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CRUDE OIL PRICE AND STANDARD OF LIVING NEXUS: EVIDENCE FROM NIGERIA

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ABSTRACT

This article is carried out through an analysis of the influence of crude oil prices on the standard of living in Nigeria by using additional variables as supporters, such as crude oil income, inflation, and exchange rates. According to data availability, the utilization data used in this study is the annual time series data from 1981-2019. The main findings are: (1) there is a long-term equilibrium connection among the series. (2) crude oil price has a negative impact on the standard living. (3) crude oil revenue negatively affects the standard of living. (4) inflation has a negative impact on the standard of living. (5) exchange rate positively affects the standard of living. (6) convergence speed indicates that system movement to the equilibrium path is quick. Therefore, this implies that despite the abundance of oil in the country. The masses do not witness its impact. Diagnostic checks confirmed the perfectness of the model. DOLS, FMOLS and CCR as robustness checks revealed similar results with ARDL long-run results.

Keywords: *Crude Oil Price, the Standard of Living, ARDL, Nigeria*

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Introduction

Crude oil is created from the remains of algae and plankton in prehistoric times that fell into the seabed about 400 million years ago. They were mixed with mud and buried by layers of sediment. Crude oil is the main ingredient for creating various transportation fuel products such as petroleum, aircraft fuel, diesel, gasoline, and oil for heating and electricity generation. In addition, crude oil can produce products other than its main products, such as asphalt, paraffin, and lubricating oil (oil). Crude oil is also used for chemicals such as fertilizer, insecticide, soap, perfume, and vitamin capsules (Energy Information Administration, 2020).

Based on historical stories, governments in various African countries have protected the owners of domestic oil refineries. This form of protection can hinder the oil refinery's development and efficiency. Some parties choose to increase the price that all consumers must pay. Meanwhile, for state-owned oil refineries, protection for domestic oil refineries has a sustainable impact on the government. It impacted price increases that exceeded price movements on world markets (World Bank, 2011). Fuel shortages are also common in this area. In 2007 and 2008, world crude oil prices continued to increase; of course, this made the African government ignore the basic formula in setting prices to protect consumers from rising world oil prices and limiting retail prices by reducing fuel tax payments. Government policies like this will prevent effective competition and lead to price increases in the long run (World Bank, 2011).

Nigeria's annual budget is usually based on higher crude oil prices. It leads to measures of spending cuts or additional financial sources to match the decline in revenues caused by unfavourable changes in crude oil prices on the world market (International Energy Agency (IEA),2021). Nigeria is Africa's largest crude oil-producing region, producing around 2 million barrels per day. In 2014 Nigeria output more than 1.9 million barrels of crude oil per day, thus ranking as the 11th largest oil producer in the world. This statement is supported by the fact that Nigeria could produce 2 million barrels per day in 2015 and 2019 (International Energy Agency (IEA), 2021). Meanwhile, crude oil contributes 10% of the country's GDP. Crude oil accounts for about 57% of government revenue and more than 80% of total exports. It suggests that any increase in export earnings can significantly affect the economy. In its "Global Economic Prospects" statement released in 2020, the World Bank predicts Nigeria's energy sector will experience a contraction of 10.6% by the end of 2020. This decline prompted the government's budget to be revised and passed by parliament on June 10, 2020. It brought the benchmark crude oil price from $57 per barrel to $25, while officials also approved an additional $5.5 billion in loans to help fund the new budget deficit (IEA, 2021).

Fluctuations in crude oil production prices in Nigeria since 2005 can be attributed partly to OPEC's inability to set an acceptable benchmark and security problems connected to violent militant groups in the country, especially in crude oil exploration sites such as the Niger Delta region. Nigeria has the continent's second-largest proven crude oil reserves. According to the EIA, the country's security concerns and other commercial risks have slowed crude oil exploration operations. Nigeria's state-owned National Petroleum Corporation (NNPC) regulates and grows the country's oil and gas sector. NNPC primarily relies on multinational oil firms to fund its development and supply expertise. The country's significant on-shore crude oil production operations are run as joint ventures between the NNPC and private oil companies, with the NNPC as the predominant owner. Production-sharing contracts are commonly used to organize expensive, sophisticated off-shore crude oil developments. It can change the conditions of these contracts to give overseas operators sufficient incentives. Chevron, Exxon Mobil, Shell, Total, and Eni are among the world's top oil firms with operations in Nigeria.

Since crude oil was discovered in Nigeria in 1970, it has been a primary source of government revenue. The crude oil and gas sector accounted for 35% of the country's GDP and 90% of overall export earnings. Nigeria has an estimated 5.28 billion m3 of confirmed natural gas reserves. It makes Nigeria one of the top ten countries in the world with natural gas resources and Africa's largest endowment (Energy Commission of Nigeria [ECN], 2017). Nigeria has 37 billion barrels of proven crude oil reserves. Despite the wealth these resources, Nigeria's economy experienced its worst growth rate in 25 years in 2016, as crude oil price changes wreaked havoc on the country's financial operations. Frequent militant attacks on oil infrastructure pushed the country's economy into negative growth indices, and a slew of other insurgencies also contributed to the lower GDP growth rate (ECN, 2017).

How Crude Oil Price Affects Standard of Living in Nigeria

Crude oil prices affected the standard of living in numerous ways. Firstly, petroleum products, a by-product of crude oil, are environmentally friendly. Its availability at an affordable price reduces the cost of production and improves output and income level. Secondly, it reduces stress and improves life expectancy, a resultant effect of the products used in hospitals and schools to ensure quality health care and education. In a nation richly endowed with crude oil reserves, petroleum products conduct low prices and reduce inflationary pressure, thereby creating a solid link between the movement in petroleum product prices and the standard of living (Odoh, 2014). When the pump prices of petroleum products are high, it negatively affects the standard of living and vice versa. Nigeria is one of the countries in the world with diverse energy sources, and the most common is hydropower and fossil fuel (coal, gas, crude oil). Hydropower is Nigeria's primary energy source (national grid) and is expected to generate power for industrial, manufacturing, and household uses. However, evidence has shown that the power supply from the national grid is epileptic, and many Nigerians have resolved to use petroleum products as an alternative to the power supply (Odoh, 2014).

Petroleum products are more reliable to produce in Nigeria because power fluctuations in the national grid may lead to a massive loss in the production chain. Therefore, the excessive power failure from the national grid has made production, manufacturing industries, and households depend more on petroleum products to produce goods and services. Furthermore, these have made its price movement a strong determinant for industrial, manufacturing and national output, as well as a determinant of national living standards. The fluctuation in crude oil prices is creating economic anxiety and panic among households in Nigeria. It is because the crude oil price of petroleum products can negatively affect the standard of living (Nwaoha et al., 2018).

Furthermore, an increase in domestic oil prices can lead to an increase in the cost of production and a reduction in output. These may lead to staff reduction (unemployment), low income, and low demand. With the reduction in output coupled with low income and low demand, there may be a mismatch in supply and demand conditions, leading to a high inflationary rate. All these may lead to a vicious circle of poverty which may negatively influence living standards (Nwaoha et al., 2018).

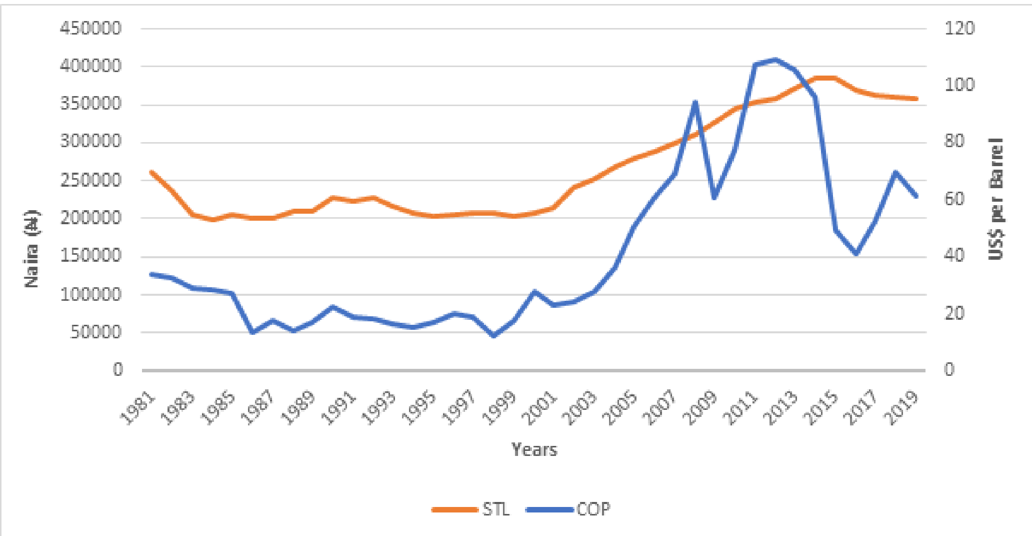

Figure 1: Trends of Crude Oil Price and Standard of Living in Nigeria (1981-2019)

Source: BP Statistical Review and World Development Indicators (2020)

Figure 1 shows the trends of crude oil price (expressed in US$ per barrel) and standard of living (using GDP per capita, local currency unit) in Nigeria from 1981 to 2019. Figure 1 depicts the graphical relationship between crude oil price and standard of living. The graph shows that generally, the two graphs follow each other for the period between 1981 and 2008. Crude oil prices gradually fluctuated from 1981 until 2003, reaching US$28.1 per barrel. During this period, the trend of the standard of living was also fluctuating with increase and decrease (except for 2003). Crude oil prices then increased from US$36.05 in 2004 to US$94.1 per barrel in 2008. It was followed by an upward ward trend in the standard of living, as depicted in Figure 1. In 2009 price of crude oil dropped to US$60.86 a barrel and increased to US$109.45 a barrel in 2012. During this period, the trend of the standard of living was on the increase. From 2012 to 2016, the price of crude oil experienced a sharp decrease from US$109.45 to US$40.76 per barrel. Its recovery in 2018 was US$69.78 per barrel and dropped to US$61.145 per barrel in 2019. From 2012 to 2019, the trend of living standard of living was affected negatively, as shown in figure 1.

The study contributes empirically to the existing facts by utilizing more recent data on price crude oil and living standards to capture the exact connection between crude oil prices and the standard of living in Nigeria. It will improve the reliability of the results and the policy recommendation to originate from them. The autoregressive distributed lag method is supported with dynamic OLS and fully modified OLS, and canonical regression was applied as robustness checks.

The current research intends to explore the impact of crude oil prices on the standard of living in Nigeria. The studies carried out in the past, such as Arinze, 2011; Nwosa, 2013; Onwuka et al., 2013; Ocheni, 2015; Nwaoha et al., 2018 concentrate on the relationship between petroleum prices, the standard of living and the whole economy. However, in Nigeria, petroleum pump prices are associated with fuel subsidies by the government, which may give a different picture of the relationship. Therefore, the current study differs from the previous studies by using crude oil prices instead of refined petroleum product pump prices to quantify the relationship in the presence of an efficient dynamic method to arrive at efficient conclusions.

The following is how the paper is organized. Section 2 follows this one and deals with the literature review. Section 3 discusses methodology, which includes the theoretical framework, model specification, estimation techniques, data sources, and measurements. Section 4 contains discussions of the findings, while Section 5 contains the summary, conclusion, and recommendations.

Literature Review

The crude oil price and living standard in Africa have a relationship that has yet to be studied, much more so in Nigeria. Mohamad & Saeed (2016) are an example in this study showing the impact of crude oil prices on economic growth in Iraq by using OLS approach to analyze the data for 2000 to 2015. Results indicated that crude oil price and export of crude oil were essential determinants of economic growth. Ftiti et al. (2016) reviewed the level interdependence among crude oil prices and economic growth for four nations (i.e., UAE, Kuwait, Venezuela, and Saudi Arabia). The study from 2000 to 2010 used the frequency approach cointegration process extended by Engel & Granger (1987). Results established that oil price changes during the time of volatility in the global business cycle influenced the link between oil and economic growth in these countries. Apere & Eniekezimene (2016) examined the connection between crude oil prices and the economic growth of Nigeria from 1981 until 2013 through VAR and OLS techniques. Outcomes from the VAR model revealed that changes in crude oil prices significantly affected Nigeria's growth.

Gummi et al. (2016) studied the existence of a connection between crude oil price and economic growth in Nigeria using for the 1974-2014 periods granger causality test was chosen to test the existence of the connection. Findings revealed that there is a significant one-way causality running from crude oil price to economic growth. In contrast, outcomes from the OLS approach indicated that oil prices had a positive correlation with GDP and a decrease in oil prices' negative effect on GDP.

Meanwhile, in the same country, Charles et al. (2017) investigate the impact of oil price volatility on economic growth. Researchers discovered that crude oil price uncertainty harmed economic growth using a structural vector autoregressive and GARCH-in-mean model on monthly time series from October 1973 till 2017. Maghyereh et al. (2017) used panel datasets to check the impact of crude oil price volatility on actual economic activity in Jordan and Turkey. The index of production is used as a proxy for actual economic activity. The analysis results, which used a VAR model of monthly panel data from January 1986 to December 2014, revealed that oil price negative impacts economic activity in both countries. Al-zanganee (2017) applied a VAR model to examine the impact of the price of crude oil changes on economic growth in Iraq. Utilizing data sets for non-unit root and long-run cointegration relationships using Engle, granger, Johansen, and Juselius tests. The results of the article stated that it formed a very significant impact of the change in crude oil prices on economic growth in Iraq. In assessing the relationship between the pattern of household consumption expenditure and two macroeconomic indicators such as exchange rate and economic growth in the case of the Ghanaian economy, Bonsu & Muzindutsi (2017) applied the VAR model to the annual data for the 1961-2013 periods and the empirical result indicated that household consumption expenditure impacted positively on the economic growth of the country. Tehranchian & Seyyedkolaee (2017) analyze the nexus between crude oil price changes and economic growth in Iran using verge regression from 1980 to 2014. Results revealed that changes in oil prices reached 1147.77 acts as the threshold value. In addition, because the value of changes in crude oil price has reduced in the subsequent regime compared to the initial one, the efficiency of the changes in oil price on economic growth has reduced over time. Gatawa & Abdullahi (2017) investigated the influence of changes in petroleum product pump prices on the welfare of households in the Zaria of Kaduna state, Nigeria, used 42 filling stations with 400 household heads and applied a stratified random sampling technique in collecting data. The primary data used in this study uses descriptive and inferential statistics.

The results indicated increased petroleum product pump prices such as petrol, gas and kerosene negatively impacted household welfare. Roland (2017) used an error correction model to investigate the influence of PMS, GDI, labour employment, and lending interest rate on economic growth in Nigeria from 1970 to 2013. (ECM). This research found that PMS and interest rates had a substantial negative influence on economic growth, but GDI and labour employment had a considerable positive impact. Nwoba et al. (2017) discuss the impact of declining crude oil prices on the Nigerian economy. This study uses secondary data from 2011 to 2015 with the help of data analysis tools, namely simple regression analysis by Pearson's product-moment correlation, and chi-square is applied to discuss the relationship between crude oil prices and economic growth indicators. The findings determined that the decline in oil prices significantly impacted the country's economy.

Equally, Nyangarika et al, (2018) studied the interdependency between crude oil prices and economic growth by considering the case of Kingdom Saudi Arabia and Russia and the period with the sample of 1991 to 2016. The data in this study were tested and analyzed using the model factional integrated generalized autoregressive conditional heteroscedasticity

(FIGARCH). The results showed a positive and significant relationship among the two series and evidence of mutual dependence between crude oil prices and economic growth in the case of the two countries. Charles & Oguntade (2018) analyze the impact of crude oil prices on economic growth in Nigeria from 1980 to 2016 through the OLS technique. The result revealed a long-run relationship between the series and, specifically, a significant positive relationship between changes in price crude oil and economic growth. Using three crude oil exporting nations in ASEAN province as a case study, Kriskkumar & Naseem (2019) studied both symmetric and asymmetric influence of price crude oil on the economic growth of Brunei Darussalam, Vietnam and Malay. The analysis revealed that both symmetrical and asymmetrical influences of crude oil prices on economic growth in Malay and Vietnam were absent. In contrast, crude oil prices in Brunei positively affect economic growth in this country.

Haque & Khan (2019) learned the impact of crude oil production and government expenditure in correcting the quality of the HDI in the case of the Saudi Arabian economic for the 1990-2016 period. The estimation result revealed that crude oil exports and government spending were the country's virtual drives of the human development index. An increase in crude oil production by 100 million barrels would increase the human development index by 4% .an increase in government spending by 1% would cause the human development index by 10%, and expenditure on education would contribute much to the human development index. A negative connection existed between health expenditure and economic growth. Tawfik et al. (2019) examined the impact of crude oil prices on India's economic growth. Consider use the bounds test approach to check for a cointegration association between economic growth, oil price, capital formation, and inflation from 1989 to 2017. The result indicated that the variables exhibited a cointegration relationship. VECM results present that oil price, inflation and capital formation granger caused economic growth in the long term. Also, the value of oil prices is negative and significantly related to economic growth in India. To describe the effect of fluctuations in crude oil price and generated oil revenue on the well-being of Nigerians from 1981 to 2014, Manasseh et al. (2019) utilized Johanson and Juselius test for cointegration and multiple regression techniques. Results present that the series were cointegrated and fluctuations in crude oil price exert an insignificant impact on welfare, whereas oil revenue utilizes a significant positive impact on welfare. Sunday (2019) examine the connection between changes in oil price and the growth of infrastructure in Nigeria for time 1981 to 2016, using cointegration and ECM modelling technique. The results show if there is a change in oil prices or inflation rates, it will harm infrastructure growth.

In contrast, genuine exchange rate appreciation tends to encourage infrastructure investment. Musa et al. (2019) studied the impact of oil prices and exchange rates on economic growth in Nigeria using the ARDL approach to test the time from 1982 until 2018. This study provides positive and significant results of exchange rate and crude oil prices on economic growth in Nigeria in the short and long term. Using the ARDL model, According to Nonejad (2019) investigates the impact of crude oil price volatility on economic growth in the US. The findings of a test utilizing quarterly time series data indicate that crude oil price volatility affects economic growth. Rosnawintang et al. (2020) in this study use panel data from a sample of sixteen states and a quarterly time series 2008 and 2015 to explore the effect of crude oil prices GDP in Kazakhstan. The long-term link between the series was investigated using Westerlund's (2007) cointegration test, while the causal relationship was investigated using Dumitrescu & Hurlin's (2012) panel Granger causality test. Long-term crude oil price variations and per capita regional real income growth were found to have a positive and substantial association in this context. The cointegration and Granger causality tests demonstrated that an increase in crude oil prices significantly influenced the real income of Kazakhstan regions.

Mahmood & Zamil (2019) used the cointegration approach to explore the link between crude oil prices and personal consumption per capita from 1970 to 2016. The study discovered a positive association between crude oil price and the interest in private consumption per capita in both the long and short term, matter the state of crude oil price has a direct influence on consumption instance of Saudi Arabia. Furthermore, crude oil price crises have minor impacts on private consumption per capita, so the non-oil and gas sector maintained economic consumption during periods of sluggishness.

Furthermore, Sapnken et al. (2020) studied the effect of refined crude oil products on the economic growth of Cameroon from 1994 till 2014 by applying ARDL bounds and Granger causality tests. The result indicated the attendance of cointegration connection with prices, income and urbanization. It had a positive and significant effect on the consumption of kerosene and liquefied petroleum gas in the long and short-run horizons. Moreover, Two-way causality existed between liquefied petroleum gas and income, while no causality runs from kerosene consumption towards income. Majidli & Guliyev (2020) employed a fully modified ordinary square approach to analyze the connection between crude oil prices, non-oil economic growth and the exchange rate of Azerbaijan's economy from 2005 to 2019. Results a positive and significant connection between increase in crude oil prices and non-oil economic growth.

Cantavella (2020), in his study of the asymmetric impact of crude oil prices on real economic growth between 1945-2018 in Spain, uses the non-linear ARDL approach. Revealed that long-run crude oil price decrease is associated with a more significant effect on economic growth than long-run crude oil price increases leading. Onakoya & Agunbiade (2020) learn the outcome of instability in crude oil prices on the Nigerian economy and countrywide income covering 1995 to 2017 through inferential and descriptive (regressions) statistics. Results showed that changes in oil prices had an insignificant negative impact on GNP, GDP, and income per capita. In contrast, the country's exchange rate significantly adversely affected economic growth. Ogbebor et al. (2020) investigate the effect of inflation on living standards in Nigeria from 1998 to 2017 by employing the ARDL. Output delivers that there exists a cointegration connection among the variables, and inflation exerts a significant adverse effect on Nigerians' standard of living.

However, the study has not found any recent research exploring the impact of crude oil prices on living standards in Nigeria. Research utilized recent data to involve knowledge in this regard.

Research Methodology

Theoretical Framework

The endogenous growth hypothesis provides a useful framework for understanding the relationship among fluctuations in price crude oil and living standards. Other research on fluctuating oil prices and economic well-being, as well as those by Dogah (2015), Nwaoha et al. (2018), and Kamasa et al. (2020). The endogenous growth theory who have supporters. The volatility in the living standard is supported by fluctuation in crude oil prices. The researchers provide the basis for their argument regarding events in the crude oil 1948 to 1972 that impacted the economies of the respective crude oil-export and import countries. Laser (1987) states that when in a country there is an increase in crude oil prices, people are expected to be able to lower their standard of living. It is different if the situation states that when is a decline in crude oil prices, this impact on living standards needs to be clarified because the effect is different from one country to another. Therefore, the standard of living can be modelled as a purpose of crude oil price.

Model Specification

Model the empirical connection between crude oil price and the standard living in Nigeria. The study relied on the Autoregressive Distributed Lag (ARDL) method as an estimation model. The rationale behind utilizing ARDL is that it can be applied irrespective of the order of integration of series. It has its cointegration test known as the bounds test. The long run, short run and error correction coefficients can be obtained simultaneously. The endogeneity issue isn't a problem in the ARDL framework because each Variable selects its lag and minimizes the tendency of spurious results (Pesaran & Shin, 1999). ARDL was further necessitated to efficiency and robustness checks in small sample estimation because the small sample properties the ARDL method are far more excellent than that of the Johansen and Juselius cointegration test (Erbaykal, 2008). To further increase the reliability of the estimates, the study applied dynamic ordinary least squares (DOLS), fully modified ordinary least squares (FMOLS), and the canonical cointegration regression (CCR), respectively, for robustness checks. The rationale behind implementing DOLS, FMOLS and CCR is to overcome endogeneity and simultaneity bias issues through differences in lead lags and estimator bias (McCoskey & Kao, 1998; Kao & Chiang, 2000).

To derive the empirical functional equation, the study adopts the mode of Manasseh et al. (2019), which explains the welfare determined by the circumstances of each individual and the combination of fluctuations in crude oil prices (OPF) and crude oil income (OR) as determined in equation 1 as follows.

$$W_t = f(OPF_t, OR_t) \tag{1}$$

This study modifies model equation 1 by introducing a standard of living (STL) in place of well-being, crude oil price (COP) of crude oil price fluctuations. It incorporates additional control variables such as inflation (INF) and exchange rate (EXR) for enhanced robustness. The implicit form be modified model is presented in equation 2 as:

$$STL_t = f(COP_t, ORV_t, INF_t, EXR_t) \tag{2}$$

Since the model given in equation 2 contains a mixture of variables in relative and absolute values, the linear-log function form of the equation is specified in equation 3 as:

$$\ln STL_t = \beta_0 + \beta_1 \ln COP_t + \beta_2 \ln ORV_t + \beta_3 \ln INF_t + \beta_4 \ln EXR_t + \varepsilon_t \tag{3}$$

where $\ln$ stands for the natural log sign, β_0 represents the drift parameter, $\beta_1, \beta_2, \beta_3, \beta_4$ are the coefficients of slope parameters to be estimated, time t (1981-2019) and ε_t is the stochastic variable which is expected to be normally distributed with zero mean and constant variance.

The predictions of the nexus between crude oil price and standard of living may depend mainly on the collected data, measurement, and source reliability. Therefore, the data source for this study includes World Development Indicators (WDI), B.P. statistical review and the Central Bank of Nigeria (2020) Statistical Bulletin from 1981 to 2019. The research anticipates that crude oil price, oil revenue and inflation negatively affect the standard of living, while the exchange rate positively impacts the standard of living. Crude oil revenue is measured by crude oil revenue expressed in billions of Naira, CPI counts inflation, and the exchange rate is measured by the official exchange rate (US$/LCU times average). The standard of living variable is counted by GDP per capita (constant LCU), which is the whole country GDP divided by total population of country.

Estimation Procedure

According to Gujarati (2004), Non-stationary time series regression on one or more time series can produce incorrect regression results. Consequently, when working with time series data, it is essential to test the stationarity of the series to avoid false regressions. Another reason to perform a stationarity test is that the results of a non-stationary series can only be used for a certain period and cannot be extended for the future. Consequently, such non-stationary series may have limited practical value for analytical purposes. Therefore, the study employed two conventional unit root tests, which include the Augmented Dickey-Fuller (ADF) unit root test of Dickey & Fuller (1981) and Philip Perron (P.P.) by unit root test of Philips & Perron (1988), respectively.

For example, to illustrate the equations for the unit root test, consider a variable Z that has a unit root represented by the first-order autoregressive AR (1):

1. level equation using constant without trend is given in equation 4;
2. level equation using both constant and linear trends is presented in equation 5;
3. a level equation without constant and linear trend is given in equation 6.

$$Z_t = \delta_0 + \sum_{j=1}^{k} \delta Z_{t-1} + \mu_t \tag{4}$$

$$Z_t = \delta_0 + \delta_1 \theta + \delta_1 Z_{t-1} + \sum_{j=1}^{k} \delta Z_{t-1} + \mu_t \tag{5}$$

$$Z_t = \sum_{j=1}^{k} \delta Z_{t-1} + \mu_t \tag{6}$$

Where $Z_{t-1} = (Z_{t-1} - Y_{t-2})$, $Z_{t-2} = (Z_{t-2} - Z_{t-3})$, $Z_{t-p} = (Z_{t-p} - Z_{t-q})$, and *p* represents the number of recent time and *q* as the number of previous times or years (Bala & Tahir, 2016) and μ_t is the error term. The hypotheses in this test are: $H_0: \delta = 0$, Z_t is non-stationary variable, (unit root exist) and $H_1: \delta \neq 0$, Z_t is stationary variable, (no-unit root).

An optimum lag length determines how long a variable takes to be influenced by the previous Variable and other endogenous variables. Because the linear ARDL approach is mainly to the number of lags employed, if the selected number of lags is too long, the degrees of freedom shall be reduced, hence losing the required information. On the other hand, if the selected lag value is too short, the form generated may be incorrect (model misspecification) and characterized by a high standard error (Gujarati et al., 2009). The vector error correction (VAR) framework uses general parameters to determine the optimal lag length, which includes likelihood ratio (L.R.), FPE, AIC, S.C. and Hannan Quinn (H.Q.) were regarded as the optimal lag length selection criteria (Enders-Walter, 2004). The F-statistic is sensitive to several lags optimum in ARDL. The estimation of F-statistic to choose appropriate lags that are the optimum lag length (Bahmani-Oskooee & Brooks, 2003). Our lag choice is based on the preliminary tests: L.R., FPE, H.Q. and AIC. Considering the statistic properties of the estimated coefficients of the VAR model, a series of diagnostic tests were held to check the reliability of the estimated and to know whether the model performs well on statistical and econometric grounds.

Upon establishing that variables were stationary and the appropriate maximum lag determined, the next step involves performing a cointegration test to determine there is a long-term equilibrium connection among variables using the bounds test. The assumption that the bounds test is based that the series should be either I(0) or I(1), and that is why only the lower and upper bounds critical values was compared with the estimated F-statistic value in the process determining the cointegration relationship (Handson et al., 2016). However, the bounds testing approach to cointegration can be applied irrespective of whether the variables were all I(0), I(1) or a combination of I(0) & I(1). However, the presence of I(2) variables invalided the computed F-statistics provided by Pesaran et al. (2001).

The boundary test has several advantages compare to other conventional cointegration techniques. Engel & Granger's (1987) and Johansen & Juselius's (1988, 1990) tests for cointegration. This test has the advantage that it can be applied and used regardless if the principle variables are all I(0), I(1) or a combination of both. The form of the model certainly requires sufficient delay to carry out the process of generating data in a general way towards a particular model framework. One of the error correction models can come from the ARDL form through a simple linear transformation and then integrating short-term adjustments to long-term equilibrium without loss of long-term information. It shows that the minor sample nature of the ARDL approach is far excellent to the Johansen Juselius cointegration technique (Erbaykal, 2008).

The problem of endogeneity in the form of a model doesn't have a significant impact on the ARDL technique. This situation is supported by the fact that the ARDL technique is free from residual correlation, so this model makes it possible for variables to have a different maximum or optimum lag length, which is entirely impossible with the convection test for cointegration. According to Pesaran & Shin (1999), this statement is also supported by research, which states that a corresponding lag in the ARDL model will correct serial correlation and endogeneity problems. Based on the advantages of the ARDL method, this study developed an infinite error correction method (UECM) to capture the relationship between variables, as shown in equation 7. it can be used to analyze cointegration through a bound F-test for cointegration in related research.

$$\begin{aligned}\Delta \ln STL_t = {} & \alpha_0 + \alpha_1 \ln STL_{t-j} + \alpha_2 \ln COP_{t-j} + \alpha_3 \ln ORV_{t-j} + \alpha_4 \ln INF_{t-j} + \alpha_4 \ln INF_{t-j} \\ & \alpha_5 EXR_{t-j} + \sum_{j=1}^{k} \phi_{1j} \Delta \ln STL_{t-j} + \sum_{j=0}^{p} \phi_{2j} \Delta \ln COP_{t-j} + \sum_{j=0}^{q} \phi_{3j} \Delta \ln ORV_{t-j} + \\ & \sum_{j=0}^{m} \phi_{4j} \Delta \ln INF_{t-j} + \sum_{j=0}^{n} \phi_{5j} \Delta \ln EXR_{t-j} + \varepsilon_{1t}\end{aligned} \tag{7}$$

To test estimate the long run equilibrium connection among the series, the research test the null hypothesis which is $H_0: \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = 0$ for no long run equilibrium nexus as towards the alternative hypothesis $H_1: \alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq \alpha_5 \neq 0$ for the long-term equilibrium link among the variables on the variables in Equation (7).

The situation of the long-term equilibrium link is based on the result of the F-statistics test obtained through the Ordinary Least Squares (OLS) framework of the UECM-ARDL, as given in equation (7). The F-statistics value is then compared with critical bounds, namely lower and upper critical bounds. A long-run equilibrium link exists when the quantified F-statistics is higher than the upper bound critical value. The null hypothesis of no cointegration relationship is rejected. The study accepts the alternative hypothesis, and therefore, cointegration exists. Otherwise, the cointegration relationship does not exist if the quantified F-statistics is less than the lower bound critical value. Moreover, rejecting the null hypothesis for no cointegration becomes impossible. On contrary, the result becomes inconclusive if the estimated F-statistics are within the upper and lower bound critical values (Pesaran et al., 2001).

Following Pesaran et al. (2001), the long-term model given in Equation (3) can be derived and converted into a short-term ARDL model as follows;

$$\ln STL_t = \varphi_0 + \sum_{j=1}^{k} \varphi_{1j} \ln STL_{t-j} + \sum_{j=0}^{p} \varphi_{2j} \ln COP_{t-j} + \sum_{j=0}^{q} \varphi_{3j} \ln ORV_{t-j} + \sum_{j=0}^{m} \varphi_{4j} \ln INF_{t-j} + \sum_{j=0}^{n} \varphi_{5j} \ln EXR_{t-j} + \varepsilon_{2t} \quad (8)$$

From Equation (8) the study deduced the following long-run equation (3) presented above.

$$\ln STL_t = \beta_0 + \beta_1 \ln COP_t + \beta_2 \ln ORV_t + \beta_3 \ln INF_t + \beta_4 \ln EXR_t + \varepsilon_t \quad (9)$$

With $\beta_0 = \frac{\varphi_0}{1-\sum \varphi_{1i}}, \beta_1 = \frac{\varphi_{1i}}{1-\sum \varphi_{1i}}, \beta_2 = \frac{\varphi_{2i}}{1-\sum \varphi_{1i}}, \beta_3 = \frac{\varphi_{3i}}{1-\sum \varphi_{1i}}, \& \beta_4 = \frac{\varphi_{4i}}{1-\sum \varphi_{1i}},.$

Therefore, using the residuals of the long-term model, the study can deduce the cointegration relationship from the following short-run and error correction models given in Equation 10.

$$\Delta \ln STL_t = \varphi_0 + \sum_{j=1}^{k} \varphi_{1j} \Delta \ln STL_{t-j} + \sum_{j=0}^{p} \varphi_{2j} \Delta \ln COP_{t-j} + \sum_{j=0}^{q} \varphi_{3j} \Delta \ln ORV_{t-j} + \sum_{j=0}^{m} \varphi_{4j} \Delta \ln INF_{t-j} + \sum_{j=0}^{n} \varphi_{5j} \Delta \ln EXR_{t-j} + \theta OET_{t-1} + \varepsilon_{3t} \quad (10)$$

where ln is the log sign, ϕ_0 is the intercept parameter, $\phi_{1j}, \phi_{2j}, \phi_{3j}, \phi_{4j}, \phi_{5j}$ represents the short run coefficients to be estimated, Δ stands for the difference operator, θ is the coefficient of error correction term to be estimated, $\sum$ is the summation, STL_t stands for standard of living at time t, COP_t denotes crude oil price at t time, ORV_t is the exchange rate at t time, INF_t represents inflation at time t, EXR_t denotes exchange rate at t time and ε_{3t} is the stochastic variable.

where the error-correction term, ECT_{t-1}, is the residual of the long-run model which is obtained by lagging Equation (3) by one period.

$$ECT_{t-1} = \varepsilon_{t-1} = \ln STL_t - [\beta_0 + \beta_1 \ln COP_{t-1} + \beta_2 \ln ORV_{t-1} + \beta_3 \ln INF_{t-1} + \beta_4 \ln EXR_{t-1} \quad (11)$$

The parameter θ is the error correction coefficient indicating the rapid convergence back to equilibrium in the case of short-run dynamic disequilibrium. The estimated model exhibits long-term equilibrium relationships between $lnSTL_t$ and its determinants; $lnCOP_t$, $lnORV_t$, $lnINF_t$, and $lnEXR_t$. For the convergence speed to hold and confirm the existence of cointegration among the variables, the estimated coefficient must be negative, less than one in magnitude and statistically significant. Therefore, the ECT_{t-1} would imply cointegration when all these are satisfied.

The ARDL model needs to be evaluated based on statistical properties so that several stages of Testing and Testing are carried out to check whether the model has adequately worked according to statistical guidelines. The correlation of the serial problem was checked Bruesch-Godfrey serial correlation L.M. test propounded by Bruesch (1978). The heteroscedasticity problem was checked using autoregressive conditional heteroscedasticity (ARCH) or Bruesch & Pagan's (1979) test for heteroscedasticity. To check whether the errors in the model were correctly specified or miss-specified, a miss-specification error test in the form of the

Ramsey RESET test propounded by Ramsey (1969) was conducted. The Jarque-Bera normality test determines whether errors were normally distributed within the research period. Stability test for the model CUSUM and CUSUM of squares, as proposed by Brown et al. (1975) and Pesaran (1999) equally conducted.

Discussion

This section begins with a statistics summary and steps for conducting a correlation analysis of the variables in the study. These statistics revealed essential features of the variables used in the study in a meaningful way. From Table 1 standard of living, crude oil price, crude oil revenue, inflation and exchange rate have an average of N266735.9 per capita income, \$41.9316 per barrel, N2.43 billion, 61.4381 as consumer price index and N94.1434 per U.S. dollar between 1981 to 2019. The standard deviation for standard of living, crude oil revenue, inflation and exchange rate indicates that data deviates with a more significant margin from the meanwhile crude oil price, implying lower variation from the mean and the processed data. There are no missing value events in the observation. The correlation analysis revealed that at the bottom of Table 1 shows, it could be observed that all variables have a positive correlation and the most crucial correlation coefficients were within the benchmark of 0.5-0.8 in absolute terms, and this indicates the absence of multicollinearity problems among the variables (Prodan, 2013).

Table 1: Summary Statistics and Correlation Analysis

	STL	**COP**	**ORV**	**INF**	**EXR**
Summary statistics					
Mean	266735.9	41.9316	2.43E+12	61.4381	94.1434
Std. Dev.	66964.77	29.5817	2.72E+12	73.0000	92.8218
Observations	39	39	39	39	39
Correlation Analysis					
lnSTL	**1.**	**-0.7027**	**-0.7479**	**-0.7566**	**0.6854**
lnCOP	**-0.7027**	**1.**	**0.6961**	**0.6470**	**0.5611**
lnORV	-0.7479	**0.6961**	**1.**	**0.7770**	**0.6721**
lnCPI	**-0.7566**	**0.6470**	**0.7770**	**1.**	**0.7707**
lnEXR	**0.6854**	**0.5611**	**0.6721**	**0.7707**	**1.**

Source. Authors' Computation using Eviews-9.

The study made use of time series data from 1981 until 2019. Data illustrates the issue of false regression (Gujarati, 2004). Several tests were performed and described in this part to check the time series characteristics of the data. Non-stationarity of time arrangement knowledge is a persistent concern in precise inquiry. The inquiry used the Augmented Dickey-Fuller test (ADF) and Phillip-Perron test for stationarity to prevent evaluating and receiving erroneous results (P.P.). It entails calculating the unit root test equations 1.4, 1.5, and 1.6 in Section 3 of this study. Table 2 demonstrates all variables, including standard of life, crude oil price, crude oil revenue, inflation, and exchange rate, were stationary only at the first difference I(1), with most of the series significant at the 1% level. All variables of order one or more were integrated, as often stated as I (1). It has guided the use of ARDL as the estimate approach for this investigation since it can be used for all I(0), I(1), or a combination.

Table 2: Unit Root Test Results

	Level				1st Difference			
	ADF-test		PP-test		ADF-test		PP-test	
Series	Intercept	Trend	Intercept	Trend	Intercept	Trend	Intercept	Trend
lnSTL	-0.9450 (0.7620)	-1.5128 (0.8065)	-0.3114 (0.9138)	-3.1767 (0.1043)	-3.8744^{***} (0.0052)	-3.7771^{**} (0.0293)	-3.8744^{***} (0.0052)	-3.7771^{**} (0.0293)
lnCOP	-1.0635 (0.7201)	-2.3333 (0.4068)	-1.0635 (0.7201)	-2.3333 (0.4068)	-5.9438^{***} (0.0000)	-5.9162^{***} (0.0001)	-5.9439^{***} (0.0000)	-5.9136^{***} (0.0001)
lnORV	-1.4417 (0.5517)	-0.8250 (0.9541)	-1.5218 (0.5119)	-0.7820 (0.9585)	-6.1724^{***} (0.0000)	-5.3718^{***} (0.0005)	-6.1724^{***} (0.0000)	-6.9571^{***} (0.0000)
lnINF	-1.4761 (0.5321)	-0.8224 (0.9539)	-1.6583 (0.4438)	-0.7789 (0.9588)	-3.5656^{***} (0.0117)	-3.9249^{**} (0.0211)	-2.8256^{*} (0.0644)	-2.9107 (0.1709)
lnEXR	-2.0909 (0.2493)	-1.2525 (0.8845)	-2.2394 (0.1964)	-1.2516 (0.8847)	-5.2050^{***} (0.0001)	-5.6089^{***} (0.0003)	-5.2050^{***} (0.0001)	-5.8080^{***} (0.0001)

Note: ***, ** & * imply 1%, 5% & 10% level of significance.

This section dealt with the optimum lag selection result using the estimated VAR model presented in section three of this study. The optimum lag selection results for this research are informed in Table 3. From table 3, the result shows that the optimum lag length is four (4) since the majority of the criteria, such as L.R., AIC, and H.Q., indicate fourth lag to be the optimum lag length for model estimation in objective one of this study as marked by the asterisk. Therefore, the maximum lag for the ARDL method estimation is lag four (4).

Table 3: Optimum Lag Selection Results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-64.0956	NA	3.57e-05	3.9483	4.1705	4.0250
1	159.3124	370.219	4.32e-10	-7.3892	-6.0561^{*}	-6.9290
2	197.2864	52.0785	$2.26e\text{-}10^{*}$	-8.1306	-5.6865	-7.2869
3	212.5253	16.5450	5.10e-10	-7.5728	-4.0177	-6.3456
4	260.9241	38.7190^{*}	2.36e-10	-8.9099^{*}	-4.2439	-7.2992^{*}

Note: * implies lags selected by different criteria.

Determine whether optimum lag length was not related to autocorrelation and heteroscedasticity tests. The optimum lag length in the VAR model is essential to ensure dynamic stability and is suitable for testing estimates on the model. Thus, the VAR serial correlation L.M. test, heteroskedasticity test, normality test and roots of the characteristic polynomial for stability were examined and presented in Table 4 and Figure 2, respectively. Table 4 indicates how the results of the autocorrelation test explain that in the model. There is no autocorrelation problem. It is free from heteroscedasticity because it has a p-value or probability of more than 0.05, except for the normality test. In addition, Figure 2 shows the characteristic root of the polynomial. In the figure, it is explained that there are no roots that have a location outside the unit cycle (modulus). This condition illustrates that the VAR model has fulfilled stability and optimum lag selection stably and dynamically according to the estimated model.

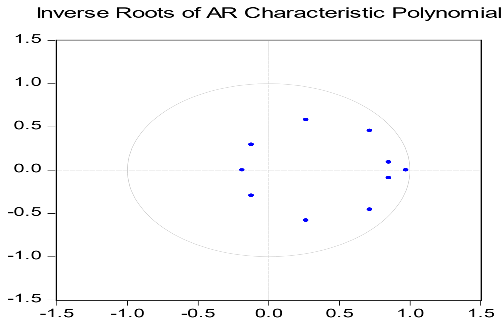

Figure 3: Optimum Lag Stability Test

Table 4: Optimum Lag Selection Diagnostic Test Results

Tests	Coefficients	P-values
Serial Correlation LM Tests	19.7733	0.7586
Heteroskedasticity Tests	333.5164	0.0889*
Normality Tests	25.37208	0.0047***

Note: *** & * implies 1% & 10% level of significance.

Demonstrated a limit test to prove relationship each Variable used in research for the long term. The critical limit value in this test is found in the study of Pesaran et al. (2001). This study reveals the limit testing of the ARDL method to find out the cointegration of the variables shown by equation 7, attached in table 5. There are five of these variables towards the long term. The data processing results show the calculated f-statistics value of 8.5075, which means that the value is already above the lower critical value of 3.74 and the upper critical value of 5.06 with a significance of 1% with a strong cointegration connection with each Variable.

Table 5: Bounds Test Result For Cointegration

Bounds test: Unrestricted intercept with trend		
Estimated model equation		
Optimum lag structure	(1, 0, 2, 2, 0)	
F-statistics	8.5075***	
Significant level	Critical value bounds (N=37)	
	Lower Bounds I(0)	Upper Bounds I(1)
1%	3.74	5.06
5%	2.86	4.01
10%	2.45	3.52

Note: *F*-statistics is greater than the upper bonds at 1% significant level, indicating cointegration among series.

This study has a strong cointegration for the time series according to the period, so to calculate the coefficients in the long-term ARDL method, the results are reported in table 6. The result is that the coefficient values of the equation are 1.8 and 1.9, and the optimal lag is obtained, namely lag (4) selected according to most characteristics to minimize loss of degrees of freedom.

At 1%, the crude oil price coefficient significantly negatively influences living standards. In the long term, a 10% rise in crude oil prices is related a 0.382 per cent fall in the quality of living. The conclusion is backed by Renaissance growth theory, which holds that crude oil price variations negatively influence economic growth. Crude oil is a production function input. Therefore, an increase in its price leads to increased production costs, low productivity, and, as a result, low revenue. On-demand side, an increase in crude oil prices leads to decreased consumption due to its positive relationship with spending power. The combined impact of the demand and supply sides suggests that rising crude oil prices result in decreased living standards. The study findings are consistent with those of Olukayode et al. (2018), which a negative correlation among crude price volatility and living standards, and Kamasa et al. (2020), who discovered a significant negative connection between crude price volatility and economic welfare in Ghana. However, the results contradict those of Nwaoha et al. (2018), discovered a strong positive connection between crude oil price and standard of living, and Manasseh et al. (2019), who crude oil price fluctuations no statistically significant effect on residents' well-being in Nigeria.

Further, crude oil revenue also negatively and significantly impacts living standards at a 1% level. Remarkably, a 10% increase in crude oil revenue is associated with a 1.843% decrease in living standards in the long run. This finding indicates that there is no equitable distribution of generated crude oil revenue among the masses in the country and the effect of corruption in the oil and gas sector of the economy. The result contradicts the finding of Manasseh et al. (2019), who reported that generated oil revenue has a significant positive impact on the well-being of Nigerians. In like manner, the result supported the finding of Bakare & Fawehinmi (2010), the negative impact of oil revenue on Nigerians' living standards.

Furthermore, the negative inflation coefficient significantly impacts the standard of living at a 1% level in the long run. It means that an upward change in inflation by 10% is associated with a 3.540% decrease in the standard of living ceteris paribus, which implies that an upward change in inflation has a negative impact on the living standard in Nigeria. The finding in this research is consistent with the theoretical fact that inflation is related with washing away the purchasing power of money (Naira in our case). It was making a large amount of money to command a small number of goods and services, which led to a higher cost of living and consequently worsened the living standard in Nigeria. However, the result differs from the result of Manasseh et al. (2019), who declared that inflation does not significantly affect well-being.

The empirical finding of Manasseh et al. (2019) positive relationship between exchange rate and well-being is consistent with the current finding. Moreover, the estimated coefficient of the exchange rate significantly impacts the standard of living at a 5% level in the long run. Specifically, an appreciation in exchange rate by 10% is correlated with a 0.747% decrease in the standard of living in Nigeria. The positive connection between the exchange rate and the standard of living supported the theoretical postulation that when the Naira exchange rate strengthens, it makes imports cheaper. Nigerians spend little money on foreign goods. Nigerians have been putting pressure on foreign companies to keep prices low so that they can remain competitive. This situation leads to lower prices, ultimately more money in Nigerian's pockets, and a higher living standard.

Short-run and error correction results were obtained through quantifying equation 1.10 presented in section three of this study, the results were reported in Table 6. The coefficient of crude oil price exerts a significant negative impact at 5% on the standard of living in the short run. Precisely, an increase in crude oil price by 10% is connected with a 0.218% decrease in the standard of living. By indication, the power of crude oil prices to reduce the standard of living is more significant in the long run than in the short run. This result is in suitability with the findings of Ademola et al. (2015) for the negative connection between crude oil prices and living standards in Nigeria (Manasseh et al., 2019). They found a significant negative relationship between crude oil prices and well-being in Nigeria. On the other hand, the finding of Alley et al. (2014), who reported that crude oil price positive impacts the standard of living in the short run, contradicts the current result.

Further, the coefficient of crude oil revenue is negative and significantly associated with a 5% level in influencing living standards. The short-run result is intuitive with the long-run result, indicating that crude oil revenue decreases living standards in both periods. However, the power of the crude oil revenue to decrease the standard of living is more prominent in the long term than in the short term. Because during the short-run, an increase in crude oil revenue by 10% decreases the standard of living by 0.531%. Likewise, its lag-one has a negative and significant impact on the standard of living. This finding contradicts the result of Manasseh (2019), who reports a positive relationship between oil revenue and welfare in Nigeria.

Furthermore, the coefficient of inflation significantly negatively impacts the standard of living at 1%. The negative impact of inflation in decreasing the standard of living is more stringent in the long term than in the short term. It is because, in the short-run, a 2.049% decrease in living standards is due to a 10% increase in inflation. Similarly, the inflation lag-one is also negative and statistically at a 1% level, impacting living standards.

According to the findings of Manasseh et al. (2019), inflation exerts an insignificant positive impact on well-being in Nigeria, which is contrary to the current results of this study. Moreover, the exchange rate coefficient is positive and statistically significant at the 5% level, implying that appreciation or depreciation in the exchange rate contributed to either a positive or negative standard of living in the short run. Therefore, an appreciation in the Naira exchange rate by 10% is associated with a 0.427% increase in living standards. The finding supports the result of Manasseh (2019), who reports that the exchange rate utilizes a significant positive impact on well-being in Nigeria.

In addition, the ECT is found to satisfy all the three necessary conditions mentioned in section three. It can provide additional evidence to support each Variable's relationship in the long-term model. In absolute terms, the ECT coefficient -0.5715 indicates the rapid convergence toward the long-run equilibrium at 57% yearly.

Table 6: Long-run and Short-run Results

Variables	Coefficient	t-Statistic	P-values
Long-run coefficients			
$lnCOP_t$	-0.0382***	-3.3297	0.0021
$lnORV_t$	-0.1843***	-3.4002	0.0022
$lnINF_t$	-0.3540***	-5.3995	0.0000
$lnEXR_t$	0.0747**	2.2568	0.0307
Constant	7.7777***	6.9171	0.0000
@TREND	0.0584***	6.9976	0.0000
Short-run coefficients			
ΔlnCOP	-0.0218**	-2.2599	0.0151
ΔlnORV	-0.0531**	-2.2395	0.0273
ΔlnORV (-1)	-0.0343**	-2.2166	0.0356
ΔlnINF	-0.2049***	-3.3691	0.0024
ΔlnINF (-1)	-0.1544***	-2.8950	0.0076
ΔlnEXR	0.0427**	2.4447	0.0461
Δ@TREND	0.0333***	4.4701	0.0001
ECT (-1)	-0.5715***	-5.0599	0.0000

Note: *** & ** imply 1% & 5% level of significance.

As mentioned before in chapter three, DOLS, FMOLS, and CCR estimators were applied to tend as robustness checked to ARDL long-term result. The estimated long-run coefficients from these estimators are present in Table 7. The DOLS, FMOLS and CCR estimated coefficients corroborate the long-run ARDL results presented in table 6, as all coefficients were statistically significant. In addition, the signs of the coefficients are consistent with the ARDL long-run results since changes in any of the crude oil price, crude oil revenue and inflation are associated with a decrease in standard of living shown by DOLS, FMOLS and CCR, respectively. In comparison, appreciation in the exchange rate is correlated with an increase in the living standard from all three estimators.

Table 7: Robustness Checks Results

Dependent Variable: lnSTL						
Variables	DOLS		FMOLS		CCR	
	Coefficients	t-Statistic	Coefficients	t-Statistic	Coefficients	t-Statistic
lnCOP	-0.4673***	-12.0249	-0.3899***	-9.9436	-0.3923***	-9.9196
lnORV	-0.2345***	-4.3482	-0.1920***	-4.8522	-0.1927***	-4.4387
lnINF	-0.0802**	-2.5884	-0.0776**	-2.2611	-0.0798**	-2.2806
lnEXR	0.2275***	4.0393	0.1721***	3.9609	0.1689***	3.7898
Constant	16.0411***	13.4420	15.4446***	18.4573	15.4608***	16.6499
R^2	0.9866		0.9232		0.9231	
Adjusted R^2	0.9675		0.9139		0.9138	

Note: ***, ** & * imply 1%, 5% & 10% level of significance.

The OLS approach was prepared to estimated the model. Certain assumptions must be met for this approach to provide impartial, efficient, and consistent estimations. As a result, before the projected outcomes could be used to fulfil the study objectives, diagnostic or reliability tests were performed to determine the statistical sufficient of the models. Table 8 summarizes the ARDL diagnostic results.

Heteroscedasticity occurs when the variance of a model's residuals is inconsistent. The Breusch-Pagan-Godfrey test is used to assess the existence of heteroscedasticity. Table 8 displays the outcome. Table 8 clearly shows no collinearity issue since the p-values of the F-statistics and the observed R-squared were more significant than 0.05, indicating that the investigation did not reject the null hypothesis of no serial correlation problem. There was no heteroscedasticity in the model. P-values were more than 5%, and the null hypothesis of variance homogeneity was accepted. The underlying principle of a decent regression analysis is that the model's error term is usually spread. The probability of Jarque-Bera should be greater than 0.05 to confirm the normalcy test. Table 8 shows the normality result for the standard living model. The Jarque-Bera statistics are determined to be 1.6149 with a probability value of 0.4459 (44.59 per cent), which was more significant than the p-value of 0.05. (5 per cent). The result, the null hypothesis, wasn't rejected, indicating that the residuals within the model is equally distributed. Ramsey RESET test results indicated that the estimated F-statistic value was 0.0719 with a probability of 0.7908 (79.08 per cent), showing that the null hypothesis of no specification error wasn't rejected and that errors in the models are not misspecified. The Autoregressive distributed lag model's linear equation was appropriately stated and adequate for evaluation.

Table 8. ARDL Diagnostic Checks Results

Tests	F-statistic	Obs*R-squared
R-Squared	0.9911	
Adjusted R-squared	0.9876	
F-statistics	289.7789***	
Durbin-Watson stat	1.7711	
Serial Correlation LM Test	0.1212 [0.8864]	0.37001 [0.8311]
Heteroskedasticity Test	1.6112 [0.1545]	16.5083 [0.1690]
Normality Test	1.6149 [0.4459]	Not Applicable
Ramsey RESET Test	0.0719 [0.7908]	Not Applicable

Note: Numbers in [.] are the p-values.

Having to pass all diagnostic tests only sometimes implies that the model is relatively robust (Maji, 2015). The models were assessed with stability checks using Brown et al. (1975) CUSUM residuals and CUSUMSQ stability checks, and the results of the checks are shown in Figure 4 to correct the robustness of the research findings.

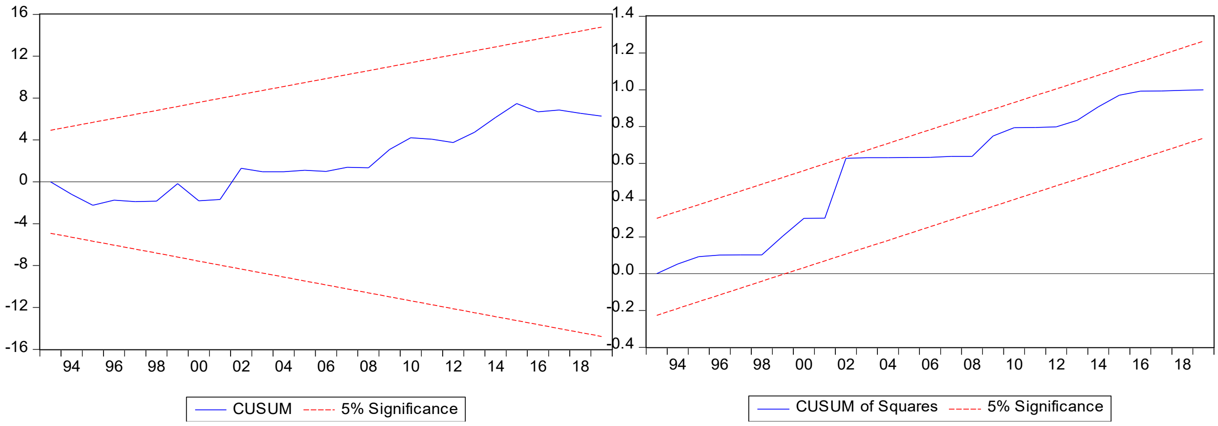

Figure 3: CUSUM and CUSUMSQ stability test plots

From Figure 3, the statistics plots fall within the critical bounds at the 5 per cent under both CUSUM and CUSUMSQ, respectively, implying strong stability in the estimated model.

Conclusion and Policy Recommendation

This study finds that this research will help policymakers to gain information and insight into making decisions to improve living standards. In achieving its objectives, this study uses annual time series data from 1981 until 2019 from the WDI (2020) and Central Banks of Nigeria Statistical Bulletin for 2020. ARDL method revealed a cointegration connection between the variables. The estimated long and short-term model results indicate that crude oil prices negatively influenced living standards. The robustness checks result from DOLS, FMOLS and CCR estimators supported the ARDL long-run results. Diagnostic tests performed on model estimates for serial correlation, heteroscedasticity, normality, misspecification, and stability revealed no properly defined and stable guidelines for serial correlation, heteroscedasticity, and normally distributed error. The ECT coefficient indicates the speed of convergence at 57% every year.

The report recommends that lawmakers pursue measures that affect Nigeria's standard of life while considering crude oil price fluctuations. Because Nigeria exports crude oil but imports refined gasoline products, which is more costly and an immediate connection with international crude oil prices. The study suggests avoiding crude oil import costs as part of risk management to lower the volatility related with crude oil price changes. In addition, the study recommends the development less costly alternative energies that are also sustainable to lessen Nigeria's economy's sensitivity to crude oil price volatility and enhance living standards.

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