Changes in Crude Oil Prices and the Flow of Government Revenue

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Authors’ contributions

This work was carried out in collaboration among all authors. Authors CS and ATC designed the study, wrote the protocol and the first draft of the manuscript. Author AKI performed the statistical analysis and managed the analyses of the study. Authors CS and ATC managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

This work is set out as an investigation into the impact of change in oil prices on government revenue broken into oil and non-oil component. Drawing data from the Central Bank Statistical Bulletin and covering the period 1981 to 2018. The Autoregressive Distributed Lag (ARDL) Model was used because of its advantages over other regression techniques. It was found that changes in oil price affected oil revenue within the studied period leaving no significant impact on non-oil revenue. The result obviously reflects the Nigerian economy and its mono-product characteristic. It is therefore recommended that a conscious policy effort should be made to diversify the economy in a manner that makes revenue to the government multifarious functions.

Keywords: Oil Price; government revenue; mono-economy; ARDL; regression; Nigeria.
1. INTRODUCTION

1.1 Background of the Study

Crude oil as one of the energy sources since its discovery in the 1800’s has been vitally important to the economy of the world [1]. Since the discovery of crude oil with its stipulated price value, it has been shaping economic development and total revenue generation by the Nigerian government. Agricultural sector was the mainstay of economy, minding that is only crude oil price movement that generate fund to the economy of Nigeria, contributing about 95% to her foreign exchange earnings, generating over 60% of her employment capacity and approximately 56% to her gross domestic earnings [2].

Meanwhile, with the discovery of oil at Oloibiri area of Bayelsa State in 1956 by Shell BP, oil has remained a major source of energy and income in Nigeria. Although Nigeria’s oil industry was founded at the beginning of the century, it was not until the end of the Nigerian civil war (1967-1970) that the oil industry began to play a prominent role in the economic life of the country early before now. As a result of the aforementioned, the country arose interest of other resources like crops including cocoa, palm products, cotton, ground nut, timber and rubber, with these products contributing most of Nigeria’s export.

Since the oil price plays significant role in generating revenue for the government which stimulates all kinds of economic activities in the economy and generates revenue as well. Then the falling crude oil price in the world market and its consequent decline in oil revenue may impose fiscal constraint on government expansionary policy which may have negative impact on revenue generation in the country. Global oil markets have witnessed intense price change in the recent years. The changes of oil prices in the global markets attracted government attention to the relationship between government revenue and changes in oil price, precisely, the form that it takes, and the extent to which it affects economic performance needed to be controlled by the government [3].

1.2 Statement of the Problem

In view of the fact that since the discovery of oil, the petroleum industry has played significant role towards the development of the Nigerian economy, the impacts are both positive and negative respectively. Various scholars have advocated for the development of other sectors owing to their belief in the negative falconets of the oil industry [4,5,6]. While others argued that the sector should be promoted and developed for its benefits [7,8,9].

Over dependence on oil revenue tends to distort and discourage sourcing of funds from other source by the government. For example, as a result of huge oil revenue flows; countries tend to de-emphasize income taxes as a source of government revenue. Besides, low tax ratios and high consumption expenditures (typically on imported goods) reinforce inflationary tendencies with regard to expenditure; government pay less or no attention to infrastructural development, encouragement of private sector investment, mechanizing the agricultural and manufacturing sector of the economy because of reliance on oil revenue.

At this junction, the study intends to examine the relationship between changes in crude oil prices and the flow of government revenue in Nigeria context.

1.3 Objectives of the Study

The broad objective of the study was to examine the relationship between changes in crude oil prices and the flow of government revenue. Other specific objectives include to:

1. Determine the relationship between changes in crude oil prices on non-oil revenue in the Nigerian economy.
2. Examine causal relationship between changes in crude oil prices on oil revenue in the Nigerian economy.

1.4 Statement of Hypotheses

H₀₁ Changes in crude oil prices have no impact on non-oil revenue in the Nigerian economy.
H₀₂ Changes in crude oil prices impacts oil revenue in the Nigerian economy.

1.5 Scope of the Study

The scope of this work is captured under three headings namely geography, time and method.

Geography: The research focuses on the Nigerian economy. Proxies of the variables under study will be drawn from the Nigerian economic environment.
Time: The years 1981 to 2018 represent a 38 year period which will be used as the sample period. 1981 is chosen as the base year because it represents the period immediately following the oil boom with its attendant drives and programmes for economic growth in Nigeria. The choice of 2018 as the upper limit is to ensure that the data to be used are current.

2. METHODOLOGY

By way of method, this study shall be empirical. It shall adopt the analytical and descriptive form. In terms of design, the ex-post facto design shall be adopted as it is focused on already completed events.

2.1 Significance of Study

This study is an eye opener to many people including:

2.1.1 Policy makers and economic watchers

This work is designed to create timely and necessary consciousness on the part of the managers of the economy. As the issue of oil price and the revenue profile of the government has remained topical.

2.1.2 Researchers and the academia

Scholars and researchers alike will understand more the interface between oil prices and the revenue base of the Nigerian government. It will thus, provide enrichment to the existing body of literature in this area of interest.

3. REVIEW OF RELATED LITERATURE

3.1 Conceptual Framework

Concept of crude oil price: Crude oil prices measure the spot price of various barrels of oil quoted in the global oil market. These oil barrels include West Texas Intermediate (WTI), Brent Blend, OPEC basket price and the New York Mercantile Exchange (NYMEX) futures price among others [10]. The Nigerian crude belongs to the OPEC Basket Price category which is the mean value of prices obtained from Nigeria and other countries like Algeria, Indonesia, Saudi Arabia, Dubai, Venezuela and Mexico. Due to the lower quality of oil from these countries, it commands lower price than both WTI and Brent Blend.

Government revenue: The term revenue has been defined by various authors in different ways. Adam [11] Revenue as the fund required by the government to finance its activities. These funds are generated from different sources such as taxes, borrowing, fine, fees etc. It is also defined as the total amount of income that accrues to an organization (public or private) within a specified period of time [12].

Correspondingly, [13] defined government revenue as all the money received other than from issue of and debt, liquidation of investments. Government revenue includes tax collections, charges and miscellaneous revenues, utility and insurance trust revenue for all funds and agencies of a government. From the above definitions, it can be said that revenue is the total amount of income accruing to a state from various sources within a specified period of time. State government, like the other two tiers of government, has sources and uses of revenue. Osisami [14] states that there are basically two types of revenue that accrues to state governments. These are internally generally generated revenue and revenue allocated from the Federation Account.

Brief history of oil in Nigeria: The search for oil began in 1908 by a German company named Nigeria Bitumen Corporation, but there was no success until 1955 when oil was discovered in Oloibiri in Niger delata by Shell-BP [15]. Nigeria started exporting crude oil in 1958 but in major quantity in 1965, after the establishment of the bonny island on the coast of Atlantic and the pipeline to link the terminal. In 1970, as the Biafra war ends, there was a rise in world oil price and Nigeria benefited immensely from this rise. Nigeria became a member of the organization of petroleum exporting countries (OPEC) in 1971 and the Nigerian National Petroleum company (NNPC) which is a government owned and controlled company was founded in 1977. By the late sixties and early seventies, Nigeria had attained a production level of over 2 million barrels of crude oil a day. Although there was a drop in production of crude oil in the eighties due to economic down turn, by 2004 Nigeria bounced back producing 2.5 million barrels per day, but the Niger delta crisis and the global economy financial crises reduced Nigeria oil production and the world oil price [9].

The discovery of oil brought in the eastern and mid-eastern regions of Nigeria hope of a brighter future in terms of economic development as
Nigeria became independent, but there were also grave consequences for the economy; as it fuelled already existing ethnic and political tension. The tension reached its peak with the civil war and reflected the impact and fate of the oil industry. Nigeria survived the war and was able to recover mainly from the huge revenue gained from oil in the 1970s [9]. Nigeria gained wholesomely from the nearly 36 months oil boom, the boom generates a lot of fund needed to meet all development need but the oil revenue which was supposed to be a blessing became a curse due to the corruption and the mismanagement of windfall gain from oil [16]. The enormous impact of the oil shock on Nigeria grabbed the attention of scholars who tried to analyze the effect of oil price on economic growth in Nigeria. A set of radical oriented writers, [17,18] were interested in the nationalization that took place during the oil shock as well as the linkages between oil and an active foreign policy. Regarding the latter, the emphasis was on OPEC, Nigeria’s strategic alliance formation within Africa, the vigorous efforts to establish the Economic Community of West African States (ECOWAS), and the country’s attempts to use oil as a political weapon, especially in the liberation of South Africa from apartheid. Many people had hoped that Nigeria will become an industrial nation and a prosperous nation from the benefits of oil but they were greatly disappointed when a major financial crisis hit, which led to the restructuring of the economy [9].

3.2 Review of Literature: Related Theories

Classical theory of economic growth: The traditional classical and neoclassical growth models developed by Solow [19] and Mincer [20] in the late 1950’s, showed that the output of an economy grows in response to larger inputs of capital and labour (all physical inputs). Non-economic variables such as human capital or human health variables have no function in these models. This theory revealed how capitals including technology leads to increase in productivity and efficiency of workers and expand production of goods and services.

Resource endowment theory of growth: The major advocates of this theory was Adam Smith “absolute cost advantage” [21]; David Ricardo “Comparative cost advantage” [22] among others, they argues that countries should specialize to produce and export according to their comparative advantage. The theory of comparative advantage suggests a country gains the greatest economic benefit relative to other countries by producing at lower overall cost, commodities which a country has in abundance or can be easily produced. Other countries will therefore benefit from trade only if they accept the cost advantage of the trading country and focus on producing a commodity in which they have an advantage [5]. It is this theory that guides resource endowment economist’s belief in free trade, specialization and the international division of labour.

Review of Literature: Empirical Research

The study of Bartolomeo et al. [23] used the Dynamic Stochastic General Equilibrium (DSGE) model to investigate the persistent effects of world oil price and monetary policy shocks (money supply-interest rate induced) on economic growth in Ghana. The results of the study reveal that fluctuation in oil price has both negative and positive output shock on Ghanaian economy.

Considering the previous studies [24] utilized quarterly data from 2000 to 2014 to investigate the impact of crude oil shocks on exchange rate, external reserves, gross domestic product, inflation rate, international trade and money supply in Nigeria using GARCH and VAR models. The results of the study showed that oil price shocks did not pose a significant inflationary threat to the Nigerian economy in the short run; rather, it improves the level of gross domestic product.

Yusuf [25] examined the impact of oil price shocks on the growth of the Nigeria economy from 1970-2011 using Structural Vector Auto Regression (SVAR). The findings of the study show that the response of oil price shocks on economic growth depicts both positive and negative impact suggesting that a long-run impact on economic growth.

Using data from Nigeria, [26] examined the impact of oil price volatility and the consequences on the growth of the Nigeria economy spanning from 1970 to 2010. The utilized Vector Autoregressive model (VAR) and found that oil price changes determine government expenditure level, which in turn determine the growth of the Nigeria economy. The study concluded that fluctuation in oil price has made the Nigerian economy to be highly vulnerable thereby making it difficult for the
government to achieve its expected growth target.

In another study for Nigeria, [27] examined the impact of oil price shocks on economic growth between 1981 and 2012. The study utilized the General Method of Moment (GMM) estimation technique and found that oil price shock insignificantly affects economic growth while oil price itself significantly improves growth. The study concluded that the positive significant effect of oil price on economic growth affirms the conventional perception that oil price increase is beneficial to oil exporting and producing country like Nigeria.

The study of Odularu [9] empirically examined the relationship between the crude oil sector and the Nigerian economic performance. Using the Ordinary Least Square (OLS) regression method the study revealed that crude oil consumption and export contributed to the improvement of the Nigerian economy. The study recommends that government should implement policies that would encourage the private sector to participate actively in the crude oil sector.

Akinlo [28] assessed the importance of oil in the development of the Nigerian economy in a multivariate VAR model over the period 1960-2009. He modeled the oil sector against other four sectors i.e. manufacturing, agriculture, trade & service and building and construction. Empirical evidence shows that the five subsectors are cointegrated and that the oil can cause other non-oil sectors to grow. However, oil had adverse effect on the manufacturing sector. Granger causality test finds bidirectional causality between oil and manufacturing, oil and building & construction, manufacturing and building and construction, manufacturing and trade and services, and agriculture and building and construction. It also confirms unidirectional causality from manufacturing to agriculture and trade and services to oil. No causality was found between agriculture and oil, likewise between trade and services and building & construction.

On the other hand, Ibeh [4] investigated the impact of the oil industry on the economic growth performance of Nigeria. Using Ordinary Least Square (OLS) regression technique. She regressed Gross Domestic Product (GDP), against oil Revenue (OREV) and time appeared as repressors. A two tailed test of 5% significant levels were conducted indicating that the two explanatory variables did not have any significant impact on growth performance of the Nigerian economy within the same period. Previous findings contradict the findings of Odularu [9] and Ibeh [4] which revealed that there is a positive relationship between oil sector and Nigeria economic performance.

Sayed [29] in his seminal paper found that given the fact that energy accounts for up to 50 per cent of the production cost of many commodities; drop in oil prices will definitely reduce the cost of production of many other commodities. For agricultural commodities like corn, that is most directly affected by lower oil prices, lower energy costs reduce the cost of production, increase the margins and encourage more planting [30]. Also, the decline in oil prices affected the prices some commodities, for example, the prices of fertilizers declined by around 8.5 per cent; prices of precious metals declined by around per cent; food prices declined by around 4.8 per cent; metal prices declined by around 2 per cent and raw materials prices declined by around 1 per cent.

4. STUDY-CASE, THE PRACTICAL EXPOSURE OF THE ISSUE

This study follows the ex post facto research design. The data used are quantitative and are of secondary nature because they are drawn from existing sources. The modified model follows the study by Odularu [9] and Ibeh [4]:

\[
\text{GOV.REV} = f(\text{CROP})
\]

Where GOV. REV is government revenue and CROP is crude oil price. In this study, government revenue is disaggregated into oil and nonoil giving rise to two models presented thus:

\[
\text{OILREV} = f(\text{CROP})
\]
\[
\text{NONOILREV} = f(\text{CROP})
\]

The study uses the ARDL form of regression due to the fact that it is efficient in the face of small samples; it tolerates series with mixed order of integration and as a dynamic model t addresses some diagnostic challenges that are common with other regression estimation techniques. Our estimation process follows thus:

- Descriptive statistical analyses
- Test for linear association
- Test for the stationarity properties of the series
- ARDL estimation
Discussion of results and drawing of inferences.

Following Pesaran [31] as cited in Arize [32] the formal augmented-ARDL model is defined as

\[ \phi(L)p_y_t = \sum_{i=1}^{k} \beta_i(L)p x_{it} + \delta w_t + \mu_t \]

Where \( L \) is a lag operator such that \( L_y_t = y_{t-1} \), and \( w_t \) is an \( s \times 1 \) vector of deterministic variables such as the intercept term, dummy variables, time trends or exogenous I(1) variables with fixed lags. In this study our exogenous variable is the change in oil price and its lagged values while the endogenous variable is government revenue broken down into oil and nonoil revenue. The final form of the equation with the variables is:

\[ \Delta CROP = \vartheta_0 + \beta CROP_{t-1} + \lambda_k \sum_{k=1}^{k} \Delta SR + \sigma \sum_{k=1}^{k} LR_{k,t-1} + \mu_t \]

Where \( \Delta \) denotes first difference of variable, \( \mu_t \) is the error or disturbance term, \( CROP \) is the dependent variable, while \( SR \) is the short-run dynamics of explanatory variables \( NOREV \) and \( OREV \). \( LR \) is the long-run dynamics of the explanatory variables \( NOREV \) and \( OREV \). \( \beta, \lambda, \sigma \) are the parameters to be estimated; \( \vartheta_0 \) is the constant parameter.

5. DATA AND RESULTS

Table 1 presents the variables under study as drawn from the Central Bank Statistical Bulletin.

<table>
<thead>
<tr>
<th>Year</th>
<th>CROP</th>
<th>GDP</th>
<th>NOREV</th>
<th>OREV</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>64.6</td>
<td>71713.9</td>
<td>2628.8</td>
<td>8026.0</td>
</tr>
<tr>
<td>1982</td>
<td>57.6</td>
<td>22270.0</td>
<td>785.1</td>
<td>4762.4</td>
</tr>
<tr>
<td>1983</td>
<td>63.3</td>
<td>62980.4</td>
<td>2237.9</td>
<td>8879.0</td>
</tr>
<tr>
<td>1984</td>
<td>21.6</td>
<td>3779.1</td>
<td>114.8</td>
<td>408.8</td>
</tr>
<tr>
<td>1985</td>
<td>57.6</td>
<td>22270.0</td>
<td>785.1</td>
<td>4762.4</td>
</tr>
<tr>
<td>1986</td>
<td>21.6</td>
<td>3779.1</td>
<td>114.8</td>
<td>408.8</td>
</tr>
<tr>
<td>1987</td>
<td>38.7</td>
<td>17321.3</td>
<td>565.7</td>
<td>3354.8</td>
</tr>
<tr>
<td>1988</td>
<td>71.8</td>
<td>5307.4</td>
<td>224.8</td>
<td>724.4</td>
</tr>
<tr>
<td>1989</td>
<td>20.5</td>
<td>596.0</td>
<td>18.3</td>
<td>82.7</td>
</tr>
<tr>
<td>1990</td>
<td>52.7</td>
<td>94145.0</td>
<td>3082.4</td>
<td>3830.1</td>
</tr>
<tr>
<td>1991</td>
<td>37.1</td>
<td>144.8</td>
<td>4.7</td>
<td>8.6</td>
</tr>
<tr>
<td>1992</td>
<td>20.5</td>
<td>596.0</td>
<td>18.3</td>
<td>82.7</td>
</tr>
<tr>
<td>1993</td>
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<td>62980.4</td>
<td>2237.9</td>
<td>8879.0</td>
</tr>
<tr>
<td>1994</td>
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<td>785.1</td>
<td>4762.4</td>
</tr>
<tr>
<td>1995</td>
<td>71.8</td>
<td>5307.4</td>
<td>224.8</td>
<td>724.4</td>
</tr>
<tr>
<td>1996</td>
<td>57.6</td>
<td>22270.0</td>
<td>785.1</td>
<td>4762.4</td>
</tr>
<tr>
<td>1997</td>
<td>16.0</td>
<td>1259.1</td>
<td>30.7</td>
<td>162.1</td>
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<td>1999</td>
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<tr>
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<td>94145.0</td>
<td>3082.4</td>
<td>3830.1</td>
</tr>
<tr>
<td>2001</td>
<td>29.1</td>
<td>13301.6</td>
<td>500.8</td>
<td>2074.3</td>
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<td>2002</td>
<td>29.1</td>
<td>13301.6</td>
<td>500.8</td>
<td>2074.3</td>
</tr>
<tr>
<td>2003</td>
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<td>155.0</td>
<td>3.6</td>
<td>7.8</td>
</tr>
<tr>
<td>2004</td>
<td>57.6</td>
<td>22270.0</td>
<td>785.1</td>
<td>4762.4</td>
</tr>
<tr>
<td>2005</td>
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<td>320.3</td>
<td>7.8</td>
<td>19.8</td>
</tr>
<tr>
<td>2006</td>
<td>57.6</td>
<td>22270.0</td>
<td>785.1</td>
<td>4762.4</td>
</tr>
<tr>
<td>2007</td>
<td>59.6</td>
<td>28662.5</td>
<td>677.5</td>
<td>5287.6</td>
</tr>
<tr>
<td>2008</td>
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<td>71713.9</td>
<td>2628.8</td>
<td>8026.0</td>
</tr>
<tr>
<td>2009</td>
<td>15.1</td>
<td>320.3</td>
<td>7.8</td>
<td>19.8</td>
</tr>
<tr>
<td>2010</td>
<td>43.7</td>
<td>80092.6</td>
<td>2950.6</td>
<td>6809.2</td>
</tr>
<tr>
<td>2011</td>
<td>61.8</td>
<td>44285.6</td>
<td>1652.7</td>
<td>3191.9</td>
</tr>
<tr>
<td>2012</td>
<td>64.6</td>
<td>71713.9</td>
<td>2628.8</td>
<td>8026.0</td>
</tr>
<tr>
<td>2013</td>
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<td>22270.0</td>
<td>785.1</td>
<td>4762.4</td>
</tr>
<tr>
<td>2014</td>
<td>71.8</td>
<td>5307.4</td>
<td>224.8</td>
<td>724.4</td>
</tr>
<tr>
<td>2015</td>
<td>71.8</td>
<td>5307.4</td>
<td>224.8</td>
<td>724.4</td>
</tr>
<tr>
<td>2016</td>
<td>50.6</td>
<td>101489.5</td>
<td>2922.5</td>
<td>2693.9</td>
</tr>
<tr>
<td>2017</td>
<td>15.1</td>
<td>320.3</td>
<td>7.8</td>
<td>19.8</td>
</tr>
<tr>
<td>2018</td>
<td>19.5</td>
<td>4111.6</td>
<td>166.0</td>
<td>416.8</td>
</tr>
</tbody>
</table>

Source: Central Bank Statistical Bulletin
Table 2. Descriptive statistics of oil price and government revenue 1981-2018

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>Median</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Std. Dev.</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>Jarque-Bera</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCROP</td>
<td>3.445752</td>
<td>3.372453</td>
<td>4.273884</td>
<td>2.549445</td>
<td>0.530017</td>
<td>0.05328</td>
<td>1.652182</td>
<td>2.742113</td>
<td>0.253839</td>
</tr>
<tr>
<td>LGDP</td>
<td>8.534402</td>
<td>8.707881</td>
<td>11.75793</td>
<td>4.975569</td>
<td>2.336377</td>
<td>-0.188011</td>
<td>1.600188</td>
<td>3.326374</td>
<td>0.189534</td>
</tr>
<tr>
<td>LNONREV</td>
<td>5.111755</td>
<td>5.582995</td>
<td>8.295549</td>
<td>1.093298</td>
<td>2.476856</td>
<td>-0.315941</td>
<td>1.639731</td>
<td>3.561879</td>
<td>0.168480</td>
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<tr>
<td>LOREV</td>
<td>6.156108</td>
<td>6.850418</td>
<td>9.091441</td>
<td>1.981415</td>
<td>2.473116</td>
<td>-0.488646</td>
<td>1.776448</td>
<td>3.882617</td>
<td>0.143516</td>
</tr>
</tbody>
</table>

Source: Author’s Computation
The trend in oil and nonoil revenue as well as the movement in oil prices are shown in the time series covering the period 1981 to 2018 which is considered long enough to establish the empirical results on the basis of whose conclusions on the objectives under pursuit are drawn.

Presented in Table 2 is the basic descriptive statistics of the series under study.

The probability of the Jarque Bera Stat shows strong evidence of normality of the distribution of the series under study, that is, all probability values are greater than 5%. The spread and variations are shown by the minimum, maximum and standard deviation with the centrality of the distribution shown by the mean and median. The fact that oil revenue in Nigeria is higher than nonoil revenue is confirmed by their respective mean values while the standard deviation shows how less constant nonoil revenue is over the oil revenue component. The volatility of oil price in Nigeria is shown by the 53% level of standard deviation relative to the mean price of 3.45.

Next, we examine the unit root properties for the series mostly in their natural log forms. The summary of the Augmented Dickey Fuller unit root test results is presented in Table 3.

From the unit root test results following the different test techniques, we observe that there are differences in order of integration of the variables, that is, a combination of I (0) and I(1) variables. This provides a first justification for the choice of the Autoregressive Distributed Lag Model given that the model tolerates such a combination and still gives robust estimates.

### Table 3. Summary of ADF unit root test

<table>
<thead>
<tr>
<th>Variables</th>
<th>ADF Stat</th>
<th>Critical Value @0.05</th>
<th>Inference</th>
</tr>
</thead>
<tbody>
<tr>
<td>LGDP</td>
<td>-3.65</td>
<td>-3.54</td>
<td>I(1)</td>
</tr>
<tr>
<td>LOREV</td>
<td>-5.23</td>
<td>-3.54</td>
<td>I(0)</td>
</tr>
<tr>
<td>LNOREV</td>
<td>-7.47</td>
<td>-3.54</td>
<td>I(1)</td>
</tr>
<tr>
<td>LCROP</td>
<td>-3.18</td>
<td>-2.95</td>
<td>I(0)</td>
</tr>
</tbody>
</table>

Source: Author’s Computation

### Table 4. Correlational analyses

<table>
<thead>
<tr>
<th>Opportunity</th>
<th>Probability</th>
<th>LGDP</th>
<th>LNOREV</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCROP</td>
<td>0.657581</td>
<td>1.000000</td>
<td>0.992283</td>
</tr>
<tr>
<td>LGDP</td>
<td>5.089469</td>
<td>-----</td>
<td>46.66290</td>
</tr>
<tr>
<td>LNOREV</td>
<td>0.0000</td>
<td>-----</td>
<td>0.0000</td>
</tr>
<tr>
<td>LOREV</td>
<td>0.626915</td>
<td>0.977472</td>
<td>0.982505</td>
</tr>
</tbody>
</table>

Source: Author’s Computation

### Table 5. ARDL results for model 1

LOREV = (D(LCROP) LGDP LNOREV )

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>D(LCROP)</td>
<td>0.439844</td>
<td>0.142838</td>
<td>3.079310</td>
<td>0.0050</td>
</tr>
<tr>
<td>D(LCROP(-1))</td>
<td>0.534168</td>
<td>0.162022</td>
<td>3.296887</td>
<td>0.0029</td>
</tr>
<tr>
<td>D(LCROP(-2))</td>
<td>0.415591</td>
<td>0.163004</td>
<td>2.549569</td>
<td>0.0173</td>
</tr>
<tr>
<td>LGDP</td>
<td>1.882490</td>
<td>0.638884</td>
<td>2.946527</td>
<td>0.0069</td>
</tr>
<tr>
<td>LGDP(-1)</td>
<td>-1.754711</td>
<td>0.520910</td>
<td>-3.368548</td>
<td>0.0025</td>
</tr>
<tr>
<td>C</td>
<td>0.036189</td>
<td>0.855001</td>
<td>0.042326</td>
<td>0.9666</td>
</tr>
</tbody>
</table>

R-squared 0.987815 Durbin-Watson stat 1.822262

Adjusted R-squared 0.984404

F-statistic 289.5(Pv<0.05)

Source: Author’s Computation
To further show the pre-estimation features of the variables studied, we carry out correlational analyses which is a test of the linear association of the variables under study. The results are shown in Table 4.

From the results, all the variables share positive linear association but in a varying degree. While oil revenue share a 62.7% correlation with oil price, nonoil revenue is positively correlated with oil price to the tune of 63.4%. It is however evident that oil price varies positively with revenue as shown by the correlational analyses.

**ARDL estimates:** The results of the ARDL estimates following the two models specified above are presented in Tables 5 and 6 respectively. Before using the estimates to test the formulated hypotheses, a discussion on the general statistics is made first. The result of the first model in Table 5 shows goodness of fit as indicated by the 98% R-squared same as that of the second model depicted in Table 6 with an R-squared of 98.9%. This goes to confirm that the explanatory variables in the two models are good fit for the explanation of the dependent variables which are oil and nonoil revenue respectively.

In addition a look at Tables 5 and 6 helps to confirm that the f-stats (289 and 397) are all statistically significant implying that the overall regression is fit for the set purpose of making a good analysis. It can also be deduced that there is no case of autocorrelated residual in the models as the Durbin-Watson in both cases are all approximately equal to 2.

### 5.1 Test of Hypotheses

The formulated hypotheses are tested using the results for model one and two presented in Tables 5 and 6 respectively.

### 5.2 Hypothesis One

This hypothesis is restated as follows:

\[ H_0 \text{Changes in crude oil prices have no impact on oil revenue in Nigeria economy:} \]

The test is based on the ARDL estimates contained in Table 5 for model 1. The result shows that change in oil D (CROP) and the associated lagged values all positively and significantly affected oil revenue within the studied period. The probability of the t-stat are all less than 0.05 while the coefficients are positively signed. In terms of elasticity, it can be inferred that 1% change in oil price produces 43.9% in government revenue as shown by the elasticity coefficient.

On the basis of the above results, the null hypothesis of no impact is rejected and the alternate accepted with a conclusion that changes in crude oil prices positively significantly impacted on oil revenue in Nigeria within the studied period. This finding supports the studies of Odularu [9] Alley et al. and [27] that oil price significantly improves growth.

### 5.3 Hypothesis Two

This hypothesis is restated as follows:

\[ H_0 \text{Change in crude oil prices has no impact on nonoil revenue in Nigeria economy:} \]

The test is based on the ARDL estimates contained in Table 6 for model 2. The result shows that change in oil D (CROP) and the associated lagged values non-significantly affected nonoil revenue within the studied period. The probability of the t-stat are all greater than 0.05. The elasticity coefficient is reported by obviously has no significance hence there is no need for its discussion.

### Table 6. ARDL results for model 2

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>D(LCROP)</td>
<td>0.033967</td>
<td>0.143761</td>
<td>0.236271</td>
<td>0.8151</td>
</tr>
<tr>
<td>D(LCROP(-1))</td>
<td>-0.069430</td>
<td>0.171087</td>
<td>-0.405815</td>
<td>0.6882</td>
</tr>
<tr>
<td>D(LCROP(-2))</td>
<td>0.225779</td>
<td>0.156181</td>
<td>1.445624</td>
<td>0.1602</td>
</tr>
<tr>
<td>LGDP</td>
<td>0.487519</td>
<td>0.182754</td>
<td>2.667623</td>
<td>0.0130</td>
</tr>
<tr>
<td>LOREV</td>
<td>0.204113</td>
<td>0.111626</td>
<td>1.828543</td>
<td>0.0790</td>
</tr>
<tr>
<td>C</td>
<td>-1.917687</td>
<td>0.709327</td>
<td>-2.703529</td>
<td>0.0119</td>
</tr>
</tbody>
</table>

R-squared: 0.989208, Durbin-Watson stat: 1.813077

Adjusted R-squared: 0.986717

F-statistic: 397.2 (pv<5%)
On the basis of the above results, we refuse to reject the null hypothesis of no impact with a conclusion that changes in crude oil prices nonsignificantly impacted on nonoil revenue in Nigeria within the studied period. This finding contradicts that of Akinlo [28] that has it that oil can cause other non-oil sectors to grow. Furthermore, the findings of Sainsbury [30] and Sayed [29] that found that lower energy costs reduce the cost of production and increase the margins are contradicted.

6. SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Summary of Findings

The findings from the specific objectives of this study are as follows:

1. Change in oil prices significantly and positively affected government’s oil revenue within the studied period. This finding supports the studies of Odularu [9] and Alley [27] that oil price significantly improves growth.

2. Change in oil prices did not significantly affect government’s nonoil revenue within the studied period.

6.2 Conclusion

In Nigeria, though crude oil has contributed largely to the economy, the revenue has not been properly used. Considering the fact that there are other sectors in the economy, the excess revenue made from the oil sector can be invested in them to diversify and also increase the total GDP of the economy. This work is set out as an investigation into impact of change in oil prices on government revenue broken into oil and nonoil component. The above objective was pursued by dividing it into two specific objectives with correspondingly number of hypotheses formulated and tested in the course of this research work. The results recorded from the study are both intuitive and in conformity with preexisting findings and theoretical evidence and creates a ground for strong policy advocacy in the government revenue drive.

6.3 Recommendations

In line with the specific objectives of this study, we recommend as follows:

1. That the government should evolve policies that will not only improve on the overall growth of the economy but also ensure a balanced growth through due contributions from all the sectors of the economy. This is essential as it will enhance due contribution from the sectors in meeting the revenue needs of the government.

2. Efficient policies should be made to consciously break the economy away from its current mono-economic outlook. Government should plan a Nigerian economy without oil as it is evident that the oil sector plays overbearing role in every facet of the nation’s economic life.

The recommendations are in tandem with the advocacy of Igbeasere [5] that diversification and industrialization is necessary for sustainable growth.

It is expected that this study will trigger further interest and discourses in this area both locally and across other economies with mono-product outlook like Nigeria.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES


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