.173150	Akaike info criterion		0.632659
Sum squared resid	1.08E+09	Schwarz criterion		0.298938
Log likelihood [1]	0.513387	Harman-Quinn criter.		0.774866
F-statistic	4.773249	Durbin-Watson stat		1.707359
Prob(F-statistic).	0.000852			

Source: Computed Results (e-view 9.0)

The result of the parsimonious vector correction model indicates that oil price flu cm foreign reserve at 5% level are negatively related to GDP. This means that these variable conform to apriori theoretical expectation and implies that they decrease GDP in Consequently, foreign reserve and foreign exchange at lag I were found to be positively to GDP. This result implies that increase in these variables stimulate economic growth.

Pairwise Granger Causality Test Result

Table 5: Pairwise Granger Causality Test Result
Pairwise Granger Causality Tests Date: 08/06/17 Time: 08:59 Sample: 1980 2015 Lags: 2

Null Hypothesis:	Obs	F- Statistic	Prob.
LOG(OPF) does not Granger Cause LOG(GDP)	34	4.12925	0.8793
LOG(GDP) does not Granger Cause LOG(OPF)		0.63307	0.0396
LOG(FERX) does not Granger Cause LOG(GDP)	34	5.53432	0.7657
LOG(GDP) does not Granger Cause LOG(FERX)		1.25275	0.0004
LOG(FEXA) does not Granger Cause LOG(GDP)	34	7.15265	0.8591
LOG(GDP) does not Granger Cause LOG(FEXA)		0.35222	0.0027
LOG(ABA) does not Granger Cause LOG(GDP)	34	4.39817	0.1382
LOG(GDP) does not Granger Cause LOG(ABA)		0.02780	0.0075
LOG(FERX) does not Granger Cause LOG(OPF)	35	0.64524	0.4218
LOG(OPF) does not Granger Cause LOG(FERX)		6.82615	0.0067
LOG(FEXA) does not Granger Cause LOG(OPF)	35	0.05893	0.2926
LOG(OPF) does not Granger Cause LOG(FEXA)		2.59115	0.4292
LOG(ABA) does not Granger Cause LOG(OPF)	35	3.55728	0.6701
LOG(OPF) does not Granger Cause LOG(ABA)		1.13742	6.0328
LOG(FEXA) does not Granger Cause LOG(FERX)	35	7.88533	0.4351
LOG(FERX) does not Granger Cause LOG(FEXA)		0.06243	0.2215
LOG(ABA) does not Granger Cause LOG(FERX)	35	5.96384	0.0056
LOG(FERX) does not Granger LOG(ABA)		0.52334	0.1030
LOG(ABA) does not Granger LOG(FEXA)	35	2.74854	0.3061
LOG(FEXA)does not Granger LOG(ABA)		1.09105	0.6032

Source: Computed Result (e-view 9.0)

The pairwise Granger causality test result in table 4.6 shows that oil price fluctuations, foreign reserve, foreign exchange and annual budget allocation have unidirectional causation with economic growth this implies that changes independent variable is liable to cause a change in the dependent variable. This is an indication that they have contributed to the economic growth the period under view. But a change in economic growth does not necessarily affect oil price foreign reserve, foreign exchange rate and annual budget of Nigeria.

V. Conclusion and Recommendations

The findings of this study have established that an oil price fluctuation in the international market has serious implications or effect on economic growth. The study shows that a significant long run relationship exists between oil price and economic growth in Nigeria, thus, fluctuations in oil price distorts economic growth. Also, there is no significant long run relationship between foreign exchange allocation and real GDP, but negative short run relationship exists between foreign exchange allocation and real GDP in Nigeria, thus, foreign exchange hampers real GDP in the short run, while oil price contributed positively to GDP in Nigeria. Based on the results, the study recommended that in order to achieve high economic growth, substantial amount of federal government budgetary allocation should be directed towards the oil sector in order to stabilize and sustain economic growth. Also, measures should be taken to maintain higher oil price stability in the international market. Effective public financial management and accountability policies should be implemented to ensure prudent spending during the period of rise of oil and saving for the future when there is a fall in price.

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