THE IMPACT OF OIL PRICE SHOCKS ON EXCHANGE RATE AND ECONOMIC GROWTH IN NIGERIA: AN ARDL BOUND TEST COINTEGRATION APPROACH

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Abstract

This study seeks to investigate the impact of Oil Price shocks on Exchange rate and Economic growth in Nigeria using annual time series data from 1981-2019. The study establishes two equations, the GDP equation, and Exchange Rate equation, and applies Bounds test co-integration analysis and ARDL model to determine the existence of the long run and the short-run relationship between variables of each equation. The results from the Bounds test analysis depicted the strong rejection of the null hypothesis of no co-integration amongst the variables of the GDP equation at 5 per cent level of significance, and this implies the existence long-run relationship between GDP, Oil Price, Exchange rate and other variables included in the GDP equation. However, no evidence of long-run relationship was found between Oil Price, Exchange Rate, and the rest of the variables included in the Exchange Rate equation. Results from the ARDL model for the GDP equation depict a significant positive relationship between oil price and GDP both in the short run and long run. The result implies that a persistent rise in oil prices by 1% will lead to a 0.85% increase in the GDP. Similarly, oil price, rate of interest and exchange rate are a significant determinant of Nigerian economic growth in the long run. In the short run, oil price significantly affects the exchange rate. These findings imply that changes in the price of oil exert substantial effects on economic growth and exchange rates in Nigeria.

Key words: Oil Price, Exchange Rate, Economic Growth, Bounds Test Co-integration, ARDL

Introduction

Energy is regarded as the most essential input for growth and development, two-thirds of the world energy requirement is met by with oil and gas (African Development Bank and the African Union, 2009). Nigeria is the largest producer of oil in Africa, with about 37 billion barrels of proven oil reserve as of 2015, which placed it as the second in terms of oil reserve in Africa after Libya (U.S Energy Information Administration EIA, 2017) and 11th in the world. Crude Oil in Nigeria was discovered in commercial quantity in 1956, and Nigeria became an oil-producing country with exploration from the very first oil field at Oloibiri in the Niger-Delta region which commenced in 1958, producing 5,100 barrel of crude oil in a day. Soon after this, oil exploration continued with the discovery of several other oil field both onshore and offshore, by early 1970s oil production has reached about 2 million barrels per day and the country joined the league of the Organization of Petroleum Exporting Countries (OPEC) in 1971 (Nigerian National Petroleum Corporation, 2020).

At independence in 1960, Agriculture was the major economic sector in Nigeria, contributing about 70% of the country’s Gross Domestic Product (GDP), employs more than 70% of the working-age group, and accounts for about 90% of the revenues accruing to the Government and foreign exchange earnings (adedipe, 2004). The oil boom of the 1970s which was fallout of the Arab-Israel crisis in 1973 and the consequent OPEC embargo exert tremendous effects on the global oil market leading to an upsurge in the price of oil from $3
per barrel to $11.50 per barrel in 1974. This unprecedented rise in oil price resulted in the transfer of a large amount of wealth in oil-producing countries (Pinto, 1987). Hence began the gradual shift in the direction of the Nigerian economy, relying more on the oil sector at the expense of other economic sectors. Oil sector becomes the significant economic sector contributing to about a third of the Nigerian GDP in the 1980s and 1990s, which later falls to 24% in the 2000s (Omotoso, 2019). Courtesy of rising oil prices, the contribution of oil to the total revenue receipts of the Government up surged from 26.3% in 1970 to 82.1% in 1974 and 83% in 2008 (Englama, 2010).

Nigerian economy depends heavily on the proceeds from the sale of crude oil as a major revenue source and foreign exchange earnings. Annual budgets in each fiscal year are prepared and tied to a benchmark of expected global oil price and projected daily crude oil production output. From the 1980s up to 2018 oil remains the dominant export commodity, accounting for about 90% of the total exports. However, despite the huge contribution of the oil sector to government revenues, the contribution of the oil sector to the Nigerian GDP remains very minimal, contributing a little above 10% of the GDP 2019, despite this, the gross oil revenue still accounts for 60.1% of the total government revenue receipts as at 2019 Q4 (Central Bank of Nigeria, 2019), and remain the dominant export commodity taking up 76.1% of the country’s total export value. According to the International Monetary Fund (IMF), Nigeria earned revenue of about $87 billion in 2014 from oil and natural gas export, which represent almost 58% of the total government revenue in 2014. Proceeds from the sales of oil and gas are the country’s main source of earning foreign exchange, more than 95% of total value Nigeria’s exports in 2014 was oil.

Empirical shreds of evidence adjudged the oil price as the most volatile of all prices whose impact affects virtually all the macroeconomic variables of many countries (Guo, 2005) & (Mehrara & Oskoui, 2007). The oil sector plays a dominant role in the economies of Africa's oil-producing countries of which Nigeria is at the forefront; the economies of these countries significantly rely on the highly volatile oil rent thereby making them vulnerable to the volatilities in the oil market (Omolade, 2019). An oil price shock is one of the major sources of macroeconomic fluctuations, a rise of which tends to exert contractionary impact on global demand and growth in the short term. This is because higher oil prices raise the cost of production through rising energy price, depending on the level of labor market flexibility and the ability of manufacturers to shift the rising cost on to consumers in the form of higher prices; higher oil prices cause inflation (Akpan, 2009) & (Omolade, 2019). Other things being equal, a steady rise in the price of oil exert a significant positive impact on the economies of oil-exporting countries and negative on oil-importing economies. The opposite happens to be the case in the event of a fall in oil price.

An influx of oil revenue on account of an oil price windfall is mostly associated with expansion in the level of Government expenditures in Nigeria while constriction in the flow of oil revenues are often accompanied by budget deficits. However, Nigeria is not like many oil-producing countries, this is largely because, although oil accounts for about 90% of the export earnings, contributes about 70% of the revenue accruing to the government and 95% of the foreign exchange earnings, the oil sector contributes not more than 10% share on the GDP. Another major source controversy with regards to the oil sector in Nigeria is, while a large amount of foreign exchange is earned from crude oil sales, a large chunk of it is spent to import refined petroleum products. The irony is that Nigeria is a crude oil exporting country on one hand, and an importer of refined petroleum products on the other. Nigeria is the 3rd largest importer of refined petroleum products in Africa, importing over 80% of the refined petroleum product consumed in the country (PricewaterHouseCoopers (PwC), 2017). About 18.6 billion liters of premium motor spirit (PMS) was imported into Nigeria between January-November 2019, costing over N3trillion equivalent to $9.9 billion (The Guardian, 2020). Thus, equivalent to 30% of the national budget which stood at N10.59trillion for the 2020 fiscal year is spent on the importation of PMS alone, the total budgeted revenue from the oil and gas for the 2019 fiscal year was N3.7trillion, this implied that almost all what is projected to be earned from the sales of oil and gas is spent on PMS importation.

The continued dependence of Nigerian economy on oil is a source of concern because the volatility in the global oil price will spill over to affect the other macroeconomic variables, thereby making the macroeconomy vulnerable to the shocks in the oil price. An economy that heavily relied on the export of crude oil, a commodity whose price is highly volatile as its major source of revenue and foreign exchange is vulnerable to the shocks that are recurring in the global oil market. A typical example of this was the episode of oil price shocks of 2014 which occurred due to an oversupply on one hand and a fall in demand on the other. From the supply side, the culprits were the increase in the oil output by the non-OPEC nations and surge in US shale oil production. The sluggish growth in the emerging markets particularly China, India and Brazil was pointed as the major source of fall in the demand of oil; these caused the oil price to crash by more than half between June 2014 to March 2015 (Huo, 2015). The price of oil nose-dived from US$110.9 per barrel in May 2014 to $56.69 per barrel in March 2015, the downward spiral continued to as low as $30.66 per barrel by January 2016. A drastic drop in the oil price of this magnitude has both trade and growth effects on the oil-
exporting countries. Consequently of these, the Nigerian economy slipped into recession in the second quarter of 2016 with a GDP contraction of -0.36% in the first quarter and -2.06% in the second quarter of 2016, -1.3% and -0.52% in the fourth quarter and first quarter of 2016 and 2017 respectively. Similarly, Nigerian external reserve dropped from $40.67 billion to $27.6 billion from January 2014 to January 2016 (Emefiele, 2017). The drop in the foreign exchange reserve put too much pressure on Naira, and the CBN in November 2014 succumbed to the external pressure against Naira by reducing the value of Naira in the official exchange rate window from N155/$1 to N168/$1, this was followed by further depreciation of naira from N168/$1, to N197/$1 in February 2015. By the end of May 2016, the exchange value of Naira against the dollar had fallen to N336.96/$1 from N197/$1 in January 2015 in the parallel market. The CBN was forced to adopt a more flexible exchange rate regime in June 2016, and peg the official exchange rate at N305/$1. However, despite the adoption of the flexible exchange rate regime, the naira continued to depreciate against the dollar in the parallel market, from the N340/$1 in the first week of flexible exchange rate regime trading to an all-time low hitting N525/$1 in September 2016 (Emefiele, 2017).

The most recent oil price shock of March/April 2020 was equally a result of supply and demand shocks. The supply shock was occasioned by Saudi Arabia and Russia oil price war and the demand shocks caused by COVID-19 pandemic which prompt factory closures global supply chain disruption and shutdowns of air, sea and road travel. Brent crude price plunged to $32.01 per barrel in March, and slipped to as low as $18.38 per barrel in April, from $63.65 and $55.66 per barrel in January and February 2020 respectively. This development forced the Nigerian government to review its budget for the 2020 fiscal year, and to adjust the official exchange rate from N307/$1 to N360/$1 in March 2020; this was further followed by another downward adjustment in the value of naira to N381/$1 in May 2020.

Owing to the importance of oil as a major energy source, and the effects the variations in the prices of oil exerts on macroeconomic variables, many studies were conducted to ascertain the degree to which changes in the price of oil affects macroeconomic performance. Empirical results revealed a mixed outcome concerning the magnitude of the effect of oil price shocks on the macroeconomy. Findings showed that macroeconomic variables react differently to oil price fluctuations in different countries. While oil price shocks exert a negative impact on economic growth in some countries, it positively impacts growth on other economies. Periods of high oil prices are accompanied by a large influx of oil revenues, appreciation of external reserve value and stability of exchange rate in the oil-exporting countries. Similarly, a decline in the price of oil would translate into a drop in foreign reserve, destabilization of the exchange rate market and inflation (Hodo, Akpan, & Offiong, 2013). The exchange rates of net oil-exporting countries tend to appreciate in response to a surge in oil prices and depreciate when oil prices decline countries, the reverse happens to be the case in the net importing oil countries (Krugman, 1983).

Numerous studies were conducted to assess the impact of oil prices shock on the macroeconomic variables, but a survey of the empirical results of some of those studies reveals mixed and divergent results. While some studies reveal that oil price shocks exert a significant impact on the macroeconomic variables like government revenue, external reserve, exchange rate and inflation (Hamilton , 2009) (Abdulhakeem, 2016), (Aigheyisi, 2018) and (Abayomi A., Adam, & Alumbugu, (2015). Rising oil prices results in appreciation of external reserves, exchange rate and output of the oil-rich economies (Amuzegar, 2001) & (Majid, 2006) Other studies argued that certain factors act as an impediment for oil-rich economies to reap the full benefits of positive oil shocks, factor such as lack of local refining capacity, the narrow and undiversified economic base makes those economies highly import-dependent, and downplay the benefit of positive oil shocks because a large chunk of the foreign exchange earned is expended on import thereby depleting the external reserve and impede exchange rate appreciation (Kilian, 2009),(Hamilton,2008), & (Wall, 2011). Similarly, other studies argued that oil price shocks oil does not significantly affect output (Akpan, 2009).

This study was motivated by the recent past two episodes of oil price shocks of 2014 and 2020 whose impact exacerbates some macroeconomic indicators in Nigeria; the study seeks to investigate the effects of oil price shocks on the exchange rate and economic growth in Nigeria. Unlike most of the previous studies conducted on this area which primarily dwell on applying the Vector Autoregressive (VAR) technique to examine the effect of oil price changes on macroeconomic variables like (Jin, 2008) (Rano, 2009), (Englama, Duke, Ogunleye, & Isma’il, 2010) & (Akpan, 2009), while studies such as (Abdulhakeem, 2016), (ononugbo, et al., 2018) and others make use of volatility models. This study will apply the techniques of Autoregressive Distributed Lag Model (ARDL) to examine the long run and short-run effects of oil price shock on the exchange rate and economic growth in Nigeria

1. Literature Review

A survey of literatures that discussed the relationships between oil price, exchange rate and other
macroeconomic variables was carried out, and below are some takeaways from their empirical results.

(BHATTACHARJEE, 2013) On a study aimed at investigating the impact of crude oil prices on the wholesale price index of Indian economy and the causality linkage between oil price changes, inflation and Economic Growth of Indian Economy. Findings of the study showed that crude oil prices significantly affect the Wholesale price index (WPI). That crude oil prices exert a significant positive effect on WPI. The study further reveals that inflation has a significant influence on GDP growth of Indian economy, that is, an increase in the rate Inflation retards GDP growth. Moreover, the study finds evidence of a bidirectional causality between crude oil price changes and rate of inflation, i.e. “Crude oil price changes Granger causes Inflation rate” and “Inflation Granger Causes the crude oil price rate change”.

(Oyeyemi, 2013) Employ OLS estimation techniques on an annual data for the period 1979-2010 to examine the impact of oil price shocks on the growth of the Nigerian economy. The study found that a current oil price shock exerts a long term effect on the growth of the Nigerian economy. Similarly, the results of the finding reveal a significant positive relationship between oil price and the real exchange rate. The study further revealed a direct positive relationship between crude oil price and GDP, specifically; the study showed that a unit rise in oil price results in a 15% increase of the real GDP.

Moreover, (Wilson, David, Inyiama, & Beatrice, 2014) used an OLS and Granger Causality estimation techniques to test the existence of a causal relationship between oil price and some key macroeconomic indicators in Nigeria. They used a time series data covering the period 1980-2010. Results of their analysis indicated that oil price volatility in the short run does not affect Nigerian GDP, similarly, no evidence of significant influence was found between the oil price volatility and key macroeconomic variables. Particularly, oil price volatility has no significant effect on the exchange rate and real GDP in Nigeria. Furthermore, the exchange rate of oil-exporting countries was found to have been significantly determined by oil-price, the opposite happens to be the case in oil-importing nations. Similarly, the study showed that inverse relationship between the oil-price and exchange rate prevails in the oil-exporting nations, while the connection linking oil-price and the exchange rates in oil-importing countries is uncertain.

(Rickne, 2009) Use a panel of 33 oil-exporting countries for the period 1985-2005 to empirically investigate the role of strong political and legal institutions in the relationship between the oil price and the real exchange rates of oil-exporting countries. A simple theoretical model in which the influence of oil price movements on the real exchange rate of an oil-exporting economy was assumed to depend on the degree of myopia in government spending of oil revenue was developed. Eight good governance indicators empirically believed to affect the spending pattern of governments was evaluated on a panel of 33 oil-exporting countries. The implications of this empirical finding are: that, oil-exporting countries with strong and efficient institutions can by-pass the resource curse often associated with a volatile real exchange rate. Similarly, the results provide an insight into the controversies in the empirical literature regarding the real exchange rate determination in oil-producing economies. It can further be deduced that favourable institutions are responsible for the lack of strong positive price effect in heavily oil-dependent economies such as Norway, Canada or Saudi Arabia.

(Suleiman & Muhammad, 2011) using VECM with annual data covering the period 1980-2010 to investigate whether fluctuations in oil price and productivity differentials affects the real effective exchange rate in Nigeria. Findings of the study indicated that, whereas real oil-price exerts a significant positive impact on the real exchange rate in the long-run, the productivity differential exerts a negative impact on the real exchange rate. The study further revealed that the real exchange rate appreciation experienced during 2000-2010 was largely driven by a rise in oil prices because that was a period of high oil prices and exports, oil-exporting nations experienced large flows of foreign exchange revenue. Thus, a long-run positive and significant relationship existed between the real exchange rate and real oil price in Nigeria. Lastly, the study implied that effective exchange rate policy in developing countries where oil exports constitute the large share of exports is very relevant.

(Alfred & Syed Abul, 2017) used the SVAR model to examine how the exchange rates of six major oil-exporting countries with a flexible exchange rate policy respond to an oil price shocks. The study considers logistic (asymmetric) and exponential (symmetric) smooth transition adjustments of real and nominal exchange rates for the six major oil-exporting economies in response to different oil prices shocks. Empirical findings showed that overall oil supply shocks have no significant impact on real and nominal exchange rate returns of oil-exporting countries, both for linear and nonlinear specifications. Nominal and real exchange rates are driven by crude oil demand instead, which in turn is influenced by fluctuations in the global business cycle and the demand for industrial commodities. Moreover, the study also revealed that direct oil supply and demand shocks do not have asymmetric effects on real and nominal exchange rate returns. The effects, if at all significant, can either be linear or symmetrically nonlinear. The study thus finds empirical support for
nonlinear asymmetric effects of aggregate demand shocks.

(Jahan-Parvar & Mohammadi, 2011) Make use of an ARDL model on a monthly data sampled from fourteen countries to formally test the Dutch disease hypothesis, through examining whether of not long-run relationship existed between real oil prices and real exchange rates. The ARDL and Bounds test co-integration results showed that stable long-run relations exist between real oil prices and real exchange rates in all countries, thus affirming the Dutch disease assumption. Similarly, a short-run unidirectional causal connection from oil prices to exchange rate in four countries is found, and causality from exchange rates to oil prices is evidenced in two countries, and evidence of bidirectional causality was found in four countries whereas neither unidirectional nor bidirectional causality was found in the remaining nations. Findings of this study implied that the Dutch disease problem ensued over time and recommends that monetary authorities of developing oil-exporting economies be vigilant to counter the potential negative impacts of oil windfalls.

Furthermore, (Jin, 2008) conduct a study involving Russia, China and Japanese economies to investigate how oil price and real effective exchange rate affects the real economic activities of these countries. Results of the VAR analysis used in the study indicated that an increase in oil price exerts a significant positive impact on the Russian economy, whereas, higher oil prices negatively impacts the growth of Japan and Chinese economies. Empirical results precisely showed a sustained rise in oil price by 10% may lead to a 1.67% growth of Russian GDP and a similar decline in Japanese GDP. In the same vein, hike in oil prices leads to positive growth of GDP and appreciation in the real exchange rate of the Russian economy, the opposite is the case in the Japanese economy.

Nevertheless, (Rano, 2009) on a study that was aimed at assessing the impact of the oil price shock and volatility of real Exchange rate on the level of economic activity in Nigeria, found that oil price and real exchange rate volatilities Granger cause real GDP in Nigeria. Similarly, the long-run analysis of his study further indicated that a 10% permanent increase in crude oil prices raises real GDP by 7.72%. Similarly, exchange rate appreciation of 10% increases GDP by 0.35%. The study used a VAR model on a quarterly data that span the period of 1986-2007, in which the long-run response of real GDP to an oil price and exchange rate volatility was tested through a Johansen VAR-based co-integration, whereas VECM was used for short-run analysis.

In the same vein, (Ononugbo, et al 2018) employ the techniques of ARCH-GARCH and ARDL-ECM to examine the impact of oil price volatility on GDP, inflation, exchange rate and interest rate in Nigeria, on a monthly time-series data for the period of 2000-2015. Result of their study showed that volatility of the oil prices have a positive impact on real GDP, but significantly worsen exchange rate, in that a rise in oil price volatility lead to depreciation in the value of Naira by more than a proportionate amount. The study concludes that the effect of oil price fluctuations on the economy passes through the exchange rate channel.

Furthermore, (Mathew & Ngalawa, 2017) applied Panel Structural Vector Autoregressive (PSVAR) estimation technique to assess empirically the oil price shocks transmission processes and their impact on economic performance within the monetary framework of the net oil-exporting African economies within the period of 1980-2015. Variables of the study are GDP, rate of inflation, money supply, bank rate, exchange rate, and unemployment and oil price. Results of the data analysis data revealed a significant response to the oil price shocks by the included variables, similarly, a significant positive connection between oil price and the GDP of the oil-exporting African economies was found. Thus, the oil price has a large impact on the macroeconomic performance of these economies, further, the impacts of the oil price shocks are transmitted via the medium of money supply, exchange rate and inflation.

In the same vein, (Ononugbo, et al., 2018) employ the techniques of ARCH-GARCH and ARDL-ECM to examine the impact of oil price volatility on GDP, inflation, exchange rate and interest rate in Nigeria, on a monthly time-series data for the period of 2000-2015. Result of their study showed that volatility of the oil prices have a positive impact on real GDP, but significantly worsen exchange rate, in that a rise in oil price volatility lead to depreciation in the value of Naira by more than a proportionate amount. The study concludes that the effect of oil price fluctuations on the economy passes through the exchange rate channel.

In the same vein, (Akpan, 2009) using quarterly data for the period 1970-2007 Analyses the dynamic relationship between oil price shocks and major macroeconomic variables in Nigeria using a VAR approach. Findings of the study revealed that oil price shocks do not significantly affect industrial output in Nigeria. Positive oil shocks directly increase the domestic money supply, national income and government expenditure indicating high monetization of the oil revenues. Similarly, positive oil price shocks give rise real exchange rate appreciation thus affirming the “Dutch Disease” syndrome observed through significant real effective exchange rate appreciation. Furthermore, the study found that positive as well as negative shocks to oil price significantly increase inflation.

(Terfa, 2016) Apply the ARDL techniques on the Daily data of All Share Index of the Nigerian stock market,
crude oil prices and exchange rate for two periods: 2008-2009 and 2012-2015 to examine the effect of crude oil price movement on the Nigerian stock market and the role of the exchange rate as a countercyclical policy tool. No causality was found between exchange rate and crude oil price movement in Nigeria during the 2008 global financial crisis, however, causality was found from the stock market to crude oil prices in the first lag and at higher lags they are granger causing each other. Results from the ARDL model shows a positive relationship between oil prices and performance of the Nigerian stock market, this implies that a negative oil price shocks would drag the market down in times of turmoil. Naira devaluation was found to be effective in cushioning the effect of negative oil price shocks on the stock market performance.

(Almulali, and B. Che Sab 2013) conduct a study to investigate the impact of oil revenues on the macroeconomy of the OPEC countries using a panel model of data analysis between the period of 2000–2011 a period in which the OPEC member countries experienced high levels of oil prices resulting to large flows of oil revenues to the OPEC countries. The results of the analysis indicated that oil revenues have significant long-run and short-run positive relationship with GDP, domestic investment, government expenditure and the consumer price index (CPI). However, the relationships between oil exports revenues and real exchange rate, gross domestic savings and current account balances were found to be negative both in the short run and long run. The study recommends the OPEC member countries to increase their domestic savings by controlling their level of domestic consumption, equally recommended was the adoption of a more flexible exchange rate regimes by these countries.

(Shafi & Liu, 2014) Employ the use of Vector Error Correction Method (VECM) on an annual time series data between 1971-2012 to identify the impact of oil prices and risk exposure of exchange rate volatility on Russian economic growth. The study found that oil prices and the exchange rate have a positive relation with economic growth of Russia; the rise in oil prices affects the GDP growth and Russian exchange rate positively. Similarly, a rise in the exchange rate will also increase GDP. Furthermore, imports, exports, interest rate, inflation, government consumption expenditure and foreign direct investment were found to have a significant effect on the exchange rate. However, Interest rate, inflation, government consumption and import of Russia are positively related to the exchange rate while the exports and real effective exchange rate are found to have negatively related.

(Azman Aziz & DAHALAN, 2015) Investigates the asymmetric effects of oil price shocks on real economic activities in ASEAN-5 from 1991 to 2014, using an unrestricted (PVAR) method. Evidence of the asymmetric relationship between oil prices and economic activities of these countries were found. Positive oil price shocks negatively affect output growth of the ASEAN-5 economies both in the short run and in the long run. i.e., the economies of the ASEAN-5 experience a short-run growth following a rise in oil price, however, a sustained increase in oil price lead to a decline in the GDP of these countries declines in the long run. Thus, the GDP of ASEAN-% countries responds negatively to a positive oil price shocks in the long term and increase in oil prices contribute about the same proportion to the variability of GDP, real exports, real imports and inflation than that of oil price decreases.

Similarly, (Kibunyi, Nzai, & Wanjala, 2018) conduct a study using an (ARDL) model on a time series data of Kenya between the period of 1970-2016, to empirically investigate how changes in oil price affect the growth of GDP and other macroeconomic indicators in Kenya. The study was especially aimed at assessing how fluctuations in the price of crude oil affect the growth of Kenyan GDP growth, Inflation and Real exchange rate. The findings of the study revealed that Crude Oil Prices significantly affect the GDP growth in the long-run; this is largely because Kenya imports oil for re-sale by exporting it to Uganda, Rwanda, and South Sudan. The study further revealed that crude oil price have both long-run and short-run effect on inflation, however, in the short run it was found that oil price affects inflation with a lag of one, that is, last year’s oil prices affect the current year’s inflation rate. However, the relationship between crude Real Exchange Rate and oil price, in the long run, was found to be negative.

From the empirical review of the observed studies, mixed outcome regarding the impact of oil price shocks on the exchange rate and economic growth is observed. Findings of these studies indicated that economic growth and exchange rate reacts differently to oil price shocks in different countries. However, this study differs from the previous studies in terms of duration and the analytical method employed.

2. Data And Methodology

This study is aimed at examining the effect of oil price fluctuations on the macroeconomic performance in Nigeria, the key macroeconomic variables that made up the sample of this study are; GDP, Exchange Rate, Oil Price, Oil Export, Foreign Exchange Reserve, interest and inflation. Thus, annual data of these variables data for the period 1981 to 2019 were collected. This period is chosen to capture most episodes of oil shocks ranging from the 1980s due to Iran-Iraq, the first Persian Gulf War in 1990-91, the oil price spike of 2003 – 2006, 2007-2008 and the oil price slump of 2014-2015. The data for the study was obtained from the CBN statistical Bulletins, World Bank and National Bureau of Statistics.
Variables for which the data were sourced include; GDP, Oil price, Oil Export, Foreign Exchange Reserve, Inflation, Exchange Rate, the Interest rate for the period 1981-2019.

GDP was chosen as the proxy for economic growth because it is the most important of all the macroeconomic variables, as it is used to measure the total output of goods and services of a given economy. It is an indicator of the economic performance of a country for a given period. A rapidly growing GDP is an indicator of economic prosperity (Bodie et al. 2008).

3.1. Empirical Methodology

This study employs the use of Autoregressive Distributed Lag econometric technique to investigate the long run and short-run impact of oil price shocks on GDP and Exchange. Bound test approach for co-integration and ARDL Model will be used to determine the existence as well as the impact of Oil price shocks on Exchange Rate and Economic Growth in the long run and short run. To achieve this objective, two-equation will be estimated, one with GDP as the dependent variable and the other with Exchange Rate as the dependent variable. To avoid the spurious regression estimates, the time-series properties of the variables will be tested using Augmented Dickey-Fuller (ADF) Phillips-Perron (PP) tests to determine the stationary level of the variables.

Some of the variables of the series were found to be stationary in their level form, i.e. of I(0) order of integration, while other variables are only stationary after first difference, i.e they are of I(1) order. For this, we employ a Bounds test co-integration approach and ARDL model to investigate the relationship among them. The ARDL procedure was developed specifically (Pesaran & Shin 1999) to investigate the short-run and long-run relationship between variables, this procedure has numerous advantages over other econometric models because it allows for analysis of the relationships among variables regardless of the order of integration of the regressors, whether integrated of I(0) or I(1).

3.2. Unrestricted Error Correction Model (Uecm) For Bound Test Cointegration Analysis

As a requirement for Bound test, UECM was established. The UECM is used to test for the existence of long-run co-integration among variables. The UECM equations are specified as:

For the GDP equation

\[ LGDP_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \Delta LGDP_{t-i} + \sum_{i=0}^{q} \alpha_{2i} \Delta LOILP_{t-i} + \sum_{i=0}^{q} \alpha_{3i} \Delta LOILXPT_{t-i} + \sum_{i=0}^{q} \alpha_{4i} \Delta LEXCHR_{t-i} + \sum_{i=0}^{q} \alpha_{5i} \Delta LEXITR{SV}_{t-i} + \delta \Delta LGDP_{t-i} + \beta_2 \Delta LOILP_{t-i} + \beta_3 \Delta LOILXPT_{t-i} + \beta_4 \Delta LEXCHR_{t-i} + \beta_5 \Delta LEXITR{SV}_{t-i} + \epsilon_t \]  

Where:

\[ L\text{GDP} = \text{Log of GDP} \]
\[ L\text{OILP} = \text{Log of Oil Price} \]
\[ L\text{OILXPT} = \text{Log of Oil Export} \]
\[ L\text{EXCHR} = \text{Log of Exchange rate} \]
\[ L\text{EXITR{SV}} = \text{Log of Foreign Exchange Reserve} \]
\[ L\text{INTR} = \text{Log of interest (lending) rate} \]

“\( \Delta \)” is the first difference operator, “\( \epsilon_t \)” is the error term.

For Exchange rate equation, the UECM specification is:

\[ L\text{EXCHR}_t = f(L\text{OILPV}, L\text{EXITR{SV}}, L\text{INFL}, \text{LINTR}) \]  

\[ L\text{EXCHR}_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \Delta L\text{EXCHR}_{t-i} + \sum_{i=0}^{q} \alpha_{2i} \Delta L\text{OILP}_{t-i} + \sum_{i=0}^{q} \alpha_{3i} \Delta L\text{EXITR{SV}}_{t-i} + \sum_{i=0}^{q} \alpha_{4i} \Delta L\text{INFL}_{t-i} + \sum_{i=0}^{q} \alpha_{5i} \Delta L\text{LINTR}_{t-i} + \delta \Delta L\text{GDP}_{t-i} + \beta_2 \Delta L\text{OILP}_{t-i} + \beta_3 \Delta L\text{EXITR{SV}}_{t-i} + \beta_4 \Delta L\text{INFL}_{t-i} + \epsilon_t \]  

Where:

\[ L\text{EXCHR} = \text{Log of Exchange rate} \]
\[ L\text{OILP} = \text{Log of Oil Price} \]
\[ L\text{EXITR{SV}} = \text{Log of Foreign Exchange Reserve} \]
\[ L\text{INTR} = \text{Log of interest (lending) rate} \]
\[ L\text{INFL} = \text{Log of inflation} \]

“\( \Delta \)” is the first difference operator, “\( \epsilon_t \)” is the error term.

To conclude with regards to the existence of long-run co-integration relationship among the variables, Wald test will be conducted using the equation, (2) and (4) above with Eviews 11 to get the F-statistics which will then be compared to lower and upper bound critical value of the (Pesaran et al. 2001). The null hypothesis for co-integration in equation (2) is \( H_0: \alpha_1 = \alpha_{2i} = \alpha_{3i} = \alpha_{4i} = \alpha_{5i} = \alpha_{6i} = 0 \). While the null hypothesis
for co-integration in equation (4) is stated as;
\[ H_0: \text{LEXCHR} \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = 0 \]

The rule of thumb is to reject the null hypothesis of no co-integration, if the F-statistics from the Wald tests are greater than their respective upper bound critical values, and accept the alternative hypothesis suggesting the existence of co-integration among the variables. Conversely, we fail to reject the null hypothesis of no co-integration among the variables if the computed F-statistic is less than the lower bound critical value. However, if the calculated F-statistic is neither above the upper bound nor below the lower bound critical values, no conclusion about the existence of co-integration among the variables can be reached.

3.2.1. The ARDL Model

To examine the long-run and short-run dynamic coefficients for the effect of oil price volatility on real GDP, Exchange rate and inflation, the ARDL model analysis will be conducted after the Bounds test analysis. The ARDL model will be specified as thus:

For GDP as the dependent variable,

\[
\begin{align*}
\text{LGDP}_t &= a_0 + \sum_{i=1}^{p} a_i \Delta \text{GDP}_{t-i} + \\
&\sum_{i=0}^{q} a_{2i} \Delta \text{LOILP}_{t-i} + \sum_{i=0}^{q} a_{3i} \Delta \text{LOILPXPT}_{t-i} + \\
&\sum_{i=0}^{q} a_{4i} \text{LEXCHR}_{t-i} + \sum_{i=0}^{q} a_{5i} \text{LINTR}_{t-i} + \epsilon_t
\end{align*}
\]

(5)

Where: \( p, q \) are the respective optimal lags for the variables and \( \epsilon_t \) is the error term.

For Exchange rate as the dependent variable:

\[
\begin{align*}
\text{LEXCHR}_t &= a_0 + \sum_{i=1}^{p} a_i \text{LEXCHR}_{t-i} + \\
&\sum_{i=0}^{q} a_{2i} \Delta \text{LOILP}_{t-i} + \sum_{i=0}^{q} a_{3i} \text{LEXRSV}_{t-i} + \epsilon_t
\end{align*}
\]

(8)

4. Empirical Results And Discussion

**TABLE 1: UNIT ROOT (STATIONARY) TESTS**

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>LEVEL</th>
<th>FIRST DIFFERENCE</th>
<th>ORDER OF INTEGRATION</th>
</tr>
</thead>
</table>

8
Table 1 is the stationary test results using Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) tests. The null hypothesis (Ho) is that the series has a unit root i.e. is a non-stationary and alternative hypothesis (H1) assumes no unit root i.e. the series are stationary. Results indicate that log of GDP, the log of Oil price, the log of Oil Export, the log of Foreign Exchange Reserve and log of Exchange Rate was stationary at the first difference I (1) while log of Inflation and Interest rates is stationary at level i.e. integrated of order zero I (0). The absolute value of computed Test Statistic for the ADF and PP tests were compared with the absolute critical value at 5%, if the test statistic value is greater than 5% critical value, we then reject the null hypothesis that the series have unit root and not stationary, thus confirming that the series has no unit root, and it is stationary.

<table>
<thead>
<tr>
<th></th>
<th>T-stats (ADF)</th>
<th>T-stats (PP)</th>
<th>P-value (ADF)</th>
<th>P-value (PP)</th>
<th>T-stats (ADF)</th>
<th>T-stats (PP)</th>
<th>P-value (ADF)</th>
<th>P-value (PP)</th>
<th>(ADF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loilp</td>
<td>-2.3315</td>
<td>-2.3315</td>
<td>0.4077</td>
<td>0.4077</td>
<td>-4.7145</td>
<td>-5.9980</td>
<td>0.0005</td>
<td>0.0000</td>
<td>I(1)</td>
</tr>
<tr>
<td>Lgdp</td>
<td>-2.4546</td>
<td>-3.0881</td>
<td>0.3473</td>
<td>0.1236</td>
<td>-4.2261</td>
<td>-4.2261</td>
<td>0.0020</td>
<td>0.0020</td>
<td>I(1)</td>
</tr>
<tr>
<td>Loilxpt</td>
<td>-1.0950</td>
<td>1.125797</td>
<td>0.9111</td>
<td>0.9167</td>
<td>-4.8948</td>
<td>-6.4030</td>
<td>0.0003</td>
<td>0.0000</td>
<td>I(1)</td>
</tr>
<tr>
<td>Lexch</td>
<td>-1.2525</td>
<td>-1.2516</td>
<td>0.8845</td>
<td>0.8847</td>
<td>-5.2050</td>
<td>-5.2050</td>
<td>-0.0001</td>
<td>0.0001</td>
<td>I(1)</td>
</tr>
<tr>
<td>Lextrsv</td>
<td>-2.9351</td>
<td>-3.2042</td>
<td>0.1637</td>
<td>0.0988</td>
<td>-5.6156</td>
<td>-6.9848</td>
<td>0.0000</td>
<td>0.0000</td>
<td>I(1)</td>
</tr>
<tr>
<td>Linfl</td>
<td>-4.6901</td>
<td>-3.2227</td>
<td>0.004</td>
<td>0.0953</td>
<td>-6.8897</td>
<td>-9.6237</td>
<td>0.0000</td>
<td>0.0000</td>
<td>I(0)</td>
</tr>
<tr>
<td>Lintr</td>
<td>-2.9536</td>
<td>-1.9903</td>
<td>0.0494</td>
<td>0.5878</td>
<td>-2.3519</td>
<td>-5.9680</td>
<td>0.1623</td>
<td>0.0000</td>
<td>I(0)</td>
</tr>
</tbody>
</table>

Source: Author’s Computations from Eviews 11 result output.

After ascertaining the order of integration of the variables through the Unit root tests, Bounds tests co-integration analysis will now be conducted to determine the existence or otherwise of long-run co-integration among variables of the study. The Bounds test for co-integration was chosen for this study due to the nature of different order of integration of the variables as revealed by the unit root test results. Some variables were of I(0) order, while others were integrated of I(1) order. Unlike the traditional co-integration approaches, which mandates that variables be integrated of the same order, i.e I(1), Bounds test co-integration allows for testing for co-integration among variables with a different order of integration. For this, therefore, the Wald test will be conducted, from which the F-statistics derived will be compared with the lower bound and upper bound critical values. The decision rule is to reject the null hypothesis of no co-integration if the F-statistics from the Wald tests are greater than their respective upper bound.

4.1. Bounds Tests Co-Integration Approach
critical values and conclude that long-run co-integration exists among the variables. On the other hand, we will fail to reject the null hypothesis of no co-integration among the variables if the computed F-statistic is less than the lower bound critical value. If the calculated F-statistic is neither above the upper bound nor below the lower bound critical values, no conclusion about the existence of co-integration among the variables can be reached.

### 4.2. Co-Integration Analysis For Real Gdp Equation

To obtain the appropriate lag structure for equation 7, unrestricted VAR was estimated, the lag orders up to the maximum of 3 were estimated, out of which the lag order with the smallest value of AIC was chosen, the serial correlation LM test was equally applied to test the presence of serial correlations in the residuals. the study chose to estimate equation 7 with 1 lag because at that lag length no serial correlation was found in the residuals and has the smallest value of AIC. The selected model was then used to conduct a Wald test. The null hypothesis for the Wald test, which suggests no co-integration among the variables in equation (9).

The Bounds test analysis for real GDP equation is presented in table 3 as follows:

**TABLE 2. Bounds test results for GDP equation**

<table>
<thead>
<tr>
<th>NUMBER OF THE VARIABLE(K)</th>
<th>WALD TEST F-STATISTICS</th>
<th>CRITICAL VALUES AT 5% LEVEL OF SIGNIFICANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>LOWER BOUND I(0)</td>
</tr>
<tr>
<td>5</td>
<td>12.21769</td>
<td>2.62</td>
</tr>
</tbody>
</table>

Source: extracted from the Bounds test results EVIDES 11.

Table 2 above presents the ARDL bounds test cointegration results. It can be seen from the results that the computed F-statistic derived from the Wald test higher than the upper bound I(1) critical value at 5% level of significance. Thus, we reject the null hypothesis of no co-integration among the variables of equation 7 and therefore conclude that there is evidence of a long-run relationship between GDP, Oil Price, oil export and other control variables in the equation.

### 4.3. Co-Integration Analysis For Real Exchange Rate Equation

The optimal lag length for Equation 8 as per the AIC and LM test for serial correlations is 1 lag also, thus the Exchange Rate equation will be estimated using 1 lag length because at that lag length no serial correlation was found in the residuals and has the smallest value of AIC. The selected model was then used to conduct a Wald test. The null hypothesis for the Wald test, which suggests no co-integration among the variables in equation (8).

**TABLE 3. Bounds Test Results for Real Exchange Rate Equation**

<table>
<thead>
<tr>
<th></th>
<th>WALD TEST F-STATISTICS</th>
<th>CRITICAL VALUES AT 5% LEVEL OF SIGNIFICANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>NUMBER OF THE VARIABLE(K)</td>
<td></td>
<td>LOWER BOUND I(0)</td>
</tr>
<tr>
<td>4</td>
<td>2.368060</td>
<td>2.86</td>
</tr>
</tbody>
</table>

Source: bounds test result output EVIDES 11.

Table 3 above present the results of the Bounds tests co-integration for the real Exchange rate equation, i.e equation 8 which tries to test the relationship between crude oil prices, real exchange rate and other control variables. real Exchange Rate was the dependent variable while, Crude oil prices, inflation, Interest rate and foreign exchange reserve are the explanatory variables. The results from the Wald test shows that the computed F-statistics is lower than the upper bound I(1) critical value at 5% level of significance. We, therefore, accept the null hypothesis of no cointegration and conclude that there exists no long-run relationship between the dependent variable (real Exchange rate) and the explanatory variables (Crude oil prices, Foreign exchange reserve and Real Interest rate and Inflation).

### 4.4. The Ardl Model

From the results of the Bounds test evidence of long-run co-integration among the variables was established for equation 7, none was found in equation 8, a long-run relationship exists among the variables in the GDP equation, while in Exchange rate equation no evidence of long-run relationship was established. and Inflation equation respectively. However, based on the wald test analysis, no long-run relationship exist between real GDP, Oil Price and the other variables included in equation 7. Therefore, the study applied ARDL model to determine the long-run and short-run coefficients for the impact of oil price changes on GDP on one hand, and the short-run coefficients for the impact of oil price shocks of real on real Exchange Rate on the other hand.
Equation (5), is the specification for the ARDL model for real GDP equation, the maximum lag order was set as 1 and the optimal lag length for each variable in the equation was selected based on the AIC.

Table 4. ARDL Model (1, 0, 1, 1, 0, 1) based on AIC

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>t-Statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LGDP(-1)</td>
<td>0.614504</td>
<td>10.40946</td>
<td>0.0000</td>
</tr>
<tr>
<td>LOILP</td>
<td>0.211773</td>
<td>2.390601</td>
<td>0.0238</td>
</tr>
<tr>
<td>LOILXPT</td>
<td>0.110764</td>
<td>1.689817</td>
<td>0.1022</td>
</tr>
<tr>
<td>LOILXPT(-1)</td>
<td>-0.114983</td>
<td>-1.896408</td>
<td>0.0683</td>
</tr>
<tr>
<td>LEEXTRSV</td>
<td>-0.015457</td>
<td>-0.285172</td>
<td>0.7776</td>
</tr>
<tr>
<td>LEEXTRSV(-1)</td>
<td>0.126470</td>
<td>2.383143</td>
<td>0.0242</td>
</tr>
<tr>
<td>LINTR</td>
<td>-0.409917</td>
<td>-3.216975</td>
<td>0.0033</td>
</tr>
<tr>
<td>LEXCHR</td>
<td>-0.072770</td>
<td>-0.905317</td>
<td>0.3730</td>
</tr>
<tr>
<td>LEXCHR(-1)</td>
<td>0.148318</td>
<td>1.820545</td>
<td>0.0794</td>
</tr>
<tr>
<td>C</td>
<td>7.511526</td>
<td>4.003004</td>
<td>0.0004</td>
</tr>
</tbody>
</table>

R-squared                  | 0.991296  |
Adjusted R-squared         | 0.988498  |
F-statistic                | 354.3174  |
Prob(F-statistic)          | 0.000000  |
B.G LM Test (P-value)      | 0.9422    |

Source: EVIEWS11 ARDL output results.

Table 4, above, presents the result of ARDL model estimates of real GDP equation. The ARDL (1, 0, 1, 0, 1) Model was estimated with the optimal lag length for each variable in the equation as per AIC. Furthermore, results of the diagnostic tests indicate no evidence of autocorrelation in the residuals and the model pass the stability test as can be seen from the CUSUM squared test. Similarly, the Adjusted R-squared indicates that 99.8% variation in the real GDP is accounted for by the variation in the explanatory variables. The F-statistic shows that the overall model is statistically significant at 1% level. Thus, having confirmed the fitness of the model, we can go ahead with the estimating the long-run relationship between Nigerian GDP, Oil Price, oil export and other variables of the equation.

Long-Run Coefficients Of LGDP Equation

Table 5 Long-run coefficients for the GDP equation Based were estimated on the ARDL (1, 0, 1, 0, 1) Model estimates and AIC, as presented in the table below

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>T-Statistic</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOILP</td>
<td>0.858092</td>
<td>6.101826</td>
<td>0.0000</td>
</tr>
<tr>
<td>LOILXPT</td>
<td>-0.112078</td>
<td>-1.214206</td>
<td>0.2333</td>
</tr>
<tr>
<td>LEEXTRSV</td>
<td>0.112860</td>
<td>1.047494</td>
<td>0.3025</td>
</tr>
</tbody>
</table>
From the above table, it can be seen that the coefficients of Oil price, interest rate and exchange rate are all statistically significant at 1%, however, oil export and foreign exchange reserve were not significant. The long-run coefficients of Oil Price and Exchange rate are positive, indicating that the increase in oil price and Exchange rate appreciation contributes to the growth of Nigerian GDP in the long run. The result implies that a persistent increase in oil prices by 1% will lead to a 0.85% increase in economic growth proxies by the GDP.

Similarly, appreciation in the Naira-Dollar exchange rates by 1% leads to a 0.29% increase in GDP. This is consistent with the empirical findings of (Kaplan, 2015), who in his attempt to investigate the relationships between oil prices, exchange rate and economic growth in Russia find similar results, his findings were that a 1% increases in oil prices lead to 0.12% increase in the economic growth of Russia. However, the coefficient of interest rate is negative which is as expected; this affirms the inverse relationship between the interest rate and GDP, a 1% increase/ decrease in interest rate will results in 1.2% decrease/increase in GDP respectively. This finding implies that oil price, exchange rate and interest rate are significant determinants of economic growth in Nigeria, and the result confirmed the findings of (Aliyu, 2009) who find that oil price shocks and exchange rate appreciation positively impact economic growth in Nigeria.

The Short-Run Coefficients For The LGDP Equation, (ECM Version Of ARDL Model).

Having determined the long-run coefficients, the study, therefore, applies the ECM version of ARDL model specified in equation (7) to obtain the short-run coefficients for the relationship between Oil Price, GDP and other variables of the GDP equation and the speed of adjustment term. Table 6 present the results for the short-run coefficients for the real GDP equation based on the ARDL (1, 0, 1, 1, 0, 1) Model as per the AIC.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>t-Statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>D(LGDP(-1))</td>
<td>0.148528</td>
<td>1.326859</td>
<td>0.1961</td>
</tr>
<tr>
<td>D(LOILP)</td>
<td>0.398552</td>
<td>3.924620</td>
<td>0.0006</td>
</tr>
<tr>
<td>D(IOILXPT)</td>
<td>0.031975</td>
<td>0.491507</td>
<td>0.6272</td>
</tr>
<tr>
<td>D(IOILXPT(-1))</td>
<td>-0.043287</td>
<td>-0.746625</td>
<td>0.4620</td>
</tr>
<tr>
<td>D(LEXTRSV)</td>
<td>-0.048597</td>
<td>0.491507</td>
<td>0.6272</td>
</tr>
<tr>
<td>D(LEXTRSV(-1))</td>
<td>0.157104</td>
<td>3.108189</td>
<td>0.0045</td>
</tr>
<tr>
<td>D(LINTR)</td>
<td>-0.0309358</td>
<td>-1.871000</td>
<td>0.0726</td>
</tr>
<tr>
<td>D(LEXCHR)</td>
<td>-0.070696</td>
<td>-0.929296</td>
<td>0.3613</td>
</tr>
<tr>
<td>D(LEXCHR(-1))</td>
<td>-0.010058</td>
<td>-0.125691</td>
<td>0.9009</td>
</tr>
<tr>
<td>ECT(-1)</td>
<td>-0.222918</td>
<td>-2.300032</td>
<td>0.0297</td>
</tr>
</tbody>
</table>

C 0.031091 1.074513 0.2925

Source: EVIEWS 11. Results output

R-squared 0.776095

Adjusted R-squared 0.689978

F-statistic 9.012093

Prob(F-statistic) 0.000003

Results from table 6 above, indicates that the coefficient of error correction term, ECT (-1), is negative which is correctly signed and is also statistically significant at 5% level. This confirmed that the long-run relationship exists among the variables of the equation as established by the Bounds test. The ECT (-1) known as the speed of adjustment is the lagged value of error terms derived from the long-run estimates. The ECT(-1) i.e the speed of adjustment indicate the rate at which the long-run equilibrium is restored after the short-run disequilibrium. The -0.222918 value of ECT coefficient in the model implies that about 22.3% disequilibrium in the previous
year is corrected in the current year. The short-run result above is consistent with the long-run findings as all most of the variables are correctly signed. Oil price in the short run have a positive and significant impact on economic growth, the result of the estimate indicates that a 1% increases in oil price will result in 0.39% increase in GDP; this is consistent with the long-run findings. Similarly, at a lag of one period, foreign reserve exerts a positive and significant impact on economic growth in the short run, a rise in external reserve by 1% lead to 0.16% increase in GDP. However, oil export in the short run have a positive but insignificant impact on the economic growth in the short run, a 1% increase in oil export will lead to a 0.03% increase in GDP. The coefficient of interest rate in rightly signed, but is only significant at 10% level in the short run, an increase in the rate of interest by1% will lead to a decline in economic growth by 0.3% in the short run. Exchange rate coefficient in the short run has a negative and insignificant influence on GDP. The adjusted R-squared of 0.6899 means that the explanatory variables account for 68% variation in GDP, the F-statistics indicate that the overall model is significant at 1% level of significance.

**Model Estimates For Exchange Rate Equation**

**TABLE 6 ARDL (1, 1, 1, 0, 1) BASED ON AIC**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>t-Statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEXCHR(-1)</td>
<td>0.989247</td>
<td>10.92474</td>
<td>0.0000</td>
</tr>
<tr>
<td>LOILP</td>
<td>-0.023957</td>
<td>-0.130141</td>
<td>0.8974</td>
</tr>
<tr>
<td>LOILP(-1)</td>
<td>-0.327915</td>
<td>-1.758950</td>
<td>0.0891</td>
</tr>
<tr>
<td>LEXTRSV</td>
<td>-0.144353</td>
<td>-1.010493</td>
<td>0.3206</td>
</tr>
<tr>
<td>LEXTRSV(-1)</td>
<td>0.236880</td>
<td>2.024774</td>
<td>0.0522</td>
</tr>
<tr>
<td>LINFL</td>
<td>-0.082147</td>
<td>-0.879839</td>
<td>0.3862</td>
</tr>
<tr>
<td>LINTR</td>
<td>0.693073</td>
<td>2.161944</td>
<td>0.0390</td>
</tr>
<tr>
<td>LINTR(-1)</td>
<td>-0.780732</td>
<td>-2.431195</td>
<td>0.0215</td>
</tr>
<tr>
<td>C</td>
<td>-0.202742</td>
<td>-0.056721</td>
<td>0.9552</td>
</tr>
</tbody>
</table>

| R-squared    | 0.987702    |
| Adjusted R-squared | 0.984309 |
| F-statistic  | 291.1306    |
| Prob(F-statistic) | 0.000000 |
| BG Serial Correlation LM Test | 0.1281 |

Source: EVIEWS 11. Results output

Table 6 above, present the results of the ARDL model estimated for Exchange Rate equation. The ARDL (1, 1, 1, 0, 1) Model was estimated with the optimal lag length for each variable in the equation as per AIC. Results of the diagnostic tests indicate no evidence of autocorrelation in the residuals and the model pass the stability test as can be observed from the CUSUM squared test. Similarly, the Adjusted R-square indicated that 98.4% variation in the Exchange rate is accounted for by variation in the explanatory variables. The F-statistic shows that the overall model is statistically significant at 1% level. Having confirmed the fitness of the model, we thus go ahead with the estimation of the short-run dynamic relationship between real Exchange rate, Oil Price and other control variables.
The table above presents the results of the short-run analysis for Exchange Rate equation, the equation investigated the short-run effects of the oil price shock as well as other explanatory variables on the exchange rate. It can be seen that the change in oil price has a coefficient of -0.479043 and is statistically significant at 5% level. Similarly, the coefficient of interest rate is given as 0.827864 and is also statistically significant at 5% level. The other coefficients were not statistically significant. This implies that the oil price and interest rate are significant determinants of the exchange rate in Nigeria in the short run. The result indicates that a 1% increase/decrease in oil price leads to a 0.47% reduction/increase in Exchange rate, respectively. The estimate further shows that an increase in interest rate by 1% leads to a 0.82% increase in the exchange rate in the short run. This finding implies that oil price fluctuations have a substantial impact on exchange rates in Nigeria.

Findings of the study reveal that Crude Oil prices exert a positive long-run and short-run impact on the Nigerian GDP, this can be attributed to the fact that Nigeria is an oil-rich country and the economy depend heavily on the export of oil for revenue. This result is consistent with the expectation that the GDP of the net oil-exporting economies like Nigeria is very much affected by oil prices. Empirical evidence showed that Nigerian GDP is affected by changes in the price of oil both in the short run and long run. Thus, it can, therefore, be concluded that the long-run relationship between the Nigerian economy and oil price exists. Similarly, a long-run relationship existed between exchange rate and GDP in Nigeria, however, it can also be concluded that the exchange rate does not have any impact on the GDP in the short run, but foreign exchange reserve does have a short-run impact on the GDP. The study further finds that oil price has no long-run impact on exchange in Nigeria, but there exists a short-run relationship between oil prices and exchange rate in Nigeria. The study can, therefore, further concludes that oil price changes have a significant impact on the exchange rate in the short run.

5. Conclusion And Policy Recommendation

This study investigated the impact of Crude oil prices on some selected macroeconomic variables in Nigeria, notably, GDP and Exchange Rate for the period 1981 – 2019. For this purpose, two models were estimated using Autoregressive Distributed Lag (ARDL) model, an econometrics model developed by (Pesaran, 2001). This method was selected because it allows for the estimation of both short-run and long-run relationship among economic variables and also due to its ability to produce unbiased long-run estimates and valid t-statistics regardless of whether or not the explanatory variables are endogenous. Similarly, ARDL method of estimation chosen for the analysis of this study due to its superiority over other econometric approaches, for it allows for analyzing the relationship between economic variables of their order of integration, the variables can be integrated of order zero or one, i.e., I (0) or I (1). It is also amenable to small sample size.

Given the volatile nature of oil prices and it's being the major source of Nigeria’s export earnings, the Nigeria Policymakers should focus on how to stabilize the macroeconomic structure of Nigeria by diversifying into alternative sources of export earnings apart from oil from the crude oil. The study further recommends saving of the oil proceeds during the oil boom periods to cushion the effect of the future negative oil shocks and Fiscal discipline through the reduction in wasteful expenditures during the oil boom periods.
Bibliography


