

## Impact of Oil Price Fluctuation on Economic Growth in Nigeria

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### Abstract

This study examined “Impact of Oil Price Fluctuation on Economic Growth in Nigeria”. The study made use of Generalized Auto-Regressive Conditional Heteroskedasticity GARCH (1,1) model to estimate effect of oil price fluctuation on economic growth in Nigeria. The data used was Quarterly data covering the period from 1984 - 2017 sourced from Central Bank of Nigeria Statistical Bulletin and OPEC database 2018. The variables used in the analysis are Gross Domestic product (GDP) was used as dependent variable, oil price, exchange rate and interest rate was used as the independent variable. The results shows that Oil price has positive and significant effect on the economic growth in Nigeria; Fluctuations in oil prices, though has positive effects on economic growth but insignificant; Exchange rate has positive and significant effect on economic growth in Nigeria. It was recommended that Since oil price is positively related to economic growth, government should utilize properly the proceeds received from oil occasioned by oil price increase to basic and improve basic infrastructures like good and motorable roads, quality education and stable power supply. Government should as a matter of urgency create both vertical and horizontal linkages in oil sector to diversify the economy through the proceeds from oil. Government should continue to judiciously invest in infrastructural development to address key bottlenecks in order to reduce the cost of domestic production and increase domestic supply.

**Key Words: (Oil Price, Economic Growth, Interest Rate. Oil Revenue, Exchange Rate)**

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### I. Introduction

Nigeria is the largest country in Africa with a population of about 160 million people and is the 6th largest oil exporter in the world with the second largest oil reserves in Africa, and is similarly the continents highest oil producer (The World Bank, 2015). Oil plays a dominant role in Nigerian economy given its huge contribution to the revenue of the country. For instance, CBN (2011) shows that oil receipts accounted for 82.1%, 83% and about 90 per cent of the nation’s foreign exchange earnings in 1974, 2008 and 2010 respectively. Similarly, the value of Nigeria’s total export revenue in 2010 was US\$70,579 million and the revenue of petroleum exports from the total export revenue was US\$61,804 million which is 87.6% of total export revenue.

Oil, a very versatile and flexible, non-reproductive, depleting, natural (hydrocarbon) is a fundamental input into modern economic activity, providing about 50% of the total energy demand in the world. Petroleum or crude oil is an oily, bituminous liquid consisting of a mixture of many substances, mainly the element of carbon and hydrogen known as hydrocarbons. It also contains very small amounts of non-hydrocarbon elements, chief amongst which are sulphur (about 0.2 to 0.6% in weight), then nitrogen and oxygen.

However, oil prices have been considered by many economists as highly volatile and consequently many empirical studies regarding the impact of oil price changing or movement on economic activity in both the oil exporting and importing countries of the world. The study of oil price volatility on economic activity dated back to 1983 when Hamilton (1983) empirically showed that oil prices shocks have significant impact on real economic activity in the United States. Ever since then many researchers have understudied the impact of oil price movement on economic activity but there is no consensus on the empirical result.

Oil prices have risen significantly over the last several years. Crude oil prices have increased on average from USD25 per barrel in 2002 to USD50.64 per barrel in 2005 and further rose to USD94.45 in 2008. An increase in petroleum prices tends to have a contractionary impact on world demand and growth in the short term. Higher crude oil prices raise inflation, with the magnitude depending in part on the extent of labor market flexibility (wage-cost push inflation) and the ability of producers to pass on cost increases to consumers. Over time, the impact of rising oil prices on activity and inflation depends also on policy responses and supply side effects (IMF, 2005; OPEC, 2016).

This steep upward trend in the price of crude oil in recent years, reaching a record nominal high of USD94.45 in 2008 and thereafter declined sharply to USD61.06 a barrel in 2009, has led to increasing concern about its macroeconomic implications, both abroad and in Nigeria. Nigeria is highly vulnerable to fluctuations in the international oil market despite being the 6th largest producer of oil in the world (OPEC, 2016). This is given the fragile nature of the Nigerian macro economy and the heavy dependence on crude oil proceeds.

Theoretically, an oil-price increase leads to a transfer of income from importing to exporting countries through a shift in the terms of trade. The magnitude of the direct effect of a given price increase depends on the share of the cost of oil in national income, the degree of dependence on imported oil and the ability of end-users to reduce their consumption and switch away from oil. It also depends on the extent to which gas prices rise in response to an oil-price increase, the gas-intensity of the economy and the impact of higher prices on other forms of energy that compete with or, in the case of electricity, are generated from oil and gas. Naturally, the bigger the oil-price increase and the longer higher prices are sustained, the bigger the macroeconomic impact (Majidi, 2006).

It is generally argued that for net oil-exporting countries, a price increase directly increases real national income through higher export earnings, though part of this gain would be later offset by losses from lower demand for exports generally due to the economic recession suffered by trading partners. Whereas in net oil-importing countries, higher oil prices lead to inflation, increased input costs, reduced non-oil demand and lower investment. Tax revenues fall and the budget deficit increases, due to rigidities in government expenditure, which drives interest rates up. Because of resistance to real declines in wages, an oil price increase typically leads to upward pressure on nominal wage levels. Wage pressures together with reduced demand tend to lead to higher unemployment, at least in the short term. These effects are greater the more sudden and the more pronounced the price increase and are magnified by the impact of higher prices on consumer and business confidence (Wakeford, 2006, Majidi, 2006).

This study is therefore motivated by the fact that Nigeria relies heavily on crude oil export revenues, representing about 90 per cent of total export earnings and on average about 70 per cent of government revenues in annual budgets. And as such any fluctuation in the oil prices will affect the macroeconomic environment in Nigeria. Thus, this work intends to empirically examine the effect of changing oil prices on economic growth of Nigeria.

### **Statement of Problem**

The provision of plausible explanation for the impact of oil price movement on economic output has occupied the attention of researchers and policymakers over the last four decades. The attention was drawn by an important role which oil plays in the world economy and the observed linkage between oil price movement and business cycle.

Oil plays a dominant role in Nigerian economy given its huge contribution to the revenue of the country. For instance, CBN statistical bulletin (2011) shows that oil receipts accounted for 82.1%, 83% and about 90 per cent of the nation's foreign exchange earnings in 1974, 2008 and 2010 respectively. Similarly, the value of Nigeria's total export revenue in 2010 was US\$70,579 million and the revenue of petroleum exports from the total export revenue was US\$61,804 million which is 87.6% of total export revenue.

However, it is empirically established that oil price is one of the most volatile prices which has significant impact on macroeconomic behavior of many developed and developing economies (Ferderer, 1996; Guo & Kliesen, 2005). Further, Mork, Olsen and Mysen (1994), Hooker (1999), Guo and Kliesen, (2005), Narayan and Narayan (2007), Mehrara (2008), Salisu and Fasanya (2013) found volatility clustering and confirm the existence of asymmetries in oil price volatility.

Therefore, the dependence of the Nigerian economy on oil proceeds as the major source of revenue is capable of raising suspicion about the impact of oil price volatility on macroeconomic volatility in the country. Macroeconomic volatility implies the vulnerability of macroeconomic variables to shocks. It is the tendency of macroeconomic variables such as GDP, inflation, exchange rate, interest rate etc to be unstable and weak in terms of withstanding shock. It is a situation whereby little shock in the economy subjects the macroeconomic variables to fluctuations and uncertainty. In the light of this, many studies investigated the impact of oil price changes on macroeconomic variables in Nigeria. However, there is no general consensus on the impact of oil price changes on economic output (see Adeniyi, 2011; Omojolaibi, 2013; Olowe, 2009; Wilson, David, Inyama & Beatrice, 2014; Taiwo, Abayomi & Damilare, 2012; Apere & Ijiomah, 2013).

The recent dwindling in global crude oil prices which started in July 2014 has adversely affected Nigeria, especially in the areas of foreign reserves, currencies crisis, declining government revenue, and ultimately, threat in terms of ability to meet financial obligations as at when due. Oil price fell from its all time high of USD105.87 in 2013 to USD 96.29 in 2014 and further fell to USD40.76 (OPEC, 2016). This means between 2013 and 2016 oil price declined sharply by more than half (64.5%). The resultant effect has been a

large out pour of policies among policy makers and debate among economists on the best policy intervention to reverse the situation.

In response to this, the Nigerian government devalued its currency by 8% from N155 to N168 in October 2015, following the global oil price dwindling and depletion of foreign exchange reserve and economic downturn, in order to revive the economic situation. The Nigerian official exchange rate depreciated consistently since October 2015 from N168 in October, 2015 to N347.25 in August 2016 representing about 106.7 per cent in less than one year (CBN, 2016). The year-on-year inflation rate in Nigeria jumped from 9.3% in October, 2015 to 15.6% in May, 2016 and again rose to 17.6 percent in August 2016, following a 17.1 percent rise in the previous year. This inflation rate is the highest reading since 2005, as cost of housing, food and non-alcoholic beverages and transport surged mostly due to rising import cost occasioned by a weak naira after devaluation.

The removal of subsidy in the downstream oil sub-sector which led to hike in gasoline pump price of 67 per cent further aggravated the situation as the Nigerian GDP grew by -0.36 per cent (year-on-year) in real terms in the first Quarter of 2016 and 0.82 per cent in the second quarter of the same year. This was lowered by 2.47 percent point from growth recorded in the preceding quarter and also lowered by 4.32 percent point from growth recorded in the last corresponding quarter of 2015. It averaged 0.18 percent from 2013 to 2016, reaching all time high of 9.19 percent in the third quarter of 2015 and a recorded low of -13.7 in the first quarter of 2016 (NBS, 2016).

These policy prescriptions have spurred the need to diversify the economy towards once thriving sectors in the economy, removal of subsidy, the war on corruption and reduction of government activities and government related overhead cost. Against this backdrop, it becomes imperative to investigate the effect of oil price fluctuation on the Nigerian economy.

### **Research Objectives**

The broad objective of this study is to examine the impact of oil price fluctuation on the Nigerian economy. The specific objectives are;

1. to determine the impact of oil price on the economic growth of Nigeria
2. to determine the impact of oil price fluctuation on economic growth in Nigeria
3. to determine the impact of exchange rate on Economic growth in Nigeria

## **II. Literature Review**

### **2.1.1 Empirical Literature**

Odularu (2010), followed the Harrod-Domar theory and Solow's theory of economic growth and used Ordinary Least Square regression and Cobb-Douglas production function to test the impact of crude oil on Nigeria economic performance. The result shows that crude oil production contributed to economic growth but have no significant improvement on economy growth of Nigeria.

Vincent, Ioraver , and Wilson. (2012) examined the controversial relationship between Economic Growth and Fiscal Deficits within the Nigerian context, using data over the period, 1970 to 2006. They adopted a modeling technique that incorporates co-integration and structural analysis. The results indicated that (i) fiscal deficit affects economic growth negatively, with an adjustment lag in the system; (ii) a one percent increase in fiscal deficit is capable of diminishing economic growth by about 0.023 percent; and (iii) there is a strong negative association between government consumption expenditure and economic growth.

Augustine (2015); examined the nexus and the magnitude of the effects of fluctuation in the exchange rate on oil price and on how it impacts the Nigeria's economic performance. The study evaluated the effects of exchange rate fluctuations on crude oil price as well as on economic performance, simultaneously. The variables employed are Gross domestic product of Nigeria, Oil price, Real exchange rate, and Trade openness, Inflation, Terms of trade, World gross domestic product, and World crude oil production. The ordinary least square and the two stage least squares estimation techniques were employed. The study found that real exchange rate has a positive effect (1.2%) on the Nigeria's economic performance. It was discovered that a 1% increase in the price of oil would positively influence the economic performance of Nigeria by the magnitude of 4%. The R2 shows that 82% deviation in the gross domestic product was captured by the explanatory variables whereas the J-statistics of the model is insignificant, thus, confirming the relevance and validity of the instruments used.

In an article written by Mansour, Fereydoon , and Reza (2012); which tries to examine the relationship between oil exports revenues and government expenditure in Iran over the period 1996 - 2007 by using Wavelet analysis approach. This method employed helped illustrate the main curve of these two variables to different wavelets in separate categories, so this analyze shows the correlation between them better and the results are more predictable. It was discovered that there is a significant impact of oil export revenues on government expenditure at different period of time. The results show a strong positive relationship between these two variables during long term period.

Ogbonna and Appah (2012) conducted a study investigating the effects of petroleum income on the Nigerian economy for the period 2000 to 2009 using the gross domestic product (GDP), per capita income (PCI), and inflation (INF) as the explained variables, and oil revenue, petroleum profit tax/royalties (PPT/R), and licensing fees (LF) as the explanatory variables. The sample covers all the economic sectors of the country, including the oil sector and the non-oil sector. This study relied mostly on secondary data from Central Bank of Nigeria's Statistical Bulletin, Nigerian National Bureau of Statistics, and the Nigerian national Petroleum Corporation. Simple regressions models were used in this study to evaluate the data collected. The results show that oil revenue has a positive and significant relationship with GDP and PCI, but a positive and insignificant relationship with INF. Similarly, PPT/R has a positive and significant relationship with GDP and PCI, but a negative and insignificant relationship with inflation. It was also found that LF has a positive but insignificant relationship between GDP, PCI and INF, respectively. Based on these findings, this study concludes that petroleum income (oil revenue and PPT/R) has positively and significantly impacted the Nigerian economy when measured by GDP and PCI for the period 2000 to 2009. This study therefore suggests that the effect of petroleum income on the Nigerian economy was positive for the period reviewed.

Lescaroux & Migno (2008) in three panels of OPEC members, other major oil exporting countries and some oil importing countries investigated the links between oil prices and various macroeconomic and financial variables including GDP, CPI, unemployment rate and bond price. Using causality tests, evaluation of cross-correlations between the cyclical components of the series and co-integration analysis, they found various relationships between oil prices and macroeconomic variables in short and long run. In long run, specifically, —the causality generally running from oil prices to the other variables.

Ujunwa (2013) in his research work conducted an investigation on the impact of the oil industry on the economic growth performance of Nigeria. In the process of the research, the ordinary least square (OLS) regression technique was employed. Considering the impact of time on changes in economic variables, the analysis was carried out using the simple regression method in which Gross Domestic Product (GDP), proxy for economic growth was used as the dependent variable, while the oil Revenue (OREV) and time appeared as repressors. A two-tailed test of 5% significant levels were conducted indicating that the two explanatory variables did not have any significant impact on growth performance of the Nigerian economy within the same period. The researcher therefore recommends that government should formulate appropriate policy mix that would motivate the firm in the oil sector to enhance improved performance and contribution of the sector.

Examining macroeconomic dynamics in oil exporting countries with the use of Panel VAR, Mohaghegh and Mehrara (2011) established that oil shocks are not necessarily inflationary. Further, domestic policies, instead of oil boom causes inflation and money is the main cause of macroeconomic fluctuations.

Ebrahim, Inderwidi and King (2014) embarked on theoretical investigation of macroeconomic impact of oil price volatility. The result showed that oil price volatility constitutes a fundamental barrier to economic growth due to its damaging and destabilizing effect on macro economy. Precisely, they show that oil price volatility adversely affect aggregate consumption, investment, industrial production, unemployment and inflation particularly in non-OECD countries. particularly in non-OECD countries.

Wilson, David, inyama and Beatrice (2012) examined the relationship between oil price volatility and economic development in Nigeria. Applying Ordinary Least Square and Granger Causality Test, the study shows that there is no significant relationship between oil price volatility and key macroeconomic variables (Real GDP, inflation, interest rate and exchange rate).

Contrarily, the study of oil price shocks and volatility of selected macroeconomic indicators in Nigeria carried out by Taiwo, Abayomi and Damilare (2012) using Johansen Cointegration Test and Error Correction Model indicated that crude oil price, stock price and exchange rate have significant influence on the growth of the Nigerian economy. Oriakhi and Osaze (2013) examined the consequences of oil price volatility on the growth of the Nigeria economy within the period 1970 to 2010. With the use of VAR model, the study find that oil price volatility has direct impact on government expenditure, real exchange rate, and real import while real GDP and inflation are indirectly influenced by the oil price volatility. By implication the study shows that changes in oil price determine government expenditure which in turn determines the growth of the Nigerian economy.

Mordi and Adebisi (2010) examined the asymmetric effects of oil price shocks on output and prices in Nigeria using a structural VAR model between 1990 and 2008. The result of their finding shows that the oil price shocks on output and prices is asymmetric in nature with the impact of oil price decrease significantly greater than oil price increase.

Similarly, using monthly data, Apere and Ijomah (2013) indicated unidirectional relationship between interest rate, exchange rate and oil price with direction from oil prices. Also, oil price has no significant impact on real GDP. They arrived at this conclusion with the use of EGARCH model, Impulse Response Function and Lag-Augmented VAR for the investigation of the macroeconomic impact of oil price levels and volatility in Nigeria during the period 1970-2009.

Bondzie, Bartolomeo and Fosu (2014) examined the impact of oil price fluctuation on the Ghanaian economy. Based on the features of its economy, they employed dynamic stochastic general equilibrium (DSGE) model and their results show a persistent effect of world oil price and monetary policy shocks on economic growth. It further shows that a shock on interest rate leads to a sharp fall in prices.

Abdulkareem and Abdulkhakeem (2016) provides an analytical insight on modeling macroeconomics and oil price volatility in Nigeria. They employed quarterly data within the multivariate GARCH model. Their result shows that all the macroeconomic variables considered (RGDP, interest rate, exchange rate, oil prices) are volatile and they concluded that oil price is a major source of shocks to macroeconomic variables in Nigeria.

In another development, Imobighe (2015) studied the impact of oil price instability on the growth process of the Nigerian economy between 1970 and 1997. He employed simple regression technique and found a positive and significant relation between GDP and oil prices.

Nwanna and Eyedayi (2016) examined the impact of crude oil price volatility on economic growth in Nigeria between 1980 and 2014. They employed ordinary least square (OLS) technique and their results show a positive and significant relationship between oil price and economic growth in Nigeria.

Aimer (2016) examines the effects of fluctuations of oil price on economic growth in Libya using annual data from 2000 to 2015. Observing the sharp movements in the prices of oil as an important source of economic fluctuation in the world economy, he employed VAR model and johansen cointegration technique to examine the effects of fluctuation on output. He found out that there is no long run relationship between oil prices and economic growth. He further reports that oil price has a positive and statistical significant impact on economic growth in Libya.

Mgbame et al. (2015) based on the empirical review found that there is a significant and positive relationship between OPV and Nigeria economic growth. He believes that oil price changes determines government expenditure level, rate of inflation, level of unemployment, which in turn determines the growth of the Nigerian economy. Considering the destabilizing effects of oil price fluctuations on economic activity and government spending in Nigeria, the study makes some recommendations which includes that the country should diversify its export revenue base as a means of minimizing reliance on crude oil and petroleum product thereby diversifying to agriculture, operations of budgetary, fiscal prudence, corporate governance, encourage savings and proper accountability. This will further protect the economy from the impact of OPV on the economy, and thus prevent the effect of the shocks from attaining a statistical significance level.

Akinlo and Apanisile (2015) investigated the impact of the volatility of oil price on economic growth in 20 Sub-Saharan African countries from the period of 1986-2012. These countries were divided into Group A and Group B. Group A consists of 10 oil exporting countries, while Group B consists of non-oil exporting countries in sub-Saharan Africa. Panel data were used for the analysis. Panel pooled OLS, panel fixed effect model and generalized method of Moment model were employed in the estimation for both oil exporting and non-oil exporting countries. The estimation of panel A model consisting of the oil exporting countries showed that the OPV has a positive and significance effect on the economic growth of oil exporting countries. The result of panel B consisting of non-oil producing countries showed that the volatility of oil price also has a positive and insignificant impact on economic growth.

Benramdane (2017) tried to test the impact of OPV on economic growth in Algeria applying a VAR model using annual data over the period 1970-2012. This study's results indicated that the negative effects of OPV offset the positive impact of oil boom; therefore, it is argued that OPV drives the "resource curse" paradox in Algeria.

### **2.1.2: Limitations of Previous Studies**

Most of the studies employed Johansen cointegration test to determine the long run relationship between oil price and economic growth. One major problem of this cointegration test is that it requires all the variables to be integrated of the same order. But the requirement of strictly I (1) stationary variables is often difficult to be met in empirical applications. This work shall employed Generalized Auto-Regressive Conditional Heteroskedasticity GARCH (1,1) model to estimate effect of oil price fluctuation on economic growth in Nigeria.

## **III. Methodology**

### **3.1 Introduction**

In an attempt to empirically analyze the impact of the oil revenue on the economic growth of Nigeria, a functional model will be formulated and specified for the period 1984 to 2017 (Quarterly Data), a period of twenty four years. The study shall employ the use of secondary data. Ultimately the following source of data will be utilized; Use of Journal, the Central Bank of Nigeria Statistical Bulletin, National Bureau of Statistics and the Federal Inland Revenue Services (FIRS)

### 3.2 Research Design

Research design is the structure and strategy for investigating the relationship between the variables of the study. The research design adopted for this work is the experimental research design. The reason is that experimental research design combines the theoretical consideration with empirical observation. It enables a researcher therefore to observe the effects of explanatory variables on the dependent variables.

### 3.3 Model Specification

Model specification is the expression of a relationship into precise mathematical form. According to Koutsoyiannis (1977), economic theory does not indicate the functional form of any relationship. This means that economic theory does not state whether a relationship will be expressed in linear form, quadratic form or in a cubic form.

#### 3.3.1 Model Specifications

In order to examine the effects of oil price change on Nigeria's economic growth, we specify our functional function as:

$$GDP = f(OILP, INT, EXR) \dots \dots \dots (3.1)$$

Where GDP = gross domestic product, OILP = global oil price, EXR = exchange rate and INT = interest rate. Putting equation 3.1 in econometric form and in order to capture economic growth we log GDP as in the form below:

$$\ln GDP_t = \beta_0 + \beta_1 OILP_t + \beta_2 INT_t + \beta_3 EXR_t + \varepsilon_t \dots \dots \dots (3.2)$$

Where  $\varepsilon_t$  is the error term,  $Ln$  is logarithmic operator and all other variables are as previously defined.

Further, the work set out to present Generalized Auto-Regressive Conditional Heteroskedasticity GARCH (1,1) model to estimate effect of oil price fluctuation on economic growth in Nigeria. To state the GARCH (1, 1) model, we first state the mean equation which is given as:

$$\ln GDP_t = \alpha_0 + \alpha_1 OILP_t + \alpha_2 INT_t + \alpha_3 EXR_t + \varepsilon_t \dots \dots \dots (3.3)$$

The mean equation in 3.3 above is stated economic growth as a function of explanatory variables and the GARCH model is stated in equation 3.4 below:

$$\sigma_t^2 = \alpha + \beta \varepsilon_{t-1}^2 + \delta \sigma_{t-1}^2 \dots \dots \dots (3.4)$$

Where  $\alpha$  = is the constant term.  $\varepsilon_{t-1}^2$  = the ARCH term which explains fluctuation from the previous period, measured as the residual from the mean equation.  $\sigma_{t-1}^2$  = the GARCH effect as last period's forecast variance (Bollerslev, 1986 and Taylor, 1986)

### 3.4 Sources of Data and their Features

Quarterly data covering the period from 1984 -2017 was used. The data was sourced from Central Bank of Nigeria Statistical Bulletin and OPEC database 2018.

### 3.5 Econometrics Software

The E-views 9.0 software shall be used in analyzing the data while the Ms-Excel will be used to transport the data.

## IV. Presentation of Result, Analysis and Interpretation

### 4.1 Unit Roots Test Result

In this study, the Augmented Dickey Fuller (ADF) unit roots test was employed to test for the time series properties of model variables. The null hypothesis is that the variable under investigation has a unit root against the alternative that it does not. The choice of lag length was based on Schwartz-Bayesian information criteria. The decision rule is to reject the null hypothesis if the ADF statistic value exceeds the critical value at a chosen level of significance (in absolute term). These results are presented in table 1 below.

**Table4.1: Unit Roots Test Result**

Variable	ADF statistics		ADF statistics			
	Level	Critical values	1 <sup>st</sup> difference	Critical values	I (d)	Lag length
GDP	0.145220	1% -3.480038 5% -2.883239 10% -2.578420	-12.49089	1% -3.480038 5% -2.883239 10% -2.578420	I (1)	2

OILP	-1.065255	1% -3.479656 5% -2.883073 10% -2.578331	-13.83191	1% -3.479656 5% -2.883073 10% -2.578331	I (1)	0
EXR	-1.770740	1% -3.481217 5% -2.883753 10% -2.578694	-3.322989	1% -3.481217 5% -2.883753 10% -2.578694	I (1)	4
INT	-2.816552	1% -3.479656 5% -2.883073 10% -2.578331	-11.73139	1% -3.480038 5% -2.883239 10% -2.578420	I (1)	0

**Source: Authors Analysis (2020)**

The results in table 4.1 above show that all the variables are non-stationary in level form since their ADF values are less than the critical values at 1%, 5% and 10%, the null hypothesis of unit root was accepted for all the variables but was rejected at 1<sup>st</sup> difference. Thus, we conclude that the all the variables under investigation are integrated of order one (I(1)). Since the variables are integrated of order one (I(1)), we therefore apply the Engle-Granger cointegration procedure to test for cointegration. The Engle-Granger cointegration procedure requires generating residual from the auxiliary result and test for unit root of the residual. There is cointegration in the model if the residual is stationary at level form but no cointegration if it is not stationary. The unit of the residual is presented in table:

**4.2 Results from Co-Integration Test**

Given the time series properties of the model variables, we proceed to implement the Engle-Granger co-integration procedure. All the variables have the same order ( $I \sim (1)$ ) of integration; we estimate their linear combination at their level form without the intercept term and obtain their residual which is then subjected to co integration test as shown in Table 4.2.

**Table 4.2: Engle-Granger Co-Integration Tests Result**

	ADF Statistics	Lag	5% Critical value	1% Critical value
Resid03	-2.341495	1	-2.883073	-3.479656

**Source: Authors Analysis (2020)**

From the table, since the residual (Resid03) ADF statistics of -2.341495 is less than the 5% and 1% critical values of -2.883073 and -3.479656, it means that the residual is not stationary and hence there is no long-run linear relationship or co-integration among the variables. Consequently, we estimate the GARCH (1, 1) model to determine the degree of volatility in oil price and its persistence level. The GARCH (1,1) result is presented in table 4.3 below:

**Table 4.3: Summary of GARCH Result**

**GARCH (1, 1) Model**

Dependent Variable OILP				
Variables	Coefficient	Std. Error	t-statistics	Probability
Constant	17.99902***	0.322033	55.89706	0.0000
RESID(-1) <sup>2</sup>	0.484584*	0.255671	1.895343	0.0580
GAECH(-1)	0.571565***	0.162771	3.511472	0.0004

\*\*\*[\*\*] (\*) denotes significant of variable at 1% [5%](10%) significance level respectively.

The GARCH result from table 3 above shows that information of the past record of oil prices has positive but marginally significant on the Nigerian economy as the coefficient of the squared of RESID(-1) is positive but the p-value greater than 0.05 but less than 0.1. The coefficient of GARCH in table 4.3 is positive and significant explaining the degree of volatility of oil price. The result equally shows a high persistence level of volatility in oil prices in the country. Since the result shows that oil price is highly volatile, we therefore test for the effect of volatility in oil price (GARCH) on the economic growth in Nigeria. The result is shown in table below:

**Table 4.4: Summary of Relationship Oil Price, Oil price Volatility and Economic Growth Result  
Mean Equation of GARCH (1, 1)**

Dependent Variable LOG (GDP)				
Variables	Coefficient	Std. Error	t-statistics	Probability
Constant	2.350013***	0.573834	4.095283	0.0001
GARCH02	0.000163	0.000103	1.587061	0.1149
OILP	0.029370***	0.010515	2.793254	0.0060

EXR	0.009995***	0.004006	2.495264	0.0138
INT	0.171641***	0.022921	7.488323	0.0000
R-squared = 0.677782 Adj R-Squared = 0.667943 F-Statistics = 68.88912 <span style="float: right;">F-prob = 0.0000</span>				

\*\*\*[\*\*] denotes significant of variable at 1% [5%] significance level respectively.

#### 4.3 INTERPRETATION OF THE MEAN RESULT OF GARCH (1, 1)

From table 4.4 above, the constant value is 2.35, meaning that when the variables (OILP, INT and EXR) are zero, the GDP will 2.35 million and it is statistically significant.

The coefficient of GARCH02 which measures the volatility effect on economic growth is positive but insignificant implying that although positive volatility of oil price may seem to have direct effect on economic growth, it does not have significant effect.

The coefficient of oil price (OILP) is positive and statistically significant implying that oil price change has a positive and significant impact on economic growth in Nigeria. This further suggests specifically that a percentage increase in oil price will enhance economic growth by 0.03 percent.

Exchange rate has positive and significant effect on economic growth suggesting that a one percent depreciation in exchange rate will improve economic growth by 0.01 percent. This is in line with a priori expectation that depreciation enhances growth as it increases export and improves balance of payment of a country.

The coefficient of interest rate has positive and significant effect on economic growth and contradicts the a priori expectation.

The coefficients of multiple determinations and its adjusted are 0.677 and 0.667 respectively, suggesting that about 67.7% of the variations in GDP is explained by the variables included in the model. This further shows a moderate explanatory power of the model. The result of F-statistics is 68.89 which shows that the overall regression is highly significant.

#### 4.4: Test of Hypothesis

##### *Hypothesis 1*

$H_0$ : Oil price does not have statistical significant effect on economic growth in Nigeria.

From table 4 above, the probability value for oil price is less than 0.05. Since the p-value is less than 0.05, we reject  $H_0$  and conclude that oil price has statistical significant effect on economic growth in Nigeria.

##### *Hypothesis 2*

$H_0$ : Fluctuations in oil prices does not have statistical significant effect on economic growth in Nigeria.

From table 4 above, the probability value for fluctuations in oil price (GARCH02) is greater than 0.05. Since the p-value is greater than 0.05, we accept  $H_0$  and conclude that fluctuations in oil price has no statistical significant effect on economic growth in Nigeria.

##### *Hypothesis 3*

$H_0$ : Exchange rate does not have statistical significant effect on economic growth in Nigeria

From table 4 above the probability value exchange rate is less than 0.05. Since the p-value is less than 0.05, we reject  $H_0$  and conclude that exchange rate has statistical significant effect on economic growth in Nigeria.

#### 4.5 Evaluation based on Statistical Criteria (First order)

##### **The Coefficient of Multiple Determinations $R^2$**

The  $R^2$  which is the coefficient of multiple determinations is 0.677. That is to say that approximately 67.7 percent of the variation in the economic growth is attributed to the changes in oil prices. This result suggests that the exogenous variables highly explain the behaviour of the dependent variable in the long than in the short run and this is quite impressive.

##### **F – Test**

F-test is conducted to further ascertain if the model is statistically significant and to know if the data actually fit into the model in order to enable us ascertain the adequacy of the model for our analysis.

##### *Hypothesis*

$H_0$ :  $\pi_1 = \pi_2 = \pi_3 = \pi_4 = \pi_5 = 0$  (the model is not significant)



$H_1: \pi_1 \neq \pi_2 \neq \pi_3 \neq \pi_4 \neq \pi_5 \neq 0$  (the model is significant)

Where  $\alpha = 0.05$  (At 5% level of significance.

Decision Rule: Reject  $H_0$  if  $F^* > F_{0.05}$ , otherwise accept  $H_0$  if  $F^* < F_{0.05}$

$F^*(4, 132) = 68.89$ , while the P – value = 0.000

Since the p-value is less than 0.05, we reject  $H_0$  and accept  $H_1$  implying that the model is statistically significant and adequate for analysis and policy implications.

#### 4.6 Evaluation based on Econometric Criteria (2nd order Test)

##### 4.6.1 Test for Auto- Correlation

The underlying assumption of autocorrelation is that the successive values of the random  $\mu_i$  are temporally independent. The Breusch-Godfrey statistics is used to test for the presence of autocorrelation of order q in the models.

**Table 4.5 Breusch-Godfrey tests**

	F- Statistics	Probability
Breusch-Godfrey LM test for autocorrelation	2.03222	0.0970

From table 4.5 above, the probability value of B-Q statistics is greater than 0.05. Since the B-Q statistics is greater than 0.05, we therefore conclude that there exists no q order serial auto-correlation of stochastic errors terms in the model.

##### 4.6.2 Test for Heteroscedasticity

The primary reason to test for heteroscedasticity after running for OLS is to detect violation of assumption OLS:5, which is one of the assumptions needed for the usual statistics accompanying OLS regression to be valid. The F – statistics can be used to verify this assumption, and the hypothesis is formulated as follow:

Hypothesis

$H_0$ : (There is no heteroscedasticity, i.e. homoscedasticity)

$H_1$ : (There is heteroscedasticity)

Decision Rule; Reject  $H_0$  if the calculated F value is greater than the tabulated F value, otherwise accept  $H_0$ . The heteroscedasticity result is presented as;

**Table 4.6:Breusch-Pagan-Godfrey Heteroskedasticity Test:**

F-statistic	2.03222	Probability	0.0970
Obs*R-squared	10.76422	Probability	0.376180

Following the above result, calculated F value = 2.03222 and the F probability value = 0.0970. Therefore, since the calculated value of 2.03222 and F probability is not significant we then accept  $H_0$  of homoscedasticity and conclude that the conditional variances of the error terms are equal.

##### 4.6.3 Normality Test

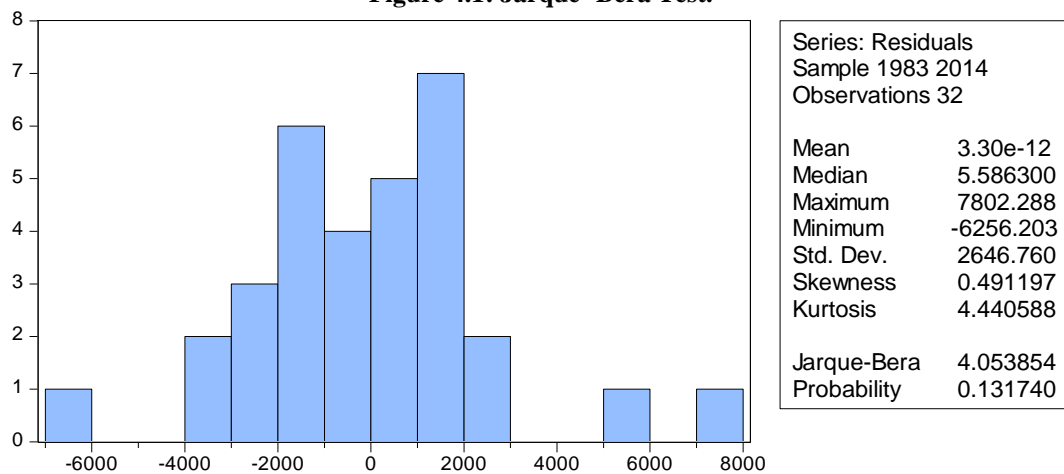
This test is to enable us determine whether the residual follow the normal distribution as postulated by classical OLS assumption. This is tested using the Jarque-Bera test. The hypothesis is formulated as follows:

$H_0: \mu = 0$  (Residual follow normal distribution)

$H_1: \mu \neq 0$  (Residual does not follow normal distribution)

The Jarque- Bera test result is presented in Table 7 below:

Figure 4.1: Jarque- Bera Test.



Evidently, the null hypothesis cannot be rejected since the Jarque- Bera probability is 0.83 ( $> 0.05$ ). Thus we accept  $H_0$  and conclude that the residual follows normal distribution and that the assumption of normal distribution is hereby satisfied.

## V. Summary, Conclusion and Recommendations

### 5.1 Summary of the Findings

The study has investigated the effect of oil price fluctuations on economic growth in Nigeria. Furthermore, following the behavioural fluctuations pattern of oil prices, we employed Generalized Auto-Regressive Conditional Heteroskedasticity (GARCH) model in the study. The summary of findings is itemized below:

- Oil price has positive and significant effect on the economic growth in Nigeria.
- Fluctuations in oil prices, though has positive effects on economic growth but insignificant
- Exchange rate has positive and significant effect on economic growth in Nigeria.

### 5.2 Conclusion

The literature is awash with the unceremonious relationship between Nigerian oil resource and her economy. The nation is yet to succeed at breaking the chain of poverty despite her abundant endowment of oil resource. The problem is caused by many factors. However, the focus of this research is identification of the impact of oil price fluctuations on the growth of the Nigerian economy.

This study finds that oil price fluctuations do not have significant impact on the economy (in contrary to the findings of some earlier studies) but oil price itself does. While increase in price positively affect the economy through its contribution to export revenues (and government revenues), surges in oil price induce or worsen uncertainty in the economy through its effect on fiscal instability and vulnerability of budget implementation. This negatively affects the economy, though not to a statistically significant extent, as this study finds out.

### 5.3 Policy Recommendations

In the light of the findings and analysis of this research, the following recommendations are considered necessary for short, medium and long term implementations.

Since oil price is positively related to economic growth, government should utilize properly the proceeds received from oil occasioned by oil price increase to basic and improve basic infrastructures like good and motorable roads, quality education and stable power supply.

Government should as a matter of urgency create both vertical and horizontal linkages in oil sector to diversify the economy through the proceeds from oil.

Government should continue to judiciously invest in infrastructural development to address key bottlenecks in order to reduce the cost of domestic production and increase domestic supply. Policies that will eliminate structural impediments that negatively affect the business climate and production costs should be pursued

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