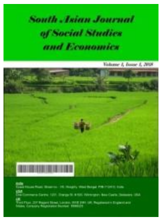

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The Dynamics of Oil Prices in the Nigerian Construction and Economic Growth

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Authors' contributions

This work was carried out in collaboration between both authors. Author PUO designed the study, performed the statistical analysis, managed the analyses of the study and wrote the first draft of the manuscript. Author ENI managed the literature searches and sourced the statistical data. Both authors read and approved the final manuscript.

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ABSTRACT

Aims: The continuous reverberation of unstable global oil price change has caused this study to examine the effect of oil price fluctuation on the construction and economic growths in Nigeria.
Study Design: Data for the analysis were extracted from different National Bureau of Statistics (NBS) publications on the construction sector and economy (GDP); and OPEC Annual Statistical Bulletin 2017 and BP Statistical Review of World Energy June 2017 on oil price from 1981 to 2016.
Place and Duration of Study: The study was done in Nigeria between October 2017 and February 2018.
Methodology: The study applied different econometric techniques including the Augmented Dickey-Fuller (ADF), the generalized least squares (GLS) regression (DF-GLS), and the Phillips-Perron (PP) for unit root test; Johansen's cointegration test and Error Correction Model (ECM) for long-run equilibrium relationship; Granger causality test for direction of causation or influence; as well as carrying different validation tests.
Results: It was found that oil price fluctuation does not have any causal influence on the construction growth nor economic growth; rather it is only the economic growth that influences the

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construction growth without feedback. It further revealed the existence of unstable long-run equilibrium contemporaneous relationship between the variables. It showed that the deviation from the equilibrium level in the current year will be corrected by 8.8% in the following year and that it will take about 11 years and 4 months to restore the long-run equilibrium state on the economic growth should there be any shock from the construction growth and oil prices fluctuation in the system.

Conclusion: The study concluded that though construction sector and general economy may be sensitive to the oil price change, their growth cannot be said to have been influenced or caused by the fluctuation in oil prices. On this strength, the subsisting oil price position in determining the economic trends in Nigeria is challenged. It then calls for new thoughts and strategies towards monitoring the oil prices and economic growth in Nigeria which may culminate in paying less attention to oil price changes and focusing more on other economic variables that trigger changes in the economy and development of Nigeria.

Keywords: Construction growth; economic growth; fluctuation; Nigeria; oil price.

1. INTRODUCTION

Over the years, research interests on the relationship between oil price fluctuation and economic growth across developed and developing countries have continued to grow. Qianqian [1] recognized the importance of oil as a lifeline in the economic development of every nation and it's price fluctuations as it affects every field of the economy. Although this relationship has been greatly discussed theoretically and empirically, González and Nabiyev [2] argue that how reliable oil price is as an economic variable predicting fluctuation in GDP growth remains controversial. Yan [3] even views oil price fluctuation as the barometer of the worldwide economy, which each change would be the hot issue to be concerned and discussed generally in a political and economic circle in every country. Therefore, the on-folding events that relate to the structure and fluidity in the economic indicators and global oil market make it pertinent for continuous examination of the interaction between the oil price fluctuation and the economic growth especially in the developing countries like Nigeria. This is because, while the economies of the developed nations are relatively stable, those of the developing countries are highly rickety.

In Nigeria, the rebasing of Nigeria National Account, the current economic crisis, the pivotal role of the construction sector in the economy, the instability in the global oil market, the coincidental oil price and economic depression in the recent time, and federal government economic diversification agenda are good reasons for re-examination of the influence of the oil price fluctuation on the construction and economic growth. According to The National Bureau of Statistics (NBS) report [4], the Nigerian economy has experienced a great change in terms of volume of activities covered in all sectors of the economy as the post-rebasing data in the construction sector shows a much more optimistic picture, and more modern construction activities have been captured, and prices correctly deflated. Pricewaterhouse Coopers Limited [5] also reveals that since the rebasing of GDP series, the economic structure of Nigeria has shown increased diversification with oil becoming less relevant (8.4% of GDP), but only from an activity perspective. PricewaterhouseCoopers Limited [5] however, agrees that oil sector remains the predominant source of fiscal and export revenues, thus stressing the linkage between the oil and non-oil sectors through the exchange rate channel.

Contrarily, Abdulkareem and Abdulhakeem [6] argue that 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); and further raise concern that 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. Besides, Nigeria has a precarious situation as an oil exporting country that imports finished oil products. According to Bjørnland [7]; Filis, Degiannakis and Floros [8]; and Wattanatorn and Kanchanapoom [9] the impact of oil price fluctuation is more severe on the importing countries than the exporting countries. Specifically, Pindyck [10]; Filis, Degiannakis and Floros [8]; and Gudarzi Farahani, Asghari Ghara and Sadr [11] found that oil price volatility adds different types of costs such as production cost, opportunity costs, investment cost and search costs. Shahbaz, et al. [12] and Narayan and Liu [13] argue that oil shocks increase uncertainties, which could adversely affect economic planning and projections, thus hindering economic growth. According to Nwanna and Eyedayi [14] since the events are unpredictable, they could cause large-scale private sector defaults, trigger distressed assets sales, high bank insolvency, and depletion of the external reserve, currency crisis and loss of market confidence. Nevertheless, Gadea, Gómez-Loscos and Montañés [15] argue that the impact of the oil price shock on GDP growth has declined over time, however, they observe that the negative effect is greater at the time of large oil price increases.

On the other hand, Alley, et al. [16] observe that one of the impacts of oil price shocks on economic growth and performance of an oil exporting country like Nigeria is the "Dutch Disease Syndrome". This is a phenomenon whereby a sudden boom in oil price cannot sweep through a developing economy that is yet to be diversified and large enough to absorb the inflow without causing inflation and at the same time placing upward pressure on the exchange rate [17]. To this effect, Mieiro and Ramos [18] argue that there is always a resource pull effect and spending effect that result when large inflow from oil export hits a less diversified economy. Thus, this presents a more complex scenario for Nigeria. But taking into account that the oil price in both of the oil importing and oil exporting countries affect the aggregate supply and demand, therefore, it is important to evaluate its effect on economic growth.

Additionally, an increase in the oil revenue is expected to increase the government economic investment through expenditures in construction and infrastructural projects and in turn leads to positive economic growth [19]; and also passes through the sectors' performance [20]. In return, Dlamini [21] posits that the construction industry is an important component in the investment programmes in developing economies, and has the potential of positive impact on the economic growth. But Kargi [22] found that the growth rate of the construction industry in the developing countries is more than the GDP growth rate, and that the percentage it takes in the GDP of developed countries relatively diminishes.

In Nigeria, the major economic investment responsibility by the government in terms of government expenditures in construction and infrastructural was as a result of increases in oil revenue. The gross domestic product (GDP) raising was also occasioned by the increase in the amount of investment in construction projects, and subsequently leading to positive economic growth [23]. In contrast, EMIS [23] observes that the current crisis in the global oil market and recent depression in the Nigerian economy have caused serious problem for a progressive economic growth, thus presenting a major risk for the construction industry, reducing budget revenues, restricting government's abilities for infrastructure investments [23]; and more importantly reduces the GDP and subsequent economic growth.

According to Kargi [22] construction industry's growth in the economic fluctuation periods, in the aftermath of a recession, is more than the GDP. Giang and Pheng [24] also opine that the process of economic growth is closely related to the sufficiency of the public infrastructure investments even if there are fluctuations. The above stance is buttressed by Okoye, et al. [25] who affirm that the growth rate of the construction sector is more volatile compared to that of GDP; and suggest that the flow of construction is influenced by other forces apart from the economy.

There is no doubt the influential capacity of oil prices on the overall economic growth of every nation because available literature [26-34] have shown that oil price fluctuation influence all sectors of the economy including construction; either negatively or positively. Particularly, as the forces of supply and demand among other factors in the global oil market affect the oil prices fluctuation which sometimes makes the price of oil very volatile [3,34-37]; Igberaese [38] argues that global oil prices are the most important external economic factor affecting the Nigerian economy. Complementing, Akomolafe and Jonathan [39] state that when there is significant fluctuation in the international price of crude oil, the Nigerian economy is wrecked by series of instabilities due to the economy's over-reliance on the oil sector.

More importantly, there is need to study the long-term effects of oil price changes on specific sectors of the economy instead of on the aggregate economic growth level because sector sensitivities to changes in oil price can be asymmetric, as some sectors may be more severely affected by these changes than others.

Secondly, Arouri, Foulquier and Fouquau [40] observe that a sector's sensitivity to oil prices depends on whether oil serves as its input or output, its exposure to indirect oil price effects, competition and concentration, and its capacity to absorb and pass on oil price risk to its consumers. Besides, Idrisov, et al. [41] posit that understanding the dynamism of the oil prices influence on the economic development are important for understanding the reasons for the current retardation in GDP growth and for developing a plan to accelerate growth or minimize the retardation. It is on this premises that this study examines the dynamic effect of oil price fluctuation on the construction sector growth and the aggregate economic growth in Nigeria.

2. LITERATURE REVIEW

A wide range of empirical and theoretical studies have been done on the influence of the oil price change on the economic growth both in the developed and developing countries including Nigeria [1,11,14,27,29-31,33,34,36-38,41-50]. However, the results of these studies are mixed and conflicting. While some claim that oil price fluctuation exerts adverse impact on macroeconomic variables [1,7-11]; others found that crude oil price fluctuation exert positive influence on the economic growth [16,37,48,50]. Still, some others argue that the effects are less disruptive and also not as significant as thought since oil is becoming less relevant in the economic equation of many countries in the recent time [19,36,51-55], while others found that the effect is asymmetric and there is no clear effect of oil price changes on the economic growth [41,56-59] since the impact of oil price fluctuations is considered to be different for oil importing and exporting countries [48].

Moreover, it is evidently clear that many economic sectors such as manufacturing, agriculture, transportation, and construction use oil to produce outputs. Unfortunately, studies focusing on the influence of oil prices on the construction sector are sparse and limited. The few available literatures are superficial and lacked consensus despite the construction sector's central role in the economic development of every nation especially in the developing countries [33,36,39,60-64].

For instance, Olatunji [60] studies the impact of oil price regimes on construction cost in Nigeria. The study shows that there is a strong relationship between frequent changes in oil price regimes and flight in construction costs. This implies that construction costs are high due to the high cost of finance and intense volatility caused by issues in oil price regimes. The study further reveals that the Nigerian construction industry grows more and contributes more to the aggregate national economic development than the oil sector despite the fact that crude oil is responsible for about 98% of Nigeria's annual GDP earnings. In other words, the Nigerian construction industry has shown positive growth and has significantly contributed to the aggregate GDP growth since 2000, whereas the oil industry has persistently failed to contribute to positive GDP growth Olatunji [60] maintained.

Ghalayini [57] investigates if world economic growth can be explained by changes in the oil price and if there are any differences in oil price effects on economic growth between countries, focusing on the selected countries and group of countries. The result of Granger causality-tests reveals that the interaction between oil price changes and economic growth is not proved for the most countries but for the G-7 group where, a unidirectional relation from oil price to gross domestic product is proven.

The importance of oil in the development of the Nigerian economy was assessed by Akinlo [61] in a multivariate VAR model over the period 1960-2009. The result reveals that the oil industry can cause other non-oil sectors to grow. Particularly, bidirectional causality was found between oil and manufacturing, oil and building and construction, manufacturing and building and construction, manufacturing and trade and services, and agriculture and building and construction. Furthermore, the study shows that oil accounts for shocks in building & construction, and trade & services, but not nearly as much in manufacturing.

On the other hands, Akomolafe and Jonathan [39] analyze the relationship between the industrial stock returns and changes in oil price. The result shows that oil price is negatively related to stock returns of all industries in the short run; and changes in oil price granger cause changes in stock returns for all the industries including construction. This implies that industrial sectors including construction are not directly affected by oil prices, but are sensitive to oil price changes.

Khan, et al. [62] then used Granger causality technique to determine the causal link and the direction of the link between the Malaysian construction industry and oil and gas sector of Malaysia over the period of 1991 to 2010. The study found that neither oil and gas sector lead to construction industry nor construction industry lead to oil and gas sector. That is to say oil and gas sector and construction industry are independent and there is no causality link between them during study period 1991-2010.

Shaari, et al. [33] examine the effects of oil price shocks on economic sectors in Malaysia using econometric models and found the existence of the long-term effects of oil prices on the agriculture, construction, manufacturing, and transportation sectors. The study also shows that the construction sector was found to be dependent on oil prices. A similar study by Aimer [36] investigates the impact of oil price volatility on economic sectors in the Libyan economy. The result concurred with Shaari, et al. [33] but is contrary to that of Khan, et al. [62].

Meanwhile, in the study that empirically investigated the relationship between construction flow and economic growth for Saudi Arabia during the 1970–2011 period, Alhowaish [63] found that the economic growth and oil revenue have independent effects on construction growths in the long-run; while oil revenues have significant effects on economic growth just in the short-run. It further reveals existence of strong causality that runs from economic growth and oil revenues to the construction industry with feedback effects that run from construction to economic growth only.

A recent study conducted by Okoye, et al. [64] examines the interrelationship between the construction sector, oil prices, and the actual gross domestic product (GDP) in Nigeria. The study found that even though very strong positive and significant correlations exist between the construction sector output and total GDP output, the construction sector output and oil prices, and the total GDP output and oil prices, these linear relationships only exist for a short time. It also reveals that the relationships do not result in any direct causal influence on each other, except for the uni-directional causal relationship that flows from the total GDP output to the construction sector output. The study then argues that neither the construction sector nor the oil prices directly influence the aggregate economy; rather, it is other sectors' activities that stimulate the construction sector in Nigeria.

The above literature obviously shows the non existence of detailed empirical study specifically focusing on the influence of oil price fluctuation on the construction sector growth in Nigeria. Additionally, the structural changes in the Nigerian economic equation and the instability in the global oil price vis-à-vis their impending effects on the construction sector growth and overall economic growth in Nigeria need to be investigated. It is against this backdrop that this study examines the effect of oil price fluctuation on the construction sector growth and the aggregate economic growth in Nigeria.

3. METHODOLOGY

3.1 Data and Data Description

The annual statistical data from 1981 to 2016 (rebased data) on construction growth and economic growth were derived from the NBS publications in Million Naira. Annual observations of GDP and construction sector data were extracted from the following NBS publications: Nigerian Construction Sector Summary Report 2010-2012 [4], Nigerian Gross Domestic Product Quarterly Report, Quarter Four 2016 [65], Nigerian Gross Domestic Product Quarterly Report, Quarter one 2017 [66], Revised and Final GDP Rebasing Results by Output Approach [67], Nigerian Gross Domestic Product Quarterly Report, Quarter Four 2014 [68], Nigerian Gross Domestic Product Quarterly Report, Quarter Four 2015 [69], and Post GDP Rebasing Revision: 1981-2010 [70]. The annual average oil price fluctuations were also derived from OPEC Annual Statistical Bulletin 2017 [71] and BP Statistical Review of World Energy June 2017 [72].

3.2 Unit Root Test

According to Ajide [73], the order of integration is a pre-requisite for almost all time series analyses. This is due to the fact that spurious regression problems are created if non-stationary variables are not identified and used in the model, thus leading to a condition whereby results suggest that statistically significant relationships exist between the variables in the regression model even when evidence of contemporaneous correlation exist rather than meaningful causal relations [74,75]. The unit root can be represented in the following mathematical formulation in equation 1:

$$\Delta Y_t = a_0 + a_1 T + a_2 Y_{t-1} + \sum_{i=1}^{n} \gamma_i \Delta Y_{t-1} + \mu_t \quad (1)$$

Where $\Delta Y_t = Y_t - Y_1$, α_0 is a drift term, T is the time trend with the null hypothesis, H_0: $\alpha_2 = 0$ and its alternative hypothesis H_1: $\alpha_2 \neq 0$, n is the number of lags necessary to obtain white noise, and μ_t is the error term. However, the implied t statistic is not the student's t distribution, but instead is generated from Monte Carlo simulations [76]. It should be noted that failing to reject H_0 implies that the time series is non-stationary.

In practice, Baumöhl and Lyócsa [77] suggest that at least the result of two tests of a unit root test should be provided as a convention in economic literature. Generally, the Augmented Dickey Fuller (ADF) test [78], Phillips-Perron (PP) test [79], and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test [80] are most frequently used tests, and are also incorporated into the majority of statistical or econometric software. But KPSS includes a transposed null hypothesis, which identifies a dataset as stationarity against alternative of a unit root; therefore, the results of this test could be mixed [77]. In this case therefore, the KPSS test was not included rather, a modified Dickey-Fuller (DF) unit root test transformed via generalized least squares (GLS) regression (DF-GLS test) that was proposed by Elliott, et al. [81] was used.

Therefore, Augmented Dickey- Fuller Test (ADF) [78], the Dickey-Fuller Test with GLS Detrending (DF-GLS) [81], and the PP test [79] unit root tests were used to determine the existence of unit roots and the degree of differences to obtain the stationary series of economic growth, construction growth, and oil prices fluctuation. Although Kulaksizoglu [82] observes that the ADF test is the most used unit root test in econometrics, Kwiatkowski et al. [80] note that the test is a reasonable first attempt to test stationarity, but the available methods all suffer from the lack of a plausible model in which the null of stationarity is naturally framed as a parametric restriction. Since the DF and ADF tests have low power for small samples [83] and a high probability of an error of the second type (i.e., the probability of not rejecting a false H_0), the PP unit root test was also applied to check the robustness of the estimation results.

For each time series, the ADF, DF-GLS, and PP tests were run three times: with no constant included and no trend, with a constant included assuming that the series does not exhibit any trend and has a non-zero mean, and with a constant and a trend included, assuming that the series contains a trend. Also, the number of lagged first difference terms for the ADF test and the number of periods of serial correlation to include in the test regression for the PP test were determined for each time series, whereas the DF-GLS is a simple modification of the ADF test, in which the data are detrended so that explanatory variables are removed from the data prior to running the test regression [84].

A"1" indicates that the series is integrated at order one, i.e., has one unit root, and "0" denotes that the series is stationary at level. If the time series data of each variable are found to be non-stationary at level, then a long-term relationship between the variables may exist. The ADF approach controls for higher-order correlation by adding lagged difference terms of the dependent variable Y to the right-hand side of the regression [84]. The PP test corrects the t-statistic of the coefficient from the first order autoregressive model to account for the serial correlation in the series by estimating the non-augmented DF test equation, and modifying the t-ratio of the α coefficient so that the serial correlation does not affect the asymptotic distribution of the test statistic. On the other hand, the DF-GLS-ratio follows a Dickey-Fuller distribution only in the constant case, and the asymptotic distribution differs when both a constant and trend are included [84].

3.3 Granger Causality Test

The standard Granger framework is usually used to test the direction of causation between two variables. The basic concept of the Granger causality tests is that future values cannot predict past or present values. If past values for the construction growth significantly contribute to the explanation of the economic growth, then the construction growth is said to Granger-cause economic growth. This means that the construction growth is Granger-causing economic growth when the past values of the construction growth have predictive power for the current value of the economic growth, even if the past economic growth values are considered. The same can be applied to construction growth and oil prices fluctuation, and to economic growth and oil prices fluctuation. Equally, if the economic growth is Granger-causing construction growth, economic change would take place before a change in the construction growth. This applies for other comparable variables in this study. In this study therefore, the

Granger causality test is used, and fitted with annual data from 1981 to 2016 to test the direction of causation between the variables.

In all cases, the test determines if feedback effects occur between comparable variables. Therefore, the Granger causality test consists of estimating the following equations:

$$X_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} X_{t-1} + \sum_{i=1}^{n} \beta_{2i} Y_{t-i} + U_t \quad (2)$$

$$Y_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} Y_{t-1} + \sum_{i=1}^{n} \alpha_{2i} X_{t-i} + V_t \quad (3)$$

Where U_t and V_t are the uncorrelated and white noise error term series, respectively. Causality may be determined by estimating Equation (1) and testing the null hypothesis that $\sum_{i=1}^{n} \beta_{2i} = 0$ and $\sum_{i=1}^{n} a_{2i} = 0$ against the alternative hypothesis that $\sum_{i=1}^{n} \beta_{2i} \neq 0$ and $\sum_{i=1}^{n} a_{2i} \neq 0$ for Equations (2) or (3), respectively.

If the β_{2i} coefficients are statistically significant, but those of α_{2i} are not, then the economic growth is said to have been uni-directionally caused by construction growth. The reverse causality holds if the coefficients of α_{2i} are statistically significant whereas those ofβ_{2i} are not. However, if both α_{2i} and β_{2i} are statistically significant, then causality is bi-directional. This also holds for other variables combinations in this study.

3.4 Cointegration Test

The co-integrating equation is also known as the stationary linear combination which may also be interpreted as a long-run equilibrium relationship between variables under consideration. However, there are several co-integration techniques applicable for the time series analysis; but their common objective is to determine the most stationary linear combination of the time series variables. In this case therefore, Johansen's [85,86] co-integration technique was applied in investigating the stable long run relationships between the comparable variables. The following equations were estimated with VAR lag 1 and assume that the series does not contain deterministic linear trends. Johansen's Co-integration Test (consider a VAR of order p) in equation 4.

$$Y_t = \alpha_1 Y_{t-1} + \dots\dots\dots + \alpha_p Y_{t-p} + \beta X_t + \varepsilon_t \quad (4)$$

Where Y_t is a K-vector of non-stationary I(1) variables, X_t is a d-vector of deterministic variables, and εt is a vector of innovations.

However, Engle and Granger [76] argue that when variables are cointegrated, their dynamic relationship can be specified by an error correction representation in which an error correction term (ECT) computed from the long-run equation must be incorporated in order to capture both the short-run and long-run relationships. The VECM is employed to determine the short-run and long-run causalities between the variables. The VECM estimation is performed by using the following VAR framework in equations 5 and 6:

$$X_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} X_{t-1} + \sum_{i=1}^{n} \beta_{2i} Y_{t-i} + \lambda 1 Ect_{t-1} + U_t \quad (5)$$

$$Y_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} Y_{t-1} + \sum_{i=1}^{n} \alpha_{2i} X_{t-i} + \lambda 2 Ect_{t-1} + V_t \quad (6)$$

Where β_{1i}, β_{2i}, α_{1i} and α_{2i} are the short-run coefficients, $1Ect_{t-1}$ and $2Ect_{t-1}$ are the error correction terms, and U_t and V_t are the residuals. The error correction terms Ect_{t-1} are derived from a long-run cointegration relationship and measure the magnitude of past disequilibrium. The coefficient λ of the error term represents deviations in the dependent variable from the long-run equilibrium. The ECT is expected to be statistically significant with a negative sign, implying that any shock that occurs in the short-run will be corrected in the long-run. If the ECT is greater in absolute value, the rate of convergence to equilibrium will be faster. The accuracy of the ECM estimated results is validated by performing several diagnostic tests, such as the tests of normality, serial correlation (LM), and heteroskedasticity. Meanwhile, the entire analysis was carried out with EViews, version 9.0, an econometric software package used for economic and financial data. The results are presented in the section below.

4. RESULTS AND DISCUSSION

Tables 1-3 show the results of the Monte Carlo Experiment (unit root test) for ECOG and CONG and OILPG for three specifications. Specifically,

Table 1 reveals that the ADF test results indicate that all the series are stationary at first differencing in all specifications and at all conventional levels of significance; whereas all the series are also stationary at level in all specifications and at all conventional levels of significance except for ECOG and CONG which are not stationary when trend is introduced in the series.

In Table 2, the DF-GLS statistics show that all the series are also stationary at first differencing in all specifications and at all conventional levels of significance. It also reveals that all the series are stationary at level in all specifications and at all conventional levels of significance except for CONG when only constant are introduced in the series.

Likewise, Table 3 shows the PP test results. It equally reveals that each of the series is stationary after first differencing in all specifications and at all conventional levels of significance. The PP tests strongly support the results of ADF and DF-GLS that each of the series is stationary after first differencing in all specifications at all conventional levels of significance. Generally, all the series are stationary at first differencing in all the specifications and at all conventional levels of significance.

This implies that the series are integrated at the same order of I(1). It further implies that only differenced data should be used in the model. Thus, since only differenced data can to be used in the model, it is possible to apply Johansen's co integration tests to determine if there is existence of a stable long run contemporaneous relationship between the variables which may be true if the p-values of all the tests that are stationary are less than 0.05.

4.1 Cointegration Test

Table 4 shows the result of Johansen cointegration test. The result indicates that the null hypotheses of no cointegration between the variables are rejected at 0.05 level. It also shows the existence of 3 cointegrating equations. This implies that the variables are cointegrated at 5% significance level. Furthermore, the maximum eigenvalues (ʎmax) statistics and the trace

Table 1. ADF unit root test

Series	Specification	ADF-Stat	Levels of critical values			P-value	Stationarity Remark
			1%	5%	10%		
At Level form I(0)							
ECOG	No constant & trend	-2.07**	-2.63	-1.95	-1.61	0.0386	S
CONG		-2.78*	-2.63	-1.95	-1.61	0.0069	S
OILPG		-5.19*	-2.63	-1.95	-1.61	0.0000	S
ECOG	Constant only	-3.24**	-3.64	-2.95	-2.61	0.0260	S
CONG		-3.16**	-3.64	-2.95	-2.61	0.0317	S
OILPG		-5.24*	-3.64	-2.95	-2.61	0.0001	S
ECOG	With constant & trend	-3.13	-4.25	-3.55	-3.21	0.1159	NS
CONG		-3.02	-4.25	-3.55	-3.21	0.1412	NS
OILPG		-5.18*	-4.25	-3.55	-3.21	0.0010	S
At 1st Differencing I(1)							
ECOG	No constant & trend	-7.45*	-2.63	-1.95	-1.61	0.0000	S
CONG		-6.95*	-2.63	-1.95	-1.61	0.0000	S
OILPG		-7.74*	-2.63	-1.95	-1.61	0.0000	S
ECOG	Constant only	-7.34*	-3.64	-2.95	-2.61	0.0000	S
CONG		-6.83*	-3.64	-2.95	-2.61	0.0000	S
OILPG		-7.62*	-3.64	-2.95	-2.61	0.0000	S
ECOG	With constant & trend	-7.63*	-4.26	-3.55	-3.21	0.0000	S
CONG		-6.98*	-4.26	-3.55	-3.21	0.0000	S
OILPG		-7.66*	-4.26	-3.55	-3.21	0.0000	S

*Note: *, ** and *** denote the rejection of unit root at 1 %, 5% and 10% significance level, respectively. ECOG =Economic growth; CONG = Construction growth; OILPG = Oil price fluctuation; S = Stationary; NS = Non stationary*

Table 2. DF-GLS unit root test

Series	Specification	DFGLS-Stat	Levels of critical values			p-value	Stationarity remark
			1%	5%	10%		
At Level form I(0)							
ECOG	Constant only	-2.67*	-2.63	-1.95	-1.61	0.0117	S
CONG		-1.56	-2.63	-1.95	-1.61	0.1300	NS
OILPG		-5.09*	-2.63	-1.95	-1.61	0.0000	S
ECOG	With constant & trend	-3.26**	-3.77	-3.19	-2.89	0.0026	S
CONG		-2.98***	-3.77	-3.19	-2.89	0.0053	S
OILPG		-5.32*	-3.77	-3.19	-2.89	0.0000	S
At 1st Differencing I(1)							
ECOG	Constant only	-3.44*	-2.64	-1.95	-1.61	0.0017	S
CONG		-6.47*	-2.63	-1.95	-1.61	0.0000	S
OILPG		-7.70*	-2.63	-1.95	-1.61	0.0000	S
ECOG	With constant & trend	-7.02*	-3.77	-3.19	-2.89	0.0000	S
CONG		-6.96*	-3.77	-3.19	-2.89	0.0000	S
OILPG		-7.56*	-3.77	-3.19	-2.89	0.0000	S

*Note: *, ** and *** denote the rejection of unit root at 1 %, 5% and 10% significance level, respectively*

Table 3. PP unit root test

Series	Specification	PP-Stat	Levels of critical values			p-value	Stationarity remark
			1%	5%	10%		
At Level form I(0)							
ECOG	No constant & trend	-1.91***	-2.63	-1.95	-1.61	0.0547	NS
CONG		-2.71*	-2.63	-1.95	-1.61	0.0083	S
OILPG		-5.18*	-2.63	-1.95	-1.61	0.0000	S
ECOG	Constant only	-3.07**	-3.64	-2.95	-2.61	0.0385	S
CONG		-3.01**	-3.64	-2.95	-2.61	0.0435	S
OILPG		-5.23*	-3.64	-2.95	-2.61	0.0001	S
ECOG	With constant & trend	-2.94	-4.25	-3.55	-3.21	0.1637	NS
CONG		-2.20	-4.25	-3.55	-3.21	0.4729	NS
OILPG		-5.18*	-4.25	-3.55	-3.21	0.0010	S
At 1st Differencing I(1)							
ECOG	No constant & trend	-8.25*	-2.64	-1.95	-1.61	0.0000	S
CONG		-8.01*	-2.64	-1.95	-1.61	0.0000	S
OILPG		-17.35*	-2.64	-1.95	-1.61	0.0000	S
ECOG	Constant only	-8.18*	-3.65	-2.95	-2.62	0.0000	S
CONG		-8.10*	-3.65	-2.95	-2.62	0.0000	S
OILPG		-16.86*	-3.65	-2.95	-2.62	0.0001	S
ECOG	With constant & trend	-12.76*	-4.26	-3.55	-3.21	0.0002	S
CONG		-15.14*	-4.26	-3.55	-3.21	0.0000	S
OILPG		-29.22*	-4.26	-3.55	-3.21	0.0000	S

*Note: *, ** and *** denote the rejection of unit root at 1 %, 5% and 10% significance level, respectively*

statistics show that all are greater than the associate critical values for the three hypotheses of none cointegration equation, at most 1 cointegration equation and even for at most 2 cointegration equation respectively at 5% significance level.

The MacKinnon-Haug-Michelis [87] *P*-values for both λmax and trace statistics are less than 0.05 which affirms that the null hypotheses are rejected in all cases. Since there is existence of cointegration relationships, it also suggests the existence of long–run equilibrium contemporaneous relationship between the variables; thus, the need to establish the existence of long term equilibrium contemporaneous relationship between the variables.

Table 4. Results of Johansen's cointegration test

Date: 02/22/18 Time: 22:46
Sample (adjusted): 1984 2016
Included observations: 33 after adjustments
Trend assumption: Linear deterministic trend
Series: ECOG CONG OLIPG
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized		**Trace**	**0.05**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.563313	48.87458	29.79707	0.0001
At most 1 *	0.362303	21.53284	15.49471	0.0054
At most 2 *	0.183410	6.686403	3.841466	0.0097

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
** denotes rejection of the hypothesis at the 0.05 level*
***MacKinnon-Haug-Michelis [87] p-values*

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized		**Max-Eigen**	**0.05**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.563313	27.34175	21.13162	0.0059
At most 1 *	0.362303	14.84643	14.26460	0.0404
At most 2 *	0.183410	6.686403	3.841466	0.0097

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
** denotes rejection of the hypothesis at the 0.05 level*
***MacKinnon-Haug-Michelis [87] p-values*

Table 5. Error correction model result

Dependent Variable: ECOG
Method: Least Squares
Date: 02/22/18 Time: 22:49
Sample (adjusted): 1984 2016

Included observations: 33 after adjustments

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	4.385615	0.696849	6.293490	0.0000
CONG	-0.019870	0.071852	-0.276544	0.7841
OLIPG	0.133903	0.044308	3.022113	0.0052
ECM(-1)	-0.088061	0.036026	-2.444389	0.0208
R-squared	0.261425	Mean dependent var		5.006667
Adjusted R-squared	0.185021	S.D. dependent var		3.885738
S.E. of regression	3.507897	Akaike info criterion		5.461123
Sum squared resid	356.8549	Schwarz criterion		5.642518
Log likelihood	-86.10853	Hannan-Quinn criter.		5.522157
F-statistic	3.421600	Durbin-Watson stat		1.586087
Prob(F-statistic)	0.030188			

In view of this, error correction (short run) analysis is performed to ascertain the speed of adjustment of the long run relationship. The error correction analysis estimates the speed of convergence or adjustment to equilibrium must be negative and statistically significant for us to say that it is rightly signed. Meanwhile, the linear combination of levels which enters the error-correction model is just that combination which is stationary in levels. The result of the Error Correction Model (ECM) analysis is as presented in Table 5.

From Table 5, the Error Correction Model (ECM) estimate appears with the right sign (negative sign). The estimated coefficient of the ECM is -0.088. This implies that a deviation from the equilibrium level in the current year will be corrected by 8.8% in the following year. By this, there is an indication that it takes about

Table 6. Ramsey RESET Test result.

Ramsey RESET Test
Equation: UNTITLED
Specification: ECOG C CONG OILPG

Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.183635	31	0.8555
F-statistic	0.033722	(1, 31)	0.8555
Likelihood ratio	0.038052	1	0.8453

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	0.594356	1	0.594356
Restricted SSR	546.9761	32	17.09300
Unrestricted SSR	546.3817	31	17.62522

LR test summary:

	Value	df
Restricted LogL	-97.77135	32
Unrestricted LogL	-97.75232	31

Unrestricted Test Equation:

Dependent Variable: ECOG
Method: Least Squares
Date: 02/22/18 Time: 22:51
Sample: 1982 2016
Included observations: 35

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.106297	3.811623	0.814954	0.4213
CONG	0.096255	0.179403	0.536528	0.5954
OILPG	0.029589	0.093326	0.317047	0.7533
FITTED^2	0.036788	0.200333	0.183635	0.8555
R-squared	0.192998	Mean dependent var		4.452857
Adjusted R-squared	0.114901	S.D. dependent var		4.462428
S.E. of regression	4.198240	Akaike info criterion		5.814418
Sum squared resid	546.3817	Schwarz criterion		5.992172
Log likelihood	-97.75232	Hannan-Quinn criter.		5.875779
F-statistic	2.471255	Durbin-Watson stat		1.480530
Prob(F-statistic)	0.080266			

11 years and 4 months to restore the long-run equilibrium state on the economic growth should there be any shock from the construction growth and oil prices fluctuation in the system. This further means that it takes about 11 years and 4 months for the error in the system to be corrected by 100% and restored to long-run equilibrium state.

The RAMSEY Regression Error Specification test result in Table 6 indicates that the model is correctly specified, and that there is no functional form problem in the model. This implies that the explanatory variables have significant power in explaining the response variable in the regression model. Besides, the Durbin-Watson statistic (1.472685) shows that there is no first order autocorrelation in the model.

On the other hands, the heteroscedasticity test result in Table 7 indicates that the variances of the errors are equals (homogeneous) across the observations, and that the OLS estimator maintains its unique property of best linear unbiased estimator (BLUE). The normality test which was performed to validate the normality assumption of ordinary least squares regression analysis also shows that with Jarque-Bera (J-B) statistic value of 1.359 and associated probability value of 0.5069 > 0.05 the series of the residual dataset follows a normal distribution (see Fig. 1). However, the cumulative sum (CUSUM) stability test in Fig. 2 shows that the model is not stable over a long period. The result therefore, confirms that the model cannot be used for precise predictions which justify the low R^2 value of OLS. This might be due to high degree of fluctuations in the oil prices and undefined pattern of construction growth in Nigeria.

4.2 Granger Causality Test

Table 8 presents the results of Granger causality test between ECOG, CONG and OILPG. The Pairwise Granger causality test reveals the existence of a uni-directional relationship running from ECOG to CONG without a feedback. That is to say that ECOG Granger cause the CONG without complement. This implies that economic growth leads (drives) construction growth by two years. This causal effect can also be interpreted as the forward linkage from economic growth to the construction growth. On the other hand, the null hypothesis that states that total economic growth does not Granger Cause construction growth is rejected since the probability is less than 0.05; whereas the hypothesis that states that construction output does not Granger Cause total GDP is not rejected since the probability is greater than 0.05.

Table 7. Heteroskedasticity test result

Heteroskedasticity Test: White

F-statistic	1.593117	Prob. F(2,32)	0.2190
Obs*R-squared	3.169370	Prob. Chi-Square(2)	0.2050
Scaled explained SS	3.394352	Prob. Chi-Square(2)	0.1832

Test Equation:

Dependent Variable: RESID^2
Method: Least Squares
Date: 02/22/18 Time: 20:53
Sample: 1982 2016
Included observations: 35

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	14.19531	6.701168	2.118333	0.0420
CONG^2	0.034669	0.024825	1.396530	0.1722
OLIPG^2	-0.004017	0.005214	-0.770510	0.4466
R-squared	0.090553	Mean dependent var		15.62789
Adjusted R-squared	0.033713	S.D. dependent var		25.38165
S.E. of regression	24.95014	Akaike info criterion		9.353452
Sum squared resid	19920.30	Schwarz criterion		9.486768
Log likelihood	-160.6854	Hannan-Quinn criter.		9.399472
F-statistic	1.593117	Durbin-Watson stat		2.370344
Prob(F-statistic)	0.218995			

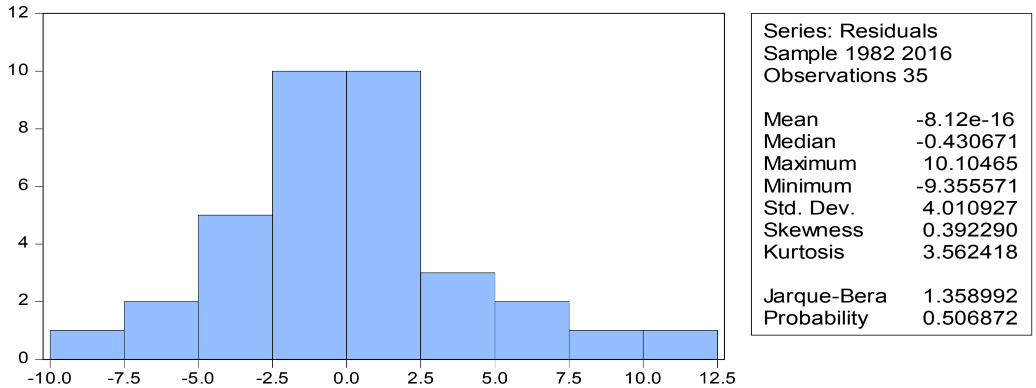

Fig. 1. The normality test result

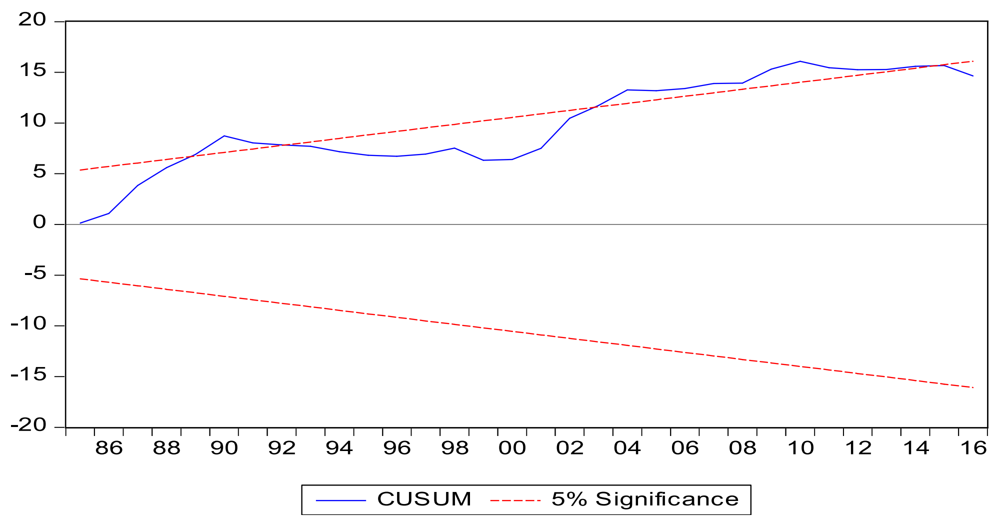

Fig. 2. Stability test result

Table 8. Results of Granger causality between ECOG, CONG and OILPG

Pairwise Granger Causality Tests
Date: 02/22/18 Time: 22:19
Sample: 1982 2016
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
CONG does not Granger Cause ECOG	33	0.75261	0.4804
ECOG does not Granger Cause CONG		3.72608	**0.0367***
OLIPG does not Granger Cause ECOG	33	1.23377	0.3065
ECOG does not Granger Cause OLIPG		1.57859	0.2241
OLIPG does not Granger Cause CONG	33	1.45676	0.2501
CONG does not Granger Cause OLIPG		0.64375	0.5329

*Note that * indicates significant at the 5% significance levels. The null hypothesis of no causality is rejected if the probability is less than 0.05*

However, there is no causal relationship between OILPG and ECOG, and between OILPG and CONG. This is to say neither OILPG Granger cause CONG nor CONG Granger cause OILPG, nor neither OILPG Granger cause ECOG nor ECOG Granger cause OILPG. This implies that none of these variables can lead each other in the series. Statistically, it implies that the causal effect only run from the direction economic growth to that of construction growth at 5% significance level. The uni-directional relationship implies that only the economic growth can influence the construction growth to a certain extent without return and in short term.

By this result, the age-long perception that construction activities drive the economy in Nigeria has been disproved, as have been shown that multiple activities in various sectors of the economy actually trigger the construction growth in Nigeria and not vice versa. Additionally, the constant crisis in the global oil price may also be a contributory factor and so the economy and/or its constituent parts cannot be directly linked with the oil price fluctuation especially in Nigeria.

From the foregoing studies, the fact that almost all the economic sectors including construction, use oil to produce output makes these sectors susceptible to the influence of oil price fluctuation. Notwithstanding, studies focusing on the influence of oil price fluctuation on the construction and economic growth in particular in Nigeria are limited and indirect. Thus as one of the sectors of economy central to the economic growth and development, this study has shown evidence and extent of the influence of oil price fluctuation on the construction and economic growth in Nigeria.

The result found that the variables are cointegrated, though there is an unstable long-term equilibrium contemporaneous relationship between the variables. it further shows that the deviation from the equilibrium level in the current year will be corrected by 8.8% in the following year; and that it takes about 11 years and 4 months to restore the long-run equilibrium state on the economic growth should there be any shock from the construction growth and oil prices fluctuation in the system. This implies that both construction and oil sectors are economic variables. On the other hands, it suggests that construction and economic growths are sensitive to oil price fluctuation.

The Granger causality test shows that oil price fluctuation does not have any causal influence on the construction growth nor economic growth; rather it is only the economic growth influences the construction growth without feedback. This then implies that oil price fluctuation does not have any direct effect on or clear relationship with both the economic growth and construction growth under the current economic condition in Nigeria. This further implies that even when there is an increase in oil price; it does not cause the increase in economic growth. This result is in conformity with [57] which found that changes in oil prices does not cause any clear change in the economic growth of the world but for the G-7 countries with established policies and strategies.

The result is aligned with the cointegration test but suggests that it is the growing in the non-oil sectors of the economy that triggers construction growth in Nigeria. This also suggests that even though construction sector and general economy may be sensitive to the oil price change, their growth cannot be said to have been influenced or caused by the fluctuation in oil prices. In fact, it portends that the inflows of funds as a result of an increase of oil price in Nigeria found their way outside the country and do not perform economic development goals. This argument is supported by the results of [39,62-64] in one part, but contrary to [33,36,61] in another part.

Generally, the result implies that both the construction growth and economic growth cannot be predicted in the long-term from the oil price fluctuation. This is affirmed by the result of the cumulative sum (CUSUM) stability test that shows unstable over a long period of time. This further implies that even when it took about 11 years and 4 months to be restored to the long-run equilibrium state on the economic growth as a result of shock from the construction growth and oil price fluctuation in the system; only about 26.14% of proportion of variation in economic growth can be explained by the combined effect of construction growth and oil price fluctuation. This might be due to high variability in the fluctuations of oil prices and undefined pattern of construction growth in Nigeria. From the foregoing, it can be suggested that Nigerian economic growth and construction growth are independent of oil price fluctuation.

This result, therefore, aligned itself with [19,36,51-55] who argue that the effects are less disruptive as a result of oil becoming less relevant in the economic equation of many countries in the recent time. It also agreed with [41,56-59] who found that the effect is asymmetric and there is no clear effect of oil price changes on the economic growth. However, it is in contrast with Imobighe [88] who argues that crude oil petroleum has remained the main engine of economic growth in Nigeria in spite of the volatility of the world oil market and its declining share in GDP.

5. CONCLUSION

The controversy on the effect of oil price change on the economic growth has continued to drag for some time now across the world with a call for sector-specific analysis due to variability in the sensitivity of the effect to different sectors of the economy and region. In response to this call, his study examined the impact of oil price fluctuation on the construction growth and economic growth in Nigeria using data from different NBS reports, the OPEC Annual Statistical Bulletin and BP Statistical Review of World Energy Reports.

The study has established that even though there is suspected sensitivity to the oil price fluctuation by both the construction sector and overall Nigerian economy, the oil price fluctuation does not have any causal effect on the construction growth nor the economic growth; rather it is only the economic growth that influences the construction growth without feedback. In another word, it means that oil price fluctuation does not have any direct effect on both the economic growth and growth of the construction sector in Nigeria even in the long term. Thus the growth in both construction and economy cannot be said to have been influenced or caused by the fluctuation in oil prices but activities of other sectors of the economy stimulate growth in construction. Aside from this, it suggests that there are some other stronger economic variables that trigger both construction and economic changes in Nigeria other than oil price fluctuation.

The study further found that though the variables are cointegrated, there is the existence of an unstable long-term equilibrium contemporaneous relationship between the variables which suggests that both the construction growth and economic growth cannot be certainly predicted in the long-term from the oil price fluctuation; but a confirmation of sensitivity to oil price fluctuation.

From the foregoing, the critical economic illusions have been made clear in the sense that the age-long axiom on the omnipotence of oil price fluctuation on the Nigerian economic growth and construction sector growth has been diffused. Therefore, this study has challenged the subsisting oil price position in determining the economic trends in Nigeria. This means that there is a need for new thoughts and strategies towards oil prices and economic growth interdependency in Nigeria which may culminate in paying less attention to oil price change and focusing more on other economic variables that trigger changes in the economy and development of Nigeria. Furthermore, the country needs to develop institutions in order to channel the capital inflows to profitable economic projects that will bring about growth and development including promoting private sector development.

On this premise, the veracity of the result of the study is glaring. It is a good precursor for economic planners, managers and policy makers in Nigeria especially now the Nigerian government is seeking for ways of formulating policies and programs that will ensure sustainable economic growth including economic diversification rather than relying exclusively on oil. Thus, the study recommended that the Nigerian government steps up implementation of its economic diversification policies including optimization of other sectors of the economy and de-emphasizing of oil sector. Of particular importance is the strict implementation of Economic Recovery and Growth Plan (ERGP) of the Federal Republic of Nigeria which focused on six priority economic sectors of agriculture, manufacturing, solid mineral, services, construction and real estate, and lastly oil and gas sectors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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