

# Effect of International Crude Oil Prices on Nigeria's Gross Domestic Product from (1985-2020)

Sadeeq Sani Sami Sule-Iko, May I. Nwoye

Faculty of Management Sciences, Nile University of Nigeria, Abuja, Nigeria  
Email: sssuleiko@gmail.com, maynwoye@gmail.com

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## Abstract

The aim of this study is to investigate the effect of oil price and its volatility on the development of Nigeria's economy; this is due to the decline of the Nigerian economy as a result of decrease in daily oil production and plummeting oil prices. The study assesses both long-and short-term effects of oil price volatility on real GDP in Nigeria. To achieve the basic objective of this research and to ascertain a comprehensive and robust outcome, the study adopted secondary data such as Nigeria's Real GDP, Crude Oil Price, Real Exchange Rate and Foreign Direct Investment (FDI) that covers the period 1985 to 2020. In the analysis of data collected the research adopts Autoregressive Distributed Lag (ARDL) estimation technique. From the analysis, it can be deduced that in the short run, there is a positive impact of oil price on real GDP which is statistically significant at one percent level. As real exchange rate rises by one percent, the real GDP rises by 1.528 per cent, all things being equal. While the long run, the effect is positive and statistically significant measuring 14.67 positive effects on the economy. It also revealed that while oil price volatility affects economic development positively in the short term, its effect in the long term is not statistically significant. Findings from the study revealed that crude prices have a positive effect on GDP in Nigeria. Therefore, sustaining an equilibrium tempo of crude oil supply in Nigeria is crucial while the international community should allow the forces of demand and supply to play its role. This is because the rate of supply has effect on price and frequent change in price means high volatility. The article is structured as follows: introduction, literature review, methodology, data analysis, discussion of findings and recommendations.

## Keywords

Crude Oil, Oil Price, Dutch Disease, Rent-Seeking, Gross Domestic Product, Foreign Direct Investment, Economic Growth

## 1. Introduction

### 1.1. Background to the Study

Crude oil is a valuable natural resource that can be found beneath permeable rock formations scattered around the world. Once refined, it can be used to make premium motor spirit, gasoline, diesel, and other petrochemicals; as a result, its presence in any nation has an enormous economic effect. The largest oil-producing countries, such as China, the United States, and Saudi Arabia, rely heavily on crude oil sales for revenue; therefore price changes are crucial to policymakers in these countries. Crude oil is Nigeria's and the world's primary source of energy. In Nigeria oil was discovered in 1956 in Oloibiri, Niger Delta after half a century of exploration by Shell B.P. after the discovery Nigeria joined the rank of oil producers in 1958 when its first oil field came on stream producing 5100 bpd (Udoka & Nkamare, 2014). Oil has been utilized in industry for the creation of goods and services since its discovery, and domestically it is used for personal consumption, with a large part of it coming from emerging countries. Nigeria's oil industry is vital to the country's economy. It provides the majority of the forex and gross income required for Nigeria's socio-economic and political development, among other things. The discovery of oil in Nigeria earned her the recognition as one of the oil rich nations globally. Nigeria generated over US\$390 billion in tax revenue from oil business between 1971 and 2005, and has a Gross Domestic Product (GDP) of US \$522.6 billion as Africa's largest economy as of 2013.

This over-reliance on oil has completely shut out Agriculture which was once the cornerstone of the country before the discovery of crude oil in commercial quantity in 1958 in Oloibiri (Aigbedion & Iyayi, 2007; Bodo & Gimah, 2020). The nation is a significant oil producer in Africa. Liquefied natural gas exports from it ranked fifth globally in 2018, with the continent's greatest natural gas reservoir (BP Statistical Review of World Energy 2019). In advanced societies, fallen oil prices are not a threat as some steps have been taken to facilitate such situations. Ayola (2013) argues that Nigeria as a mono-product economy remains vulnerable to fluctuations in international crude oil prices. Yusuf (2015) also contends that oil plays an important role in implementing Nigeria's fiscal and monetary policy, as oil accounts for an average of 80% of government revenues, 90-95% of the foreign exchange revenues and 12% of the real gross domestic product. Despite these storms, an increasing number of Nigeria's population is impoverished, and its economy remains stagnant (Okonjo-Iweala & Osafo-Kwaako, 2007).

Because Nigeria's economy is primarily dependent on oil revenue, its economy is greatly influenced by oil price fluctuations. For many years, the proceeds gotten from the sale of crude oil have been used to finance government spending and for major importation of the product into the country. Specifically, an average of 75% of government revenue comes from oil export (Nweze & Edame, 2016). Therefore, sudden negative or positive shocks in oil prices might have an

impact on budgets. Sudden and unexpected swings in oil pricing and output are referred to as crude oil shocks (Chuku et al., 2011).

### 1.2. Statement of the Problem

The importance of the presence of crude oil to any nation cannot be over-emphasized as its production, extraction; distribution and sale help boost the nation's economy by generating high revenue from its sale apart from other important uses of crude oil. Because of its importance in various manufacturing and production industries around the world, crude oil is always in high demand by developed and developing countries that do not possess crude oil, the high demand and supply of this product in turn cause fluctuations in its price thus affecting nations like Nigeria whose revenue is largely dependent in sales of its crude. The last global economic crisis, which lasted from 2008 to 2009, resulted in a drop in oil prices on the international market. In just a few days, oil prices plummeted from over USD140 per barrel to around USD40 per barrel. Nigeria's economy has been hit hard as oil prices have plummeted and daily oil production has been steadily reduced. In January 2019, the price was 57 U.S dollars per barrel, but in April 2020 it fell to 15 U.S. dollars (Mhalla, 2020). This decline has in turn affected Nigeria's GDP and the nation's economy at large. It becomes imperative to investigate the impact of fallen oil prices or fluctuations in global crude oil prices on Nigeria's GDP and the global economy at large as findings would assist economists and policymakers create a clear pathway toward economic development and shielding the economy from the impact of fluctuations in the international market.

### 1.3. Objectives of the Study

The main objective is to determine how the price of global crude oil affects Nigeria's gross domestic product. The specific objectives are to:

- i) Investigate the short-term effect of oil price on the real Gross Domestic Product (GDP) in Nigeria.
- ii) Examine the long-term effect of oil price on the real gross domestic product (GDP) in Nigeria.
- iii) Determine the short-term effect of oil price volatility on the real gross domestic product (GDP) in Nigeria.
- iv) Ascertain the long-term effect of oil price volatility on the real gross domestic product (GDP) in Nigeria.

### 1.4. Research Hypothesis

The following hypotheses were tested to achieve the objectives of this research:

- i) **HO1:** Oil price has no major short-term effect on the real gross domestic product (GDP) in Nigeria.
- ii) **HO2:** There is no major long-term effect of oil price on the real gross domestic product (GDP) in Nigeria.

iii) **HO3:** There is no major short-term effect of oil price volatility on the real gross domestic product (GDP) in Nigeria.

iv) **HO4:** There is no major long-term effect of oil price volatility on the real gross domestic product (GDP) in Nigeria.

## 2. Literature Review

### 2.1. Concept of International Crude Oil Price

Oil price is yet the main component influencing the world's economic development, modern turn of events, food cost, poverty, and other financial factors, other than its elements is the primary list exhibiting oil market conditions (Álvarez et al., 2011; Jiménez-Rodríguez, 2008; Naranpanawa & Bandara, 2012; Narayan et al., 2014).

The international oil market experience significant and consistent rise in oil price but a swift drop by the end of 2014; oil price analysis remains one of the most difficult energy-related issues. There exist multiple factors influencing oil price dynamics, which makes oil market analysis so complicated whereas this complexity is increasing continuously (Huntington et al., 2012). The complexity of oil price analysis is increasing as a result of the following factors: demand for oil substitutes, transportation and industrial appliance efficiency, financial market conditions, level of proven oil reserve and political challenges around the world are all factors to be considered. Consequently, many academics have attempted to comprehend and examine the effects of various factors on oil price dynamics as the primary indicator of the global energy market.

### 2.2. Crude Oil Price and the Nigerian Economy

Oil price fluctuation is expected to have a significant impact on corporate management of oil exporting countries given the relative importance of the crude oil sector in the production and export of goods and services and the uncertainty surrounding the crude oil market (Behbudi et al., 2010; Mehrara, 2008). Revenues generated from Crude oil sales make up a significant portion of the Gross Domestic Product (GDP) of oil-exporting countries like Nigeria, such that a rise in the price of crude oil significantly improves the country's revenue and a decrease also negatively affects the nation's revenue (Sule-Iko & Ibrahim, 2021). Nevertheless, the general impact of crude oil price fluctuations on enterprises and economic growth is mainly determined by how the government manages its previous and current revenue. When there is a boom in crude oil price, it significantly increases the real national income of that country through high export earnings (Korhonen & Juurikkala, 2007). It is understood that the business and its economy at large are heavily reliant on crude oil revenues as is shown by (IMF, 2022) that approximately "15% of its GDP originate from the crude oil sector during the period 2000 to 2009 Moreover, about 50% of the government's revenues and 70% - 75% of exports are derived from the oil sector" (Mehrara et al., 2010). Oriakhi and Iyoha (2013) state that in 2008 "crude oil price fell from a

peak of \$147 to about \$37.81 per barrel” this drop has a significant effect on the budget as the budget witnessed a significant cut in its budgeted revenue and expenditure. These cuts impacted practically every sector of the country’s business and economy.

According to [BudgIT \(2014\)](#), the story of Nigeria’s economy since the 1970s is incomplete without recounting the swings in crude oil prices; over the years, significant revenue has been generated from the sale of crude oil, but a lack of investment in infrastructure and long-term projects has resulted in a halt in the development of the economy and the country. Presently, recurring expenses are financed with earnings from crude oil, while capital expenditures are financed with debt borrowed from other countries. [Aliyu \(2009\)](#) demonstrated that “the global financial meltdown in 2009 left Nigeria’s oil revenue sliding to ₦4.84tn, representing a 39% reduction in revenues at the end of the year. This only demonstrates the fragility of the Nigerian economy, but the fault lines were not very visible, due to strengthened savings in previous Excess Crude Account”. The world economy improved in 2010 with a corresponding appreciation in the price of crude oil which consequently led to an appreciation in government revenue from 7.3 trillion to 11.1 trillion naira in 2011. The continual reliance on revenue from crude oil and gas is not sustainable owing to cost instability. Any fluctuations in the price of oil, as an exporter of crude oil and an importer of refined petroleum products, will have a positive or negative impact on the nation’s economy. Several empirical research on the impact of oil price volatility on macroeconomic variables in various economies has been conducted.

## **2.3. Theoretical Review**

The following theories were reviewed in the course of the research study.

### **2.3.1. Dutch Disease Theory**

The Dutch Disease Theory of economic growth states that higher oil prices, generally, change the industrial structure of the oil-exporting country making it more concentrated on the oil industry and non-traded sectors ([Florence & Chioma, 2019](#)). Accordingly, the higher oil profit leads to the appreciation of the local currency, which consequently causes the increase in imports of consumer goods; hence, the high concentration on imports tends to reduce the competitiveness of the local producers ([Florence & Chioma, 2019](#)). It follows according to the Dutch disease theory that an increase in oil prices is not a beneficial situation for the economy of an oil-exporting country ([Corden & Neary, 1982](#)).

The Dutch disease hypothesis was developed to make sense of the poor economic situation of the Netherlands after the discovery of the “North Sea oil”. This theory opines that a natural resource boom causes a country’s exchange rate to appreciate, lowering the competitiveness of its industrial export. According to [Ismail \(2010\)](#), the Dutch disease can be seen as the process by which a boom in a natural resource sector results in the shrinking non-resource convertible. [Ismail \(2010\)](#) expanded this concept to refer to situations in which “disease” impedes

the growth of emerging industries due to training in the manufacturing sector. If the industry closes down, this will almost certainly result in job loss, particularly in a nation with a large population, thus, the rising economy is insufficient to accommodate the unemployed.

### 2.3.2. Rent-Seeking Theory

The Rent-seeking theory also supports the Dutch diseases theory. According to Gylfason (2001), rent-seeking means spending time and money not only on the production of real goods and services but also on trying to get the government to change the rules to make business more profitable. This could take the form of output subsidies, collusion promotion, or making professional services mandatory. The term “rent-seeking” was introduced by Krueger (1974) which has a long history in economics dating back to the seminal work of Tullock (1967). Rent-seeking behavior model is such a significant part of current studies for describing the phenomenon of the resource curse. The failure of society to realize the benefit from natural resource wealth is attributed to political structures conducive to rent-seeking, according to these models.

To support the above, Lane and Tornell (1996); Van der Ploeg & Venables (2011) offered circumstantial instances using Venezuela and Nigeria as being consistent with the notion that rent-seeking by political elites is responsible for the resource curse. According to Lane and Tornell (1996), the 1979-1981 oil price surge prompted Venezuela to expand governmental investment in infrastructure and industrial policies, mostly benefiting political elites. The surging increase saw Venezuela plunge into a current account deficit despite all the benefiting factors surrounding her terms of trade. This perspective suggested that the problem with natural resource abundance is not that it leads to irrational behaviors on the part of political actors but that it provides them with an opportunity to line their own pockets by engaging in rent-seeking (Lane & Tornell, 1996).

### 2.3.3. Theory of Economic Growth

It is a common general opinion that economic growth theory started with Schumpeter (1934). However, Schumpeter did not see capital accumulation as the main factor promoting economic expansion; he assigned to the concept of the entrepreneur-innovator referring to him as a hero of development. Schumpeter (1934) stated that improved economic development is possible if there is an investment in innovation and young entrepreneurs. Schumpeter believed that economic expansion was disproportionate, and he attributed that process to the nature of the “jump”.

The foundation of Schumpeter’s theory of economic growth is the belief that markets for private property are competitive and that financial markets are good at fostering the creation of innovations. However, in countries where there is no democratic system, these requirements are often not met. Thus, democratic, and economically developed countries are the target of Schumpeter’s theory. Arthur Lewis established a different theory of economic growth. In his work, he dealt

with the problems of poor countries, but with a rich labour force (Lewis, 1954). Even though Lewis (1954) shares the conventional vision of classical economists, he wasn't always convinced by their diagnoses or tactics; hence, his proposed model assumes maintaining a low standard of living in the short run. The savings earned in this way will increase capital, which would result in to increase in income in a long-run. Thus, Lewis's model assumes an increase in the disparity between countries in the short-run as a condition for equalization of income levels in the long run (Lewis, 1956).

Walt Rostow formulated another theory of economic growth. Rostow, like Lewis, Rostow relied on capital accumulation for economic development and identified five stages of development (Rostow, 1960). Rostow opines that the greatest challenge for underdeveloped countries is reaching the third stage otherwise known as the "take-off". He claimed that the less privileged countries have had difficulty breaking the "vicious circle" developed over the years. Hence, proposed breaking the circle by accumulating capital. However, he realized that if there were no opportunities to build internal accumulation, he would have to rely on outside help.

#### **2.3.4. Selected Theory**

The Dutch disease theory is believed to be the most appropriate theory for this research because it explains how rising oil prices affect the industrial sector of oil-exporting countries, causing a greater concentration on the oil industry and non-trade sectors. The theory further detailed how high oil profits cause the local currency to appreciate, which leads to an appreciation in consumer goods imports. Thus, the strong reliance on imports tends to make local producers less competitive. Based on the "Dutch Disease Theory", it is well acknowledged that an appreciation in oil prices does not benefit an oil-exporting country's economy.

#### **2.4. Empirical Review**

Crude oil is vital to the global economy since it is both an income driver and a major input factor for many countries. Hence, economists spending a lot of time studying price changes and their effects on growth.

According to Boheman and Mexum (2015), the first strand of literature on the ratio of oil price to GDP focuses primarily on the US economy. Hamilton (1983) discovered that most of the recession in the United States after the World War II could be attributed to the rising oil prices. This correlation was made known through Granger causality tests, which show a relationship between US GDP and Oil prices. This relationship was later confirmed by Burbridge and Harrison (1984); Gisser and Goodwin (1986); Lee and Ni (2002). Mork et al. (1994) found that rising oil prices harmed US production, and lower oil prices did not show statistically significant results indicating an asymmetric relationship. Rentschler (2013) investigated the importance of oil prices volatility in many countries, including developed, developing, importing and exporting countries such as the

Republic of Korea, Japan, Malaysia, Germany, India and the United States; using VAR, the study concludes that increased volatility in oil prices can adversely affect the economies of both oil-exporting and oil-importing countries. He further opined that any economy that relies heavily on the oil trade is likely to be hit by prices shocks. There are few empirical studies in developing countries. [Berument \(2020\)](#) investigated how oil prices shocks affect the output growth in some net-exporting and net-importing countries in the Middle Eastern and North African (MENA) region, with the GDP figures ranging from 1952-2005 and asserts that oil prices shocks have a significantly positive effect on the outputs of Algeria, Iran, Iraq, Kuwait, Libya, Oman, Qatar, Syria and the United Arab Emirates, most of these are OPEC countries except of Oman and Syria.

In detail, similar studies on Nigeria include, [Akpan \(2009\)](#), who investigated the asymmetric impact of prices shock on the economy; the result of the study shows that there is a strong positive link between changes in the oil price and actual government spending. In addition, given the significant rise in real exchange rates observed, the impact of oil prices shock on industrial production growth was found to be insignificant.

Similar results were obtained by [Olomola & Adejumo \(2006\)](#) and [Ayadi \(2017\)](#), suggesting that prices shocks tend to create the tendency for Dutch disease syndrome in Nigeria.

[Chuku et al. \(2011\)](#), investigated oil prices shocks and variations in selected macroeconomic indicators in Nigeria, their findings coincide and suggest that oil prices shocks do not account for a significant proportion of observed movements in macroeconomic aggregates.

[Alley et al. \(2014\)](#) outlined the effects of oil prices fluctuations on economic growth in Nigeria, employing the Generalized Method of Moment (GMM) econometric technique as well as macroeconomic data between 1981 and 2012. He went further and asserts that rises in the oil prices positively impact economic growth. The study corroborated that of [Nwanna and Eyedayi \(2016\)](#) as against others, thus suggesting that a periodic increase in oil prices will *affect* the economy positively in the long run. [Nnanna \(2002\)](#) examine the effects of oil prices shocks on monetary policy in Nigeria, using annual time series data for the period 1970-2010, the study revealed a long-run relationship involving oil prices, inflation rate, Treasury bill rate, real exchange rate and interest rate in Nigeria in which oil prices impact on inflation.

In a similar study by [Ijirshar \(2019\)](#) on the relationship between oil revenue and industrial growth in Nigeria, the evidence shows that oil revenue has a positive significant impact on industrial growth and the economy in the long-run despite the mismanagement of oil revenue as identified in literature evidenced by its insignificant relationship with industrial growth in the short-run. In other to establish the relationships between oil revenue, public spending and economic growth [Aregbeyen and Kolawole \(2015\)](#) used the OLS techniques, under co-integration, Vector Error Correction Model (VECM) and Granger causality on an



annual time series over the period from 1980 to 2012. Findings from the research reveal that oil profit granger affects government spending and economic growth. Although, there was no causality between governments spending and growth within the period under study (Aregbeyen & Kolawole, 2015). Olaokun (2000) showed that oil prices increase exert a negative effect on the economies of Ghana and Nigeria, but have a positive effect on Russia, which like Nigeria is an oilproducing country. Olomola (2006) found out that oil prices volatility is highly significant in explaining GNP growth and unemployment.

Oriakhi and Osaze (2013) examined the consequences of oil prices volatility on the growth of the Nigerian economy within the period 1970 to 2010 using quarterly data and employing the Vector Auto-Regression (VAR) methodology. It was discovered that oil prices volatility impacted directly real government expenditure, real exchange rate and real import, while real government expenditure impacted real GDP, real money supply and inflation, hence, oil prices changes have the capacity to determine government expenditure level, which in turn determine the growth of the economy thereby reflecting the dominant role of government in Nigeria (Florence & Chioma, 2019).

### Literature Gap

Evidence gathered from the reviewed literature has supported the claim that minimal studies have been conducted in Nigeria, relating to the effect of crude oil prices on Gross Domestic Product. Although a handful number of studies has been conducted in this topic. To the researcher's knowledge, no singular study has been devoted to investigating the effect of crude oil prices on GDP, specifically in Nigeria from 1985 to 2020 using the ex-facto research approach. It is due to this gap the research was conceived.

## 3. Methodology

This chapter reviews the general method of investigation that will be adopted for the study and provides information on the research design, methods of data collection and type of data used in the research work and finally a method of data analysis employed.

### 3.1. Research Design

A research design is a plan that describes how, when and where data are to be collected and analyzed (Parahoo, 1997). It represents the blueprint of a research. This research work intends to investigate the effect of global crude oil prices on Nigeria's GDP. For a successful investigation of the effect of international crude oil prices on GDP, the ex-post facto research design will be employed. The ex post facto design is the non-experimental design used to investigate causal relationships between variables, and determine whether one or more pre-existing factors could have effect on the subsequent difference in groups of subjects. This research design was chosen to properly explain the causal connection between the two variables in the research and to determine how the variables affect each

other.

### 3.2. Sources and Method of Data Collection

There are two means of collecting data, the primary and secondary method, primary methods of data collection are those methods where the researcher himself is involved in the actual process of collection of data, and examples involve the personal interview method and use of a questionnaire. While in the secondary methods of data collection, the researcher is not directly involved in the actual process of data collection, these include extraction from established source. In the course of this research work, the secondary method of data collection would be employed as secondary data on international crude oil prices and Nigeria's Gross Domestic Product (GDP) will be extracted from the archives of the Central bank of Nigeria (CBN).

The research work involved two variables, data on global crude oil cost and Nigeria's GDP. In this study global crude oil prices are measured in dollar per barrel while the Gross Domestic Product GDP is measured in US dollars.

### 3.3. Model Specification

The model specification deployed in this investigation is based on the description of the connection between the specified variables of this study. To ascertain the connection between the price of crude oil globally and Nigeria's economic growth, a functional model for the time series data is specified as follows:

$$RGDP_t = \beta_0 + \beta_1 OP_t + \beta_2 OPV_t + \beta_3 FDI_t + \mu_t \quad (3.1)$$

$GDP_t$  stands for the real gross domestic product for the country at time  $t$ .

$OP_t$  stands for oil prices for the country at time  $t$ .

$OPV_t$  represents oil prices volatility for the country at time  $t$ .

$FDI_t$  stands for inflow of foreign direct investment for the country at time  $t$ .

This stands for control variable.

$\mu_t$  represents the error term, assumed to be normally distributed  $\beta_0$  is the constant  $\beta_1$  to  $\beta_3$  are the estimated parameters.

*Taking the log of both sides gives the equation below;*

$$\ln RGDP_t = \theta_0 + \theta_1 \ln OP_t + \theta_2 \ln OPV_t + \theta_3 \ln FDI_t + \mu_t \quad (3.2)$$

Equation (3.2) will be calculated using the proper estimating method which helps in achieving the goal of this study. The choice of method will logically be followed to avoid biases during estimation.

### 3.4. The GARCH (1,1) Model

The researcher chooses to apply the ARCH/GARCH model popularized by Engle (2001) because as McKenzie (1999) put it, the exchange rate is known to best follow the GARCH process. This represents a technical shift from traditional standard deviation, coefficient of variance and ratio analysis which are said to lack robustness (Kyereboah-Coleman & Agyire-Tettey, 2008). Thus, volatility is calculated as follows:

$$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0 \quad (3.3)$$

$$\ln P_t = \phi + \lambda \ln P_{t-1} + e_t \quad (3.4)$$

where  $e_t \approx (0, \delta_t)$  and:

$$\delta_t = \phi + \omega e_{t-1}^2 + \gamma \delta_{t-1} + \mu_t \quad (3.5)$$

“Where the conditional variance  $\delta_t$  is dependent on three terms:

a) Mean =  $\phi$ .

b) Square error term  $e_{t-1}^2$  in the previous lagged period (ARCH term).

c) Previous lag of the conditional variance  $\delta_{t-1}$  (GARCH term).

The sum of  $\omega + \gamma$  measures the persistency of volatility”.

### 3.5. Method of Data Analysis

Several econometric methods for data analysis, however, the method of analysis adopted in this study is the Auto-Regressive Distributed Lag (ARDL) method owing to its stability and consistency in time series analysis, therefore advantages of utilizing the ARDL technique cannot be overemphasized (Banerjee et al., 1998); Bicudo and Azu (2018) are a few out of many researchers that have supported the use of this technique relatively due to its numerous advantages relating to robustness in ascertaining the long-run and short-run coefficient of estimated parameters. Research scholars have questioned the efficacy of traditional co-integration techniques when data integration is not at the same level, and many others have rejected the use of Ordinary Least Square (OLS) for econometric analysis due to bias in some results.

Equation (3.2) could be modified to the Auto-Regressive Distributed Lag Model (ARDL) as follows:

$$\begin{aligned} \ln \text{RGDP}_t &= \beta_0 + \beta_1 \ln \text{RGDP}_{t-1} + \beta_2 \ln \text{OP}_{t-1} + \beta_3 \ln \text{OPV}_{t-1} \\ &+ \beta_4 \ln \text{FDI}_{t-1} + \sum_p \beta_5 \Delta \ln \text{GDP}_{t-1} + \sum_p \beta_6 \Delta \ln \text{OP}_{t-1} \\ &+ \sum_p \beta_7 \Delta \ln \text{OPV}_{t-1} + \sum_p \beta_8 \Delta \ln \text{FDI}_{t-1} + \text{EMC} + \mu_t \end{aligned}$$

All variables have similar representations as stated earlier and “ $\Delta$ ” represents the difference (change) in variables and “ $-$ ”, as the lag sign. To achieve the long-run relationship, ARDL bound test requires a null hypothesis for non-cointegration.

There are a few models accessible for this type of study; however, the best model ought to be picked given unwavering quality, viability, and most importantly its suitability for the unique study. The decision of auto-regressive distributed lag error correction model was picked due to its effectiveness, reliability, and the advantage of assisting with gaining inferential information about the unique idea of the variable.

## 4. Data Presentation, Interpretation and Analysis

### 4.1. Introduction

This chapter analyzes and estimates the empirical models to determine all the needed parameters. The estimations were based on the established growth model

from the previous chapter of the project and will mainly concentrate on the empirical analyses and discussion of findings. Accordingly, based on the established model in the earlier chapter, it was crucial to use analytical framework techniques that are well suited for achieving the research purpose without prejudice. In order to determine the short- and long-term impact of the independent variables on the dependent variable, this chapter thoroughly applied an Auto-Regressive Distributed Lag (ARDL) model for co-integration (real GDP of Nigeria). Additionally, the chapter will include several preliminary statistical studies that are crucial for characterizing the outcomes of the empirical analyses.

The study conducted the descriptive statistics of the relevant variable included in the research. In **Table 1** all the values are in the natural logarithm and the real GDP which is the dependent variable of the study shows the total number of “observations, mean, median, maximum, minimum, standard deviation and the sum of square deviation”. The real GDP shows a mean value of 10.30136 and a low of 9.53092, a high of 11.17588 and a standard deviation of 0.583867 which is relatively higher compared to the other variables. The reason is that the real GDP variables are relatively higher in value before conversion to natural logarithm. From **Table 1**, it could be seen that all the value has a positive mean, median value as well as the skewness. The correlation results are reported in **Table 2** which indicates all variables are highly correlated.

## 4.2. Measuring Volatility Index

**Table 3** displays the estimated volatility index results, which show that the exchange rate complies with the requirements for GARCH (1,1) is reliable. The conditional variance equation indicates that the mean ( $\phi$ ) is significant at the 1%

**Table 1.** Summary statistic and correlation.

	LNGDP	LNOP	LNOPV	LNFDI
Mean	10.301	3.563	1.780	7.441
Median	10.073	3.373	2.698	7.541
Maximum	11.176	8.186	4.493	9.028
Minimum	9.531	-1.594	-2.300	5.243
Std. Dev.	0.584	2.936	1.981	1.095
Skewness	0.3061	-0.189	-0.392	-0.419
Kurtosis	1.559	1.865	1.766	2.275
Jarque-Bera	3.986	2.325	3.472	1.996
Probability	0.136	0.313	0.1762	0.369
Sum	401.753	138.953	69.431	290.215
Sum Sq. Dev.	12.954	327.476	149.065	45.553
Observations	35	35	35	35

Sources: Author's computation.

**Table 2.** Correlation Matrix.

	LNRGDP	LNOP	LNOPV	LNFDI
LNRGDP	1	0.871	0.962	0.742
LNOP	0.871	1	0.813	0.674
LNOPV	0.962	0.813	1	0.716
LNFDI	0.742	0.674	0.716	1

Source: Author's computation.

**Table 3.** Estimation of volatility index.

Variable	Coefficient	Std. Error	Z-Statistic
$\Phi$	1.540	3.739	0.411
$\ln P_{t-1}$ Variance Equation	0.949***	0.018	52.420
$\Phi$	22.809***	3.945	5.781
ARCH (-1)	-0.119***	0.0014	-84.970
GARCH (-1)	1.184***	0.0025	480.883
R-squared	0.963	Akaike info criterion	9.419
Adjusted R-squared	0.962	Durbin-Watson stat	1.893

Note: Estimation is based on the ML-ARCH-Normal distribution with BFGS/Marquardt procedures. The asterisks (\*\*\*) indicates significance at 1%.

level with positive coefficient (22.80938), suggesting that conditional variance is properly classified. Even though the ARCH element is negative, the volatility persists even when the total sum of  $\omega + \gamma$  is close to 1.

Equations (4.1) and (4.2) can be changed to the GARCH (1,1) model equations as follows:

$$\ln P_t = 1.540047 + 0.949374 \lambda \ln P_{t-1} \quad (4.1)$$

$$\delta_t = 22.80938 - 0.118601e_{t-1}^2 + 1.1841\delta_{t-1} \quad (4.2)$$

### 4.3. The Short-Run and Long-Run Analysis

**Table 4** indicates the short-run and long-run results. Assessing the effect of oil prices shows indications that there is a positive influence on economic development in the short term in Nigeria. The short coefficient for the oil export is 0.015281 and statistically significant at 10 per cent. This indicates as oil prices appreciate by 1%, real GDP will increase by 1.528%, all things being equal. With this result, the first hypothesis which states that **HO1**: "Oil prices have no significant short-term impact on real gross domestic product (GDP) in Nigeria" is hereby rejected.

In the long run, the coefficient is positive (0.146681) and statistically significant at 1%. This means as the oil prices appreciate by one percent, the real GDP appreciates by 14.67 percent in the long run, all things being equal. With this, the

**Table 4.** Short-run and long-run estimation.

Panel A: ARDL Error Correction Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNGDP (-1)	0.896	0.033	27.113	0.000
LNOP	0.015	0.008	1.833	0.076
LNOPV	0.008	0.006	1.401	0.071
LNFDI	0.013	0.008	1.716	0.096
C	0.941	0.322	2.923	0.006
CointEq (-1)*	-0.104	0.012	-8.908	0.000
Panel B: The Long-run Effects				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNOP	0.147	0.047	3.149	0.004
LNOPV	0.079	0.067	1.185	0.245
LNFDI	0.125	0.084	1.484	0.147
C	9.029	0.514	17.562	0.000

second hypothesis which states that: **HO2:** There is no any significant long-term impact of oil prices on real gross domestic product (GDP) Nigeria is hereby rejected. This implies that oil prices major and significant role to play in development of the Nigerian real GDP. This is not a surprise given that the Nigerian economy has been solely dependent on the oil export for its development. Therefore, a fall in oil prices would greatly affect the revenue generation of Nigeria.

*Case 2: Restricted Constant and No Trend*

A look at the oil prices volatility indicated that there is a positive influence on economic development in short-term in Nigeria. With the reported coefficient of 0.008 which is statically significant at 10 per cent, this shows that there is positive impact of oil prices volatility on economic development. In other words, as oil prices volatility increases, real GDP increase in the short run. It shows that as oil prices volatility rises by 1%, the real GDP rises by 0.82%, all things being equal. Therefore, the third null hypothesis; **HO3:** There is no significant short-term impact of oil prices volatility on real gross domestic product (GDP) in Nigeria is hereby rejected.

In the long run, the effect of oil prices volatility is positive but not statistically significant. The coefficient is 0.078891 but not statistically significant. Therefore, the fourth null hypothesis; **HO4:** "There is no significant long-term impact of oil prices volatility on real gross domestic product (GDP) in Nigeria" cannot be rejected. The effect of oil prices volatility is a short-run phenomenon. The result demonstrates there is a potential long-run effect, but it is not statistically relevant at this time.

The coefficient of lag one of real GDP is positive and significant at 1% level

which suggests that the present GDP could be influenced by the previous year's real GDP. The effect is reportedly in the short run. Other variables include the export and FDI. The short-run coefficient for the FDI is positive (0.013015) and statistically significant at 10 per cent. This implies that as FDI increases by one per cent, real GDP increases by 1.3 per cent in the short run, all things being equal. The long-run coefficient is also reportedly positive (0.124929) but not statistically significant. This implies that there is a potentially positive effect in the short-run and long-run but is not yet statistically relevant.

#### 4.4. Discussion of Findings

There is an indication that the model is stable, and the result is consistent with expectation. Assessing the effect of oil prices shows an indication that there is a positive influence on economic development in the short term in Nigeria. It highlights that as oil prices increase by one Per cent, real GDP will appreciate by 1.528 percent, all things being equal. This result is not consistent with [Ijirshar \(2019\)](#) who found the non-significant effect of oil prices on the Nigerian economy. Also, there is an established long-run impact of oil prices on economic advancement in Nigeria. The result is statistically significant at one per cent. This implies as oil prices appreciate by 1%, the real GDP appreciate by 14.67% in, the long run, all things being equal. This implies that oil prices have a major and significant role to play in the development of the Nigerian real GDP. This is not a surprise given that the Nigerian economy has been solely dependent on oil export for its development. Therefore, a fall in oil prices would greatly affect the revenue generation of Nigeria. This result is not consistent with [Ijirshar \(2019\)](#) and [Nwanna and Eyedayi \(2016\)](#) who suggested that a periodic increase in oil prices will affect the economy positively in the long run.

Examining the effect of oil prices volatility indicated that there is a positive impact on economic advancement in the short term in Nigeria. The report shows that as oil prices volatility increases, real GDP increases in the short run. In other words, as oil prices volatility appreciates by one per cent, the real GDP rises by 0.82 per cent. In the long run, the effect of oil prices volatility is positive but not statistically significant. The coefficient is 0.078891 but is not statistically significant. The effect of oil prices volatility is a short-run phenomenon. The result demonstrates there is a potential long-run effect, but it is not statistically relevant at this time. These results are consistent with [Berument \(2020\)](#) examined how oil prices shocks affect the output growth in some net-exporting and net-importing countries in the Middle Eastern and North African (MENA) region and also corroborate with [Olomola & Adejumo \(2006\)](#) and [Ayadi \(2017\)](#), suggesting that prices shocks tend to create the tendency for Dutch disease syndrome in Nigeria but mostly in the short-term.

#### 5. Conclusion

The Nigerian government relies heavily on crude oil as its primary origin of for-

eign exchange profits and main origin of revenue, and this level of dependence forms the basis for decisions about how to distribute revenues, create budgets, and allocate resources throughout the nation. Hence, the instability in oil prices has a multiplier effect on Nigeria's economic growth and crude oil production.

Assessing the effect of oil prices shows an indication that there is a positive influence on economic development in the short term in Nigeria. It highlights that as oil prices appreciate by one per cent, real GDP will appreciate by 1.528 per cent. Also, there is an established long-run impact of oil prices on economic development in Nigeria. The result is statistically significant at 1%. This means as oil prices appreciate by one per cent, the real GDP appreciate by 14.67 per cent, in the long run, all thing being equal. This implies that oil price contributes significantly to the advancement of Nigeria's real GDP. This is not a surprise given that the Nigerian economy has been solely dependent on oil export for its development. Therefore, a fall in oil prices would greatly affect the revenue generation of Nigeria.

Examining the effect of oil prices volatility indicated that there is a positive impact on economic development in the short term in Nigeria. The report shows that as oil prices volatility increases, real GDP increases in the short run. In other words, as oil prices volatility rises by one per cent, the real GDP rises by 0.82 per cent, all things being equal. In the long run, the effect of oil prices volatility is positive but not statistically significant. The coefficient is 0.078891 but is not statistically significant. The effect of oil prices volatility is a short-run phenomenon. The result demonstrates there is a potential long-run effect, but it is not statistically relevant currently.

## Recommendations

Based on the research findings, therefore, it has become necessary to recommend as follows:

- i) The NNPC should sustain the current oil production rate to ensure sustenance of the positive short-run effect on Nigerian real GDP.
- ii) Also, improving on the long-term effect is crucial and therefore, the current status quo should be maintained.
- iii) With oil prices volatility influencing a positive effect on the Nigerian economy, it is therefore advisable that the forces of demand and supply be allowed to play their role in the international market.
- iv) Lastly, the long-run result of the effect of oil prices volatility is positive but not statistically significant which highlights that the current exchange rate system should be improved.

## Suggestions for Further Study

This research highlighted the impact of oil prices and oil prices instability on Nigeria's real GDP. The result indicates that there is a positive influence on oil prices and oil prices volatility. This could not say whether such an effect is be-



cause Nigeria is an exporter of crude oil. Therefore, it is recommended that a comparison be made between crude oil exporters and importers by assessment.

### Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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