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Do Crude Oil Prices Affect Energy Consumption in Nigeria?

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Author's contribution

The sole author designed, analyzed, interpreted and prepared the manuscript.

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ABSTRACT

This study examines the dynamic effects of crude oil price on energy consumption in Nigeria over the period 1975-2013 using the autoregressive distributed lag (ARDL) bounds testing approach to cointegration. The results show that crude oil price is a significant long-run and short-run determinant of energy consumption in the Nigerian economy. A positive and significant relationship is found between crude oil price and energy consumption in the economy with and without the incorporation of the presence of a structural break point in the series. The results in general highlight the need to lessen the dependence of economic activities that generate energy demand on crude oil price through the development of sustainable renewable energy system in the Nigerian economy.

Keywords: ARDL bounds test; crude oil price; energy consumption; Nigeria, structural break.

1. INTRODUCTION

Among many factors that drive economic activities (e.g. financial sector development, trade openness, macroeconomic performance, among others), crude oil price is also a key factor in net oil-exporting economies. Surprisingly, while recent studies have examined empirically the impact of a number of these factors including economic growth, financial sector development

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and trade openness on energy consumption using different econometric techniques for different countries (see [1,2,3,4,5]; among others), the impact of crude oil price on energy consumption in net oil-exporting countries received no significant research attention. This study aims to fill this identified gap in the literature using the case of Nigeria.

The influence of crude oil price on economic activities is one of the crucial issues confronting a number of net oil-exporting economies today [6]. It is therefore of imperative to understand the influence of crude oil price on energy consumption in Nigeria given the dependence of the economy on oil wealth and the well-documented effects of crude oil price and resource-dependence on economic, political and social activities in oil-dependent economies (see [7]. Understanding the influence of crude oil price on energy consumption in this member country of the Organisation of Petroleum Exporting countries (OPEC) could be considered a very important step in understanding the influence of crude oil price on socio-economic activities and welfare of households in net oil-exporting economies. A proper energy demand analysis is a very important tool to stimulating economic, technological and social activities, energy diversification and mitigation of environmental issues related to energy use. This study contributes to the existing studies aiding the understanding of the determinants of energy consumption in net oil-exporting economies and will encourage more studies on the possible linkage between oil-exporting and energy consumption in other net oil-exporting countries.

Building on the above discussion, this study aims to examine the dynamic effects of crude oil price on energy consumption in Nigeria using ARDL bounds testing approach to cointegration. This study will encourage more studies on the possible linkage between crude oil price and energy consumption in other net oil-exporting countries. The remainder of this study is structured as follows: section 2 provides a review of existing empirical literature. Section 3 presents the data and methodology of the study. Section 4 presents and discusses the empirical results. Finally, section 5 offers some concluding remarks on the findings.

2. A BRIEF LITERATURE REVIEW

The results of recent empirical studies reveal significant variation on the influence of economic factors on energy consumption resulting from not only the nature of the data, time span and econometric techniques employed but also on differences in institutional and economic conditions of countries. [5] found the influence of economic growth on energy consumption positive and statistically significant in Cameroon, Congo Republic, Congo Democratic, Côte d'Ivoire, Gabon, Ghana and Togo, and statistically insignificant in Nigeria. [8] found economic growth to be statistically insignificant in explaining energy consumption in Bahrain and Kuwait. [9] found the effect of financial sector development on energy consumption in Malaysia significantly positive in the long-run as well as in the short-run while [8] found the effect of financial sector development on energy consumption insignificant in Qatar. [5] also found the effect of financial sector development on energy consumption negative and statistically significant in Nigeria.

In the particular case of the influence of crude oil price on energy consumption, two explanations has been offered in recent studies. The first explanation suggests that an increase in crude oil price would have a negative effect on energy demand in the economy. The argument in this explanation is that since oil is the major source of energy, a price increase would lead to an increase in the cost of production and in the price of other types of energy (for instance, natural gas, liquid gas, electricity) which in turn would cause a decline in the level of energy demand in the economy [10]. [11] and [10] empirically support this explanation. Although the general explanation of the influence of crude oil price on economic activities by [12] suggests that this explanation significantly describes the case of net oil-importing countries where oil is a major input in the production system, [10] has shown empirically that this explanation could also exist for oil-exporting economies using the case of Azerbaijan, Kazakhstan and Russia.

The Second line of reasoning explains the special case of net oil-exporting economies. With crude oil receipt constituting a significant part of revenue in net oil-exporting countries, crude oil price will influence fiscal spending, which in turn determines the level of economic activities [7]. [13] however suggests that while the direct effect of an increase in crude oil price on economic activities in net oil-exporting economies is expected be positive, a negative indirect effect may also exist through other drivers of economic activities. Specifically, macroeconomic uncertainties generated by fluctuations in crude oil prices in the international crude oil market could influence the degree to which economic activities generate incentives in the private sector and demand for energy in net oil-exporting economies (see [7]). [14] also linked fluctuations in economic activities in net oil-exporting countries to fiscal, macroeconomic and institutional challenges being generated by movements in crude oil prices.

It is evident from the above explanations that while crude oil price may have a positive relationship with the level of energy consumption in the case of net oil-exporting economies, a negative indirect causality may also exist through the exposure of other drivers of economic activities in the economy to macroeconomic uncertainties generated by movements in crude oil prices in the international crude oil market. With the precarious dependence of economic activities in the Nigerian economy on crude oil revenue, it is therefore significant to examine empirically how crude oil price influences energy consumption in the oil-dependent economy.

3. DATA AND METHODOLOGY

3.1 Data Description

This study uses annual data covering the period from 1975 to 2013 to examine the influence of crude oil price on energy consumption in Nigeria. Energy consumption is measured as energy use (kg of oil equivalent per capita). International crude oil price is measured in US dollars per barrel. Fig. 1 displays scatter plots of the relationship between energy consumption and crude oil price for Nigeria. The figure shows that a positive correlation between energy consumption and crude oil price exists for the net oil-exporting country over the period 1975-2013.

The correlation analysis in Fig. 1 highlights the linear relationship between crude oil price and energy consumption but does not show the magnitude of the causal effects of crude oil price on energy consumption in the economy.

GDP per capita (constant 2005 US$), Inflation (consumer prices- annual %), domestic credit to private sector (% of GDP) and the ratio of total trade (export and import) to GDP are included in this study to control for economic conditions in the level of macroeconomic performance, financial sector development and openness of the economy to international trade. As the economy is growing, it demands more energy for economic, technological and social activities [5]). Higher levels of economic growth could therefore be interpreted to mean more economic activities and higher level of energy consumption. On the other hand, a lower level of economic growth could indicate a lower level of economic activities and energy consumption in the economy. The level of inflation in the economy measures the degree of macroeconomic uncertainty in a country. While financial sector development could influence the energy substitution habit of households and firms in the economy by making it easier for them to access credit, international trade allows them access to both energy consuming and efficient products, all of which could alter the level of energy consumption in the economy [5]. Definition of all the variables and data sources is provided in Table 1.

3.2 Empirical Model and Estimation Method

This study empirically examines the log-linear model specified in Eq. (1) to uncover the magnitude of the causal effects of crude oil price on energy consumption in Nigeria over the period 1975-2013.

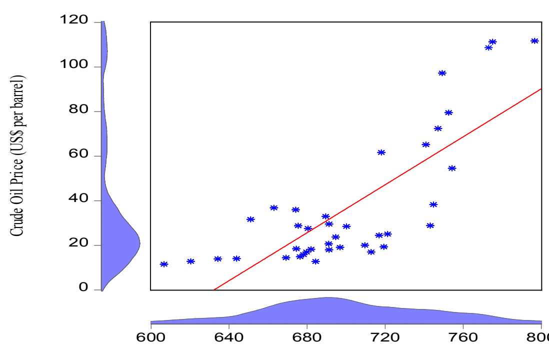

Fig. 1. Trends in energy use (Kgoe) by crude oil price in Nigeria

Table 1. Definition of variables

Variable	Definition		Source
Engy	Energy use (kg of oil equivalent per capita)	Energy consumption	WDI
Rgdpc	GDP per capita (constant 2005 US$)	Economic growth	WDI
Infrt	Inflation, consumer prices (annual %)	Price uncertainty	WDI
Pcrdgdp	Private credit by deposit money banks to GDP (%)	Financial development	GFD
OilP	Crude Oil Price (Brent US$ per barrel)	Crude oil price	BP

Note: WDI stands for World Development Indicators, World Bank; GFD stands for Global Financial Development Indicators, World Bank; BP stands for BP Statistical Review of World Energy, 2015

$$lnEngy = \alpha_0 + \alpha_1 lnOilp + \alpha_2 lnRgdpc + \alpha_4 ln\text{Infrt} + \alpha_3 ln\text{TrdO} + \alpha_5 ln\text{Pcrdgdp} + e_t \quad (1)$$

Where *Engy* stands for energy consumption, *Oilp* is the international crude oil price, *Rgdpc* represents economic growth, *Pcrdgdp* represents the ratio of private credit by deposit money banks to GDP, *TrdO* represents openness of the economy to international trade, *Infrt* is foSr inflation rate and e_t is the error term.

This study employs the autoregressive distributed lag testing approach to cointegration (ARDL-bounds) of [15] to investigate the log-linear empirical model specified in equation 1. The ARDL approach is considered to offer several desirable statistical features that overcome the limitations of both [16] and [17] cointegration techniques [15]. While both [16] and [17] co-integration techniques require all the variables to be integrated of the same order [I(1)], ARDL approach provides valid results as long as none of the variables is I(2) [whether the variables are I(0) or I(1) or mutually co-integrated], allows for simultaneous testing of the long-run and short-run relationships between variables in a time series model and provides unbiased coefficients of variables along with valid t-statistics even when the explanatory variables are endogenous and in small and finite sample sizes [15]. Two ARDL models are specified for the estimation of the log-linear empirical relationship established in Eq. (1).

3.2.1 ARDL model 1: Without Structural Break

The ARDL model specified in Eq. (2) estimates the log-linear empirical relationship established in Eq. (1) without incorporating the possibility of a structural break in energy consumption.

$$\begin{aligned} \Delta lnEngy_t = a_0 &+ \sum_{i=1}^{n} a_{1i}\, \Delta nEngy_{t-i} + \sum_{i=0}^{n} a_{2i}\, \Delta lnOilp_{1_{t-i}} + \sum_{i=0}^{n} a_{3i}\, \Delta lnRgdpc_{2_{t-i}} + \sum_{i=0}^{n} a_{4i}\, \Delta lnInfrt_{3_{t-i}} \\ &+ \sum_{i=0}^{n} a_{5i}\, \Delta lnInTrdO_{4_{t-i}} + \sum_{i=0}^{n} a_{6i}\, \Delta lnPcrdgdp_{5_{t-i}} + a_7 lnEngy_{t-1} + a_8 lnOilp_{t-1} \\ &+ a_9 lnRgdpc_{t-1} + a_{10} lnInfrt_{t-1} + a_{11} lnTrdO_{t-1} + a_{12} lnPcrdgdp_{t-1} \\ &+ \varepsilon_t \end{aligned} \quad (2)$$

3.2.2 ARDL model 2: With Structural Break

The ARDL model specified in Eq. (3) estimates the log-linear empirical relationship established in Eq. (1) incorporating the possibility of a structural break in energy consumption.

$$\begin{aligned} \Delta lnEngy_t = b_0 &+ \sum_{i=1}^{n} b_{1i}\, \Delta nEngy_{t-i} + \sum_{i=0}^{n} b_{2i}\, \Delta lnOilp_{1_{t-i}} + \sum_{i=0}^{n} b_{3i}\, \Delta lnRgdpc_{2_{t-i}} + \sum_{i=0}^{n} b_{4i}\, \Delta lnInfrt_{3_{t-i}} \\ &+ \sum_{i=0}^{n} b_{5i}\, \Delta lnTrdO_{4_{t-i}} + \sum_{i=0}^{n} b_{6i}\, \Delta lnPcrdgdp_{5_{t-i}} + b_7 lnEngy_{t-1} + b_8 lnOilp_{t-1} \\ &+ b_9 lnRgdpc_{t-1} + b_{10} lnInfrt_{t-1} + b_{11} lnTrdO_{t-1} + b_{12} lnPcrdgdp_{t-1} + b_{Dum} Break_t \\ &+ \varepsilon_t \end{aligned} \quad (3)$$

Where Δ is the difference operator, ε_t is white noise error term while *Break* is a dummy variable incorporated into the ARDL model to capture any structural break in the data series of energy consumption. Other variables remained as previously defined. After testing for cointegration among the variables, the long-run coefficients of the variables are then estimated. The optimal lag length is selected based on Schwarz information criterion (SIC). The error correction model for the estimation of the short run relationships is specified as:

$$\begin{aligned}\Delta lnEngy_t = a_0 &+ \sum_{i=1}^{n} a_{1i}\,\Delta nEngy_{t-i} + \sum_{i=0}^{n} a_{2i}\,\Delta lnOilp_{1_{t-i}} + \sum_{i=0}^{n} a_{3i}\,\Delta lnRgdpc_{2_{t-i}} + \sum_{i=0}^{n} a_{4i}\,\Delta lnInfrt_{3_{t-i}} \\ &+ \sum_{i=0}^{n} a_{5i}\,\Delta lnTrdO_{4_{t-i}} + \sum_{i=0}^{n} a_{6i}\,\Delta lnPcrdgdp_{5_{t-i}} + \lambda_1 ECM_{t-1} \\ &+ u_{2t} \qquad (4)\end{aligned}$$

$$\begin{aligned}\Delta lnEngy_t = b_0 &+ \sum_{i=1}^{n} b_{1i}\,\Delta nEngy_{t-i} + \sum_{i=0}^{n} b_{2i}\,\Delta lnOilp_{1_{t-i}} + \sum_{i=0}^{n} b_{3i}\,\Delta lnRgdpc_{2_{t-i}} + \sum_{i=0}^{n} b_{4i}\,\Delta lnInfrt_{3_{t-i}} \\ &+ \sum_{i=0}^{n} b_{5i}\,\Delta lnTrdO_{4_{t-i}} + \sum_{i=0}^{n} b_{6i}\,\Delta lnPcrdgdp_{5_{t-i}} + b_{Dum}Break_t + \lambda_2 ECM_{t-1} \\ &+ u_{3t} \qquad (5)\end{aligned}$$

ECM_{t-1} is the error correction term obtained from the cointegration model. The coefficient of the error correction term indicates the rate at which the cointegration model corrects its previous period disequilibrium or speed of adjustment to restore the long-run equilibrium relationship. A negative and significant coefficient suggests that any short-term disequilibrium will converge back to the long-run relationship.

4. EMPIRICAL RESULTS

4.1 Unit Root Tests

The results of the ADF (Augmented Dickey Fuller) and the PP (Phillips Perron) unit root tests in Table 2 show that the order of integration of the variables is mixed [I(0) and I(1)]. However none of the variables is integrated of order two I(2). The integration of the variables at I(0) and I(1) makes ARDL the preferred approach in this empirical analysis. The results of unit root with unknown single structural break presented in Table 3 dates indicate the presence of a structural break in all the data series. Interestingly, the stationary properties confirm that none of the variables is stationary at second difference [I(2)].

4.2 Results of ARDL Co-integration Test

Since ARDL bounds test is known to be sensitive to lag length, this study examines the VAR Lag Order Selection. Table 4 suggests the specification of a maximum lag length of one (Max lag = 1) in the ARDL bound test using Schwarz information criterion (SIC). Given the sample size of 39 observations (1975-2013) used in this study, the critical values for the evaluation of the null hypothesis are taken from [18]. The results of the co-integration test based on the ARDL-bounds testing method for two specifications of the log-linear empirical model in Eq. (1) (specification 1 is without a structural break while specification 2 incorporates the structural break date observed in energy nsumption) are presented in Table 5. The results indicate that the F-statistic is greater than the upper critical bound from [18] at 5% significance level using restricted intercept and no trend. This study therefore rejects the null hypothesis of no cointegration among the variables. This shows that there is a long-run causal relationship among the variables in Nigerian economy.

4.3 Long Run and Short Run Estimates

The estimated long-run and short-run coefficients are presented in Table 3. The long-run coefficient of crude oil price is positive and statistically significant at 1% level with and without the incorporation of a structural break observed in energy demand. This indicates that an increase in crude oil price will likely increase energy consumption in Nigeria. From the long-run coefficient of specification 2, a 1% increase in crude oil price significantly increases energy consumption by 0.105% (specification 1 gives 0.102%). The short-run coefficients are also positive and statistically significant with a 1% increase in crude oil price generating about 0.03% increase in energy consumption per capita in the economy.

Table 2. ADF and PP unit root tests

Variable	ADF		PP		Result
	I(0)	I(1)	I(0)	I(1)	
*ln*Engy	-1.7887	-5.4751***	-1.7775	-5.8093***	I(1)
*ln*Oilp	-0.7907	-6.1763***	-0.7868	-6.1763***	I(1)
*ln*Rgdpc	-0.1013	-4.7867***	-0.4866	-4.8430***	I(1)
*ln*Pcrdgdp	-3.3824**	-4.6756***	-2.8343*	-4.6483***	I(0)
*ln*TrdO	-2.1758	-7.7801***	-2.1654	-7.7801***	I(1)
*ln*Infrt	-3.8101***	-6.4010***	-3.4274**	-14.2467***	I(0)

*Note: ADF is the Augmented Dickey Fuller test while PP stands for Phillip Perron unit root test. The lag length in [ ]; level I(0) and first difference I(1). *, **, and *** indicate significance at 10%, 5% and 1%, respectively. All the variables are in the natural logarithm form*

Table 3. Results of unit root test with unknown single structural break

	Level form I(0)		First difference I(1).		Result
	t-Statistic	Break Date	t-Statistic	Break Date	
*ln*Engy	-3.4547 [0]	2000	-6.3704*** [0]	1994	I(1)
*ln*Oilp	-3.3068 [0]	2003	-6.7956*** [0]	1998	I(1)
*ln*Rgdpc	-2.7144 [2]	2003	-6.8025** [0]	2004	I(1)
*ln*Pcrdgdp	-3.7767 [1]	2006	-5.6556** [0]	2009	I(1)
*ln*TrdO	-3.2091 [0]	1988	-8.1690*** [0]	2010	I(1)
*ln*Infrate	-4.9080*** [1]	1995	-6.9470 ***[1]	1988	I(0)

*Note: The lag length in [ ]; *, **, and *** indicate significance at 10%, 5% and 1%, respectively. Break type: Innovational Outlier; Break selection: Minimize Dickey-Fuller t-statistic*
Sources: various computation eviews10

Table 4. VAR Lag Order Selection Criteria

Lag	LogL	AIC	SC	HQ
0	23.25383	-0.958546	-0.694626	-0.866431
1	157.7480	-6.430444	-4.583005*	-5.785638*
2	191.9470	-6.330389	-2.899431	-5.132893
3	247.1801	-7.398897*	-2.384420	-5.648710

** indicates lag order selected by the criterion; AIC: Akaike information criterion; SC: Schwarz information criterion; HQ: Hannan-Quinn information criterion*

Table 5. ARDL bounds cointegration test results

Specifications (Max lag = 1)	ARDL	F-statistic	Result
1. F_{Engy}(Engy| Oilp, Rgdpc, Pcrdgdp, TrdO, Infrt)	(1, 0, 0, 1, 0, 1)	4.7463***	Cointegration
2. F_{Engy}(Engy|Oilp, Rgdpc, Pcrdgdp, TrdO, Infrt, Brk2000)	(1, 0, 0, 1, 0, 1)	4.6309***	Cointegration
Critical Value Bounds	1%	5%	10%
I0 Bounds	3.900	2.804	2.331
I1 Bounds	5.419	4.013	3.417

ARDL Models selected on Schwarz information criterion (SIC), k = 5
**** indicates significance at 1% level; Restricted intercept and no trend*
Source of critical value bounds: [18] Appendix: Case II

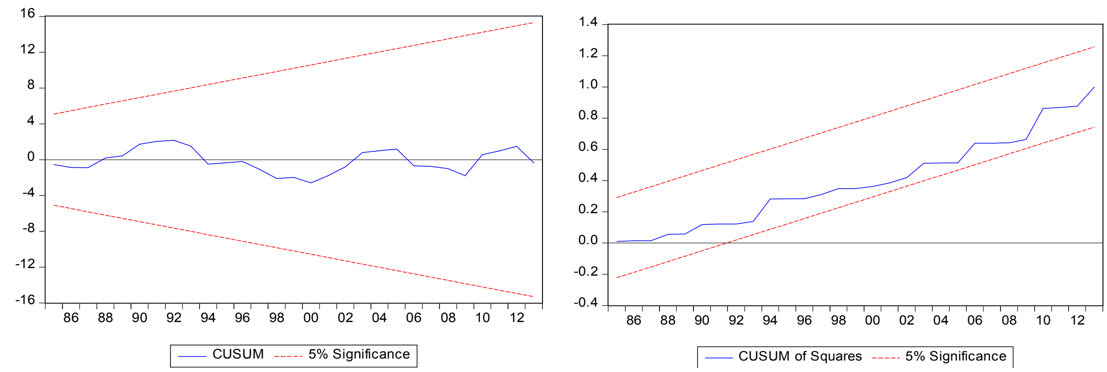

Fig. 2. CUSUM and CUSUM of Squares for specification 1 (without structural break)

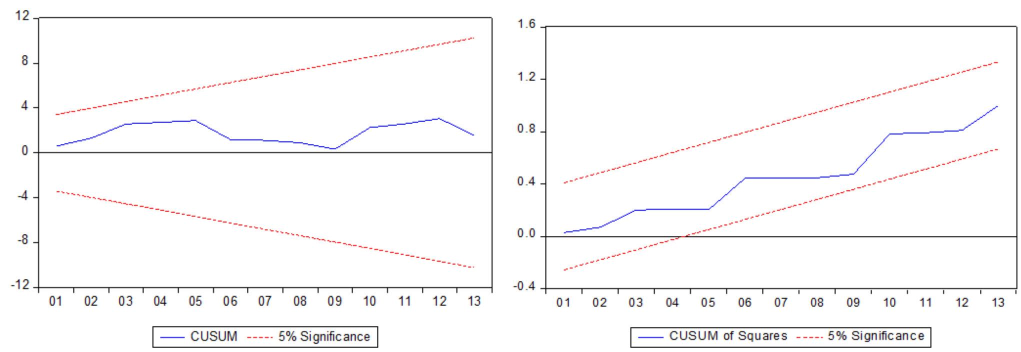

Fig. 3. CUSUM and CUSUM of Squares for specification 2 (with structural break)

Table 6. Long run and short run estimates

	Long Run Coefficients			Short Run Coefficients	
Specifications:	**1**	**2**		**1**	**2**
	Without Structural Break	**With Structural Break**		**Without Structural Break**	**With Structural Break**
C	**6.7747*** [15.7281]	**6.9014** [17.2181]	**ECM(-1)**	**-0.3540***** [-6.2820]	**-0.3569***** [-6.3983]
***ln*Oilp**	**0.1018***** [4.0272]	**0.1048***** [4.5068]	**Δ*ln*Oilp**	**0.0253**** [2.7214]	**0.0311***** [3.3778]
***ln*Rgdpc**	**-0.0813** [1.3194]	**-0.1010*** [-1.7699]	**Δ*ln*Rgdpc**	**-0.0099** [-0.2860]	**-0.0153** [-0.4548]
***ln*Infrt**	**-0.0243** [1.4246]	**-0.0303*** [-1.8160]	**Δ*ln*Infrt**	**0.0024** [0.7345]	**0.0017** [0.5249]
***ln*TrdO**	**0.0628**** [2.1590]	**0.0660**** [2.4609]	**Δ*ln*TrdO**	**0.0117** [1.1987]	**0.0138** [1.4438]
***ln*Pcrdgdp**	**-0.0768*** [-1.9900]	**-0.0792**** [-2.2163]	**Δ*ln*Pcrdgdp**	**-0.0521***** [-4.3330]	**-0.0544***** **[-4.6270]**
Break		**-0.0815** [1.6471]	**ΔBreak**		**-0.0306***** **[-3.1324]**
Diagnostic tests					
Adjusted R-squared				0.9376	0.9412
Durbin-Watson Statistic				2.2045	2.1283
Breusch–Godfrey serial correlation LM test				1.1379(0.2861)	0.5536(0.4571)
ARCH test for heteroscedasticity				0.3135(0.5756)	0.0396(0.8423)
Jarque-Bera Normality test				1.9801(0.3716)	1.5656(0.4571)
Ramsey RESET test: F-Statistic				0.0143(0.9058)	0.2368(0.6304)

*Note: *, **, and *** indicate significance at 10%, 5% and 1%, respectively*
t-statistics in [ ] and p-values in ( ) The dummy variable Break takes 1 for 2000 and 0 for other years

The coefficients of indicators of economic growth (real GDP per capita) and financial development (the ratio of private credit by deposit money banks to GDP) are found negative. However, only financial sector development is significant in both specifications in the long-run and short-run. The deviation of the sign of the coefficients of these two factors from the theoretical expectation highlights the special case of oil-dependent economies documented by [19] for Algeria. The results are also in line with the findings of [5] for Nigeria. The long-run coefficient of inflation rate is negative as expected but only significant in specification 2 while the long-run coefficient of trade openness is positive and statistically significant in both specifications. The coefficient of the structural break dummy in specification 2 is negative but only significant in the short-run. The coefficient of ECM (-1) in both specifications is negative and significant at 1% level. In both specifications, about 35% of the short-run disequilibrium is corrected in the long-run.

4.4 Diagnostic and Stability Tests

The diagnostic test results in Table 6 show that there are no evidence of serial correlation, heteroscedasticity and functional form misspecification in the two ARDL models estimated. Figs. 2 and 3 show the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares (CUSUMSQ) stability test results. The figures suggest that the coefficients of the estimated ARDL model are stable.

5. CONCLUSION

This study examines the influence of crude oil price on energy consumption in Nigeria over the period 1975 to 2013 using ARDL cointegration analysis. The results suggest that crude oil price is a significant long-run and short-run determinant of energy consumption in the net oil-exporting country. The long-run and short-run effects suggest that an increase in crude oil price would mean more energy consumption in the Nigeria economy. This highlight the dependence of economic activities that generate demand for energy in the economy on crude oil price and encourage more studies on the possible linkage between crude oil price, energy consumption and economic growth in other net oil-exporting countries. The recent movements in crude oil prices in the international crude oil market therefore highlight the need to accelerate transition toward renewable energy in the Nigerian economy.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Kumar S. Cointegration and the demand for energy in Fiji. International Journal of Global Energy Issues. 2011;35(1):85–97.
2. Ishida H. Causal relationship between fossil fuel consumption and economic growth in the world. International Journal of Global Energy Issues. 2012;35(6):427–440.
3. Ajide K, Bekoe W, Yaqub J, Adeniyi O. Energy consumption and financial development in Sub-Saharan Africa: A panel econometric analysis. International Journal of Global Energy Issues. 2013; 36(2/3/4):225–241.
4. Adewuyi AO. Determinants of import demand for non-renewable energy (petroleum) products: Empirical evidence from Nigeria. Energy Policy. 2016;95:73–93.
5. Keho Y. What drives energy consumption in developing countries? The experience of selected African countries. Energy Policy. 2016;91:233–246.
6. Ayadi OF. Oil price fluctuations and the Nigerian economy. OPEC Review. 2005; 29:199-217.
7. Sturm M, Gurtner FJ, Gonzalez J. Fiscal policy challenges in oil-exporting countries- A review of key issues. ECB Occasional Paper No.104; 2009.
8. Al-Mulali U, Lee JY. Estimating the impact of the financial development on energy consumption: Evidence from the GCC (Gulf Cooperation Council) countries. Energy. 2013;60:215-221.
9. Islam F, Shahbaz M, Ahmed AU, Alam MM. Financial development and energy consumption nexus in Malaysia: A multivariate time series analysis. Economic Modelling. 2013;30:435-441.
10. Hasanov FJ, Bulut C, Suleymanov E. Do population age groups matter in the energy use of the oil-exporting countries? Economic Modelling. 2016;54:82–99.
11. Çoban S, Topcu M. The nexus between financial development and energy

consumption in the EU: A dynamic panel data analysis. Energy Economics. 2013; 39:81-88.
12. Omojolaibi JA. Crude oil price dynamics and transmission Mechanism of the macroeconomic indicators in Nigeria. OPEC Energy Review. 2014;38:341–355.
13. Abeysinghe T. Estimation of direct and indirect impact of oil price on growth. Economics Letters. 2001;73(2):147-153.
14. Ushie V, Adeniyi O, Akongwale S. Oil revenue, institutions and macroeconomic indicators in Nigeria. OPEC Energy Review. 2013;37(1):30-52.
15. Pesaran M, Shin Y, Smith R. Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics. 2001;16:289–326.
16. Engle RF, Granger CW. 'Co-integration and error correction: representation, estimation, and testing. Econometrica: Journal of the Econometric Society. 1987; 55:251-276.
17. Johansen S. Estimation and hypothesis testing of cointegration vectors in gaussian vector autoregressive models. Econometrica. 1991;59:1551–1580.
18. Narayan PK. The saving and investment nexus for China: Evidence from cointegration tests. Applied Economics. 2005;37:1979-1990.
19. Marques AC, Fuinhas JA, Pereira DA. Have fossil fuels been substituted by renewables? An empirical assessment for 10 European countries. Energy Policy. 2018;116:257-265.

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