OIL PRICE FLUCTUATION AND FOREIGN RESERVES IN NIGERIA

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Danjuma, Irinyang Joro
Agya, Atabani Adi
Department of Economics,
Faculty of Social Sciences
Federal University Wukari, Taraba Sate, Nigeria
Corresponding author: *danjumairinyang@gmail.com*

Abstract

This paper examines the effect of oil price fluctuation on foreign reserves in Nigeria, using quarterly data from the first quarter of 1986 to the second Quarter of 2020 (1986: Q1-2020: Q2). The paper employed the Autoregressive distributed lag method (ARDL) and Augmented Dickey-Fuller (ADF) unit root test. Results showed that oil price has positive and significant effect on foreign reserves in the long and short run, and crude oil production has a significant positive effect in the long and negative short run. At the same time, the real exchange rate was negatively significant in the long run and insignificant in the short run and 93% of the disequilibrium in the short run is corrected each quarter. The paper concludes that an increase in oil price leads to accumulation of foreign reserves in Nigeria while depreciation of the exchange rate leads to depletion of foreign reserves. The paper recommends the incorporation of oil price change when formulating and implementing macroeconomic policies such as foreign reserve holding and exchange rate policy.

Keywords: Exchange rate, foreign reserves, oil price, ARDL method, Nigeria

Introduction

Oil price fluctuation has become critical in global economic policies and politics. The world cannot do without crude oil as it remains the essential commodity driving global production (Jelilov, Abdullahi, Bilal & Abdurrahman, 2020). Oil price fluctuation refers to instability, changes, or a rise or fall, in the supply or demand side of oil prices in the international oil market. The rise of flux in oil prices can be termed positive (that is a rise) or negative (that is a fall) (Jelilov, Abdullahi, Bilal & Abdurrahman, 2020; Farzana, & Sakib, 2021). Both oil exporting and importing countries

are likely to feel the effects of oil price fluctuations (Sayed, 2016). For example, a fall in oil price will lead to depletion of the foreign reserve, which results in depreciation of the local currency exchange rate and loss of appetite by foreign investors for local currency-denominated stocks of the net oil exporter. While the opposite holds for net oil importers, domestic price level and cost of production will fall, accumulation of foreign reserves which lead to the appreciation of the domestic currency and an increase in demand for local currency-dominated stocks of the net importer. Akpan (2016) opined that oil prices have traditionally been traced to supply-side disruptions such as OPEC supply quotas, political upheavals in the oil-rich Middle East and militancy in the Niger Delta region. Oil price fluctuations affect the economy through supply, demand, and trade terms (Iftikhar, Shahid, Salim, Heesup, Alejandro & Antonio, 2022). The direction of the oil price fluctuation will have either a positive or negative impact on the economy. The fluctuations in oil prices have become a concern for governments around the world, policymakers, and market practitioners in the oil business and international business organizations, as a result of intense international politics and global market competition on oil price policies (Jelilov, Abdullahi, Bilal & Abdurrahman, 2020). These fluctuations have affected several economies worldwide, including the developed economies. Ajibola, Udoette, Omotosho, and Muhammad (2015) observed that changes in global oil market prices bring about a tremendous effect on economic growth, especially in the real sector.

The benefits of foreign reserves cannot be overemphasized. Accumulation of foreign reserves enhances foreign debt service and international trade activities. It serves as self-insurance against external shocks, serves as a tool for maintaining a stable exchange rate, promotes trade and international competitiveness, mirrors the creditworthiness in the eyes of other countries, creditors and donors payments, supports monetary policy operations, enhances transaction needs, fosters confidence in the government policy framework and its capacity to meet external obligations (Kashif, Sridharan, & Thiyagarajan. 2017, World Bank 2019, Samuel, Efuntade & Olusegun, 2019). Nigeria has substantially lost income from oil price fluctuation and has to fund its annual budget mainly from borrowed funds and perhaps from recovered loot. It is also argued that Nigeria is faced with consistently devalued living standards. The current living standard in Nigeria shows that about 60% of its citizen lives below one dollar per day (Sayed, 2016). There are instances where economic activities stagnated due to the government's inability to implement its fiscal and monetary policies. In a bid to avert an oil price shock orchestrated by the fluctuation of crude oil price in the international market, the government established Sovereign Wealth Fund (SWF), but the benefits of SWF in the event of an oil price

dip are yet to be seen. Consequently, jobs are being lost daily, the public sector struggles to pay salaries, and the government consistently faces the challenge of foreign exchange volatility and budget deficit.

The issue of the foreign reserve has been a topic of discussion among researchers and policymakers since countries began to trade among themselves, and researchers have identified it as an indicator of the financial strength of an economy (Kashif, Sridharan & Thiyagarajan, 2017, and Samuel, Efuntade & Olusegun, 2019).

The plunge in oil price and its volatile behaviour has resulted in the depletion of Nigeria's foreign reserves and the devaluation of the Naira, among others. For instance, in the 2008 pre-crisis period, Crude oil prices rose from $25.6 to $138.76 per barrel, thus leading to a rise in the external reserves from $5.8 billion to $62.1 billion. During the global crisis, the fall in crude oil prices leads to the depletion of external reserves to an average of $46.5 billion. In the post-crisis, the crude oil price has been below $50 per barrel, and external reserves continue to decline to $30 billion as of November 26th, 2015 (CBN, 2016). the decline in the oil price to $43.67 led to a fall in external reserve to $26 billion. This situation led the local currency to depreciate from #191.80/$1 in 2015 to #253.09/$1 in 2016. Consequently, the economy falls into recession for the second time in 4 years (CBN, 2016). The last epistle of decline in crude oil price was witnessed in 2020 when it fell to $41.96 due to the COVID-19 outbreak in late 2019. Again the foreign reserves were massively hit. It led to a fall from its peak in 2018 of $44 billion to $35 billion as of December 2020. The Naira experienced tumultuous volatilities and depreciated from #305/$1 in 2018 to #385/$1 in 2020, setting off another round of recession in Nigeria (CBN, 2021). The picture depicted above clearly shows a somewhat correlation between oil price and foreign reserve as well as exchange rate and the need to account for recent development in this relationship cannot be overemphasized to shed new light on the relationship. This study examines the long-run relationship between oil prices and foreign reserves and the dynamic effect of oil prices on foreign reserves in Nigeria.

The study contributes to the literature by enriching our understanding of the relationship between oil price, foreign reserve and exchange rate by accounting for recent development in the economy. The study used quarterly data instead of the usual annual data used in earlier studies and employed the autoregressive distributed lag method to capture the dynamic effect of oil prices on foreign reserves in Nigeria. The paper is structured as follows: following the introduction is section II, a literature review on the nexus between oil price and foreign reserve; Section III concerns itself with its methodology. Section IV deals with empirical analysis and

discussion of results, while section V concludes and provides recommendations.

Fluctuation of Oil Prices and Performance of the Nigerian Economy

The fluctuation of oil prices has tremendously affected the Nigerian economy because the Nigerian economy has been considered a mono-economy highly dependent on crude oil export. Thus, Nigeria's macroeconomic fundamentals become unstable whenever there is a fall in global crude oil prices; studies examining this relationship between oil prices and foreign reserves in the past have mixed results. Hameed, Shafi, and Nadeem (2021) examined the volatility spillover effect between oil prices and exchange rate for 5 major oil importers (Pakistan, India, China, Japan, and Germany). 5 major oil exporters (UAE, Canada, Iraq, Russia, and Saudi Arabia), adopted Diebold and Yilmaz (2012) methodology. The study revealed that oil price volatility spillover to exchange rate differs between oil exporters and importers. In comparison, oil prices have a more significant volatility spillover effect on oil exporting countries than oil importing countries. Also, Agbo (2021) examined the impact of oil price fluctuations on Naira exchange rate movements. They used monthly data from January 1997 to August 2020 and employed the Nonlinear Autoregressive Distributed Lag technique. They found that both increases and decreases in oil prices have the opposite impact on the exchange rate, but only a decrease in oil price considerably impacts the exchange rate. As a result, a fall in oil price has a more robust and potent impact on the exchange rate in Nigeria than an increase in oil price, and an asymmetry effect exists between changes in oil prices and exchange rates. Rotimi, Ojo, and Babatunde (2018) as cited in Agbo (2021) examined the impact of oil price fluctuation on the exchange rate, using monthly data from 1980 to 2017 and employed Cointegration and Granger Causality test. The study found that the long-run relationship between the variable in the model and oil price has a significant positive impact on the exchange rate in Nigeria.

Akindapo, Egbuta and Adegorite (2020) examined the impact of oil price volatility, revenue and other macroeconomic variables on economic growth from 1983 to 2019. The study employed descriptive, ordinary least square (OLS), Cointegration test, Vector Error Correction Model and Granger Causality Test. They found that oil price volatility, foreign exchange, and interest rates significantly affect Nigeria's economic activity. Motunrayo and Nicholas (2020) examined the impact of oil prices on economic growth in seven low-income Sub-Saharan African (SSA) oil-importing nations, namely Ethiopia, Gambia, Mali, Mozambique, Senegal, Tanzania, and Uganda. The study employed linear/Non-Auto Regressive Distributive Lag (NARDL). They found that in the short run, the oil price has little impact on the group's economic growth while it impacts economic

growth negatively in the long run and oil price fluctuation has an asymmetric impact on these economies. Nwoba, Nwonu, and Agbaeze (2017) examined the correlation between oil price shocks and economic growth indices from 2011 to 2015 and employed Pearson product-moment correlation and OLS. They found that the oil price shock considerably impacts foreign exchange earnings.

Similarly, Sunday (2019) examined the relationship between oil price volatility and infrastructural growth in Nigeria for the period spanning from 1981 to 2015. The study employed Cointegration and error correction model. The study revealed that oil price volatility, inflation rate and interest rate have a significant negative impact on infrastructure growth while the interest rate is insignificant, whereas genuine exchange rate appreciation had a significant positive impact on infrastructure growth.

Jungo and Kim (2019) examined the impact of oil price variations on currency rates in SSA nations, and the study adopted a nonlinear autoregressive distributed lag model. They found that changes in oil prices have asymmetric impacts on real exchange rates over time; that is, real exchange rate movements in selected SSA nations appear to respond more to increases in oil prices than declines in the long run and symmetry in the short run. In this vein, Henry (2019) examined the impact of oil price volatility on the Naira Exchange rate for the period spanning from 1986 to 2015 and employed Autoregressive Distributed Lag (ARDL) Bounds testing approach. The study revealed that the variables in the model were Cointegrated. Also, the result revealed a significant negative impact of crude oil price volatility on exchange rates in the long run. However, it was negative and insignificant in the short run. Olayungbo (2019) examined the causal relationship between oil prices, exchange rate, trade balance and foreign reserves. The study covered the period from the 4th quarter of 1986 to the 1st quarter of 2018 (198:4-2018:1). They employed Cointegration and Granger causality test. They found a cointegration relationship between oil price and foreign reserve, and there were no causal linkages between oil price and trade balance or oil price and exchange rate. In a related study, Izekor and Aigbovo (2018) examined the impact of crude oil price shocks on Nigeria's foreign reserves. The study covered the period from 1993 to 2017 and employed a causality test. The study found that crude oil price shock does not cause depletion of foreign reserves in Nigeria. Also, Osuji (2015) examined the effect of oil price changes on foreign reserves. The study used monthly data for the period from 2008 to 2014 and the granger causality test. The study found oil price has a negative significant impact on foreign reserves. Similarly, Uguru (2015) examined the effect of oil price volatility, foreign exchange rate volatility on external reserves in Nigeria. The study used monthly data from 1999 to 2009. The study found

a direct link between oil price fluctuations, exchange rate instability and external reserve in Nigeria.

Nwafor (2017) examined the impact of external reserve on exchange rate and economic growth in Nigeria. The study used annual data from 2004 to 2015. The study found external reserves has a negative significant impact on exchange rate and Nigeria's economic growth over the study period. Bal and Rath (2015) and De Vita, Trachanas (2016) examined the causality link between oil price and real exchange rate in China and India for the period of 1994 to 2013. The study employed nonlinear Granger Causality. They found strong bi-directional nonlinear relationship between oil price and exchange rate in both countries. Altartui et al. (2016) examined the relationship between West Texas Intermediate (WTI) oil prices and OPEC countries exchange rates for the period from 1999 to 2016 and employed wavelet methods. The study found oil price has a significant impact on the exchange rate of OPEC countries. In the same vein, Basher, Haug, and Sadorsky (2016) examined the impact of oil shock on the exchange rate of oil exporting countries, they used monthly data for the period from 1976 to 2014 and employed the SVAR method. They found that oil shocks exert significant pressure on exchange rates of oil exporting countries, but there is no evidence that oil supply shocks influence exchange rates. In a comparative study, Beckmann, Bergr, and Czudaj (2016) used a static and dynamic copula technique to examine oil prices denominated in USD and exchange rates of oil importing and exporting countries from 2003 to 2013. They found that both currencies of importing and exporting countries have different dependency structures with US dollar, and the result of a jump spillover between exchange rates and oil prices, confirmed strong evidence of the jump spillover effect due to exogenous events. However, Imarhiagbe (2015) examined the impact of crude oil price on the conditional mean and volatility of foreign reserves in Nigeria, using monthly data from January 2995 to December 2013 and employed the GARCH-M and EGARCH-M method of analysis. The study revealed that oil price volatility has a positive impact on foreign reserve volatility and the impact on the conditional variance of external reserves is asymmetric. Stober (2015) examined the relationship between oil price, exchange rate and foreign reserve in Nigeria from 1970 to 2014. The study employed Johansen Cointegration, VECM and Granger Causality/Block Exogeneity Wald tests. The study found that a long-run cointegration relationship and an increase in oil prices will lead to an increase in foreign reserves in Nigeria.

Similarly, Ogundipe, Ojeaga and Ogundipe (2014) examined the relationship between Oil price, interest rate volatility and external reserves on the exchange rate in Nigeria, using annual data from 1970 to 2011. The study employed the Johansen Co-integration technique and error correction

mechanism. They found a long-run relationship among the variable in the model, and a change in oil price causes a greater than proportionate change in exchange rate volatility.

Bankole and Shuaibu (2013) examined the link between oil prices and international reserves for a small, open oil-exporting country like Nigeria from 1960 to 2011. The study employed Vector Autoregressive (VAR) model and the Impulse response function. The study revealed that oil price affects reserve holding in the long run with relatively minor effects in the short run. In contrast, impulse response functions indicated that oil price impact on external reserve holding and a minor effect was observed in variance decomposition analysis.

Theoretical Framework: Dutch Disease Theory

Dutch disease theory was developed by Warner Max Corden and James Peter Neary in 1982 in their model called "The Classic Economic Model" for the Netherlands economy after discovering the large Groningen natural gas field in 1959. The model postulated that an economy that discovered an abundance of natural resources whose demand is competitive in the market would be characterized by the non-tradable sector, which includes services and two tradable sectors, including the booming sector and the lagging or non-booming tradable sectors. The booming sector usually extracts natural resources such as oil, natural gas, gold, copper, diamond, and bauxites or crops such as coffee or cocoa. The lagging sector is usually manufacturing or agriculture (Benkhodja, 2014). Nwonwu (2016) noted that a resource boom affects the Nigerian economy in two ways: the resource movement effect and the spending effect. In the resource movement effect, the resource boom increases the demand for labour, which is the reason behind the shift in production toward the booming sector, away from the lagging sector. This shift in labour from the lagging sector to the booming sector is known as direct- deindustrialization. Nevertheless, this effect can be negligible since the hydrocarbon and mineral sectors employ few people. The "spending effect" occurs due to the extra revenue brought in by the resource boom. In addition, it increases demand for labour in the non-tradable sector at the expense of the lagging sector

The Dutch disease manifests many symptoms in Nigeria, prominent among which is the oil price fluctuation and the inability of the local productive economy to compete because of the bloated value of local currency helped by the inflow of foreign currency. The high exchange rate means local goods and services are expensive, making them uncompetitive in the international market and even encouraging the import of cheaper alternatives. Other symptoms of the resource curse, which cannot be directly connected to the Dutch experience, include weak institutions,

official corruption, assertive resource nationalism, internal unrest and even external aggression (Nwonwu, 2016; Laguda, 2019).

Research Methodology

This study made use of quarterly time series such as foreign reserves (REV), oil prices (OLP), real exchange rates (RER) and crude oil production (COP), obtained from the Central Bank of Nigeria (CBN) and National Bureau of Statistics (NBS) for the period from 1986 to 2020. This study examines the effect of oil prices on foreign reserves in Nigeria by employing the autoregressive distributed lag (ARDL) method. The advantages of ARDL include: the elimination of endogeneity problems and problems associated with hypotheses testing of long-run parameters are removed, simultaneous estimates of long and short-run parameters, it can be implemented even if the variables are integrated of a different order, so long as they are order one I(1), I(0) or fractionally integrated and it does not require symmetry lags to implement (Pesaran and Shin 1999; Pesaran et al., 2001).

Model Specification

We situate the relationship between foreign reserves and oil price by stating the simple model that foreign reserves as a function of oil price thus;
REV=f(OLP) …….(1)
Equation (1) above states that the national reserve is a function of oil price alone; to avoid overstating the influence of oil price, we added other factors influencing foreign reserve in equation (1). We express RES as a function of the oil price, real exchange rate and crude oil production thus:
RES=f(OLP, RER, COP)…….….(2)
Equation (2) is expressed in explicit econometric form thus;

$$\mathrm{R}EV_t = \beta_1 + \beta_2 OLP_t + \beta_3 RER_t + \beta_4 COP_t + \varepsilon_t \quad \text{.....(3)}$$

Equation (3) is restated in autoregressive distributed lag form as follows:

$$\Delta REV_t = \alpha_0 + \sum_{i=1}^{m} \beta_1 \Delta REV_{t-i} + \sum_{i=1}^{m} \beta_2 \Delta OLP_{t-i} + \sum_{i=1}^{m} \beta_3 \Delta RER_{t-i} + \sum_{i=1}^{m} \beta_4 \Delta COP_{t-i} + \delta_1 REV_{t-i} + \delta_2 OLP_{t-i}$$
$$+\delta_3 RER_{t-i} + \delta_4 COP_{t-i} + \varepsilon_t \quad \text{.....(4)}$$

$$\Delta OLP_t = \alpha_0 + \sum_{i=1}^{m} \beta_1 \Delta OLP_{t-i} + \sum_{i=1}^{m} \beta_2 \Delta REV_{t-i} + \sum_{i=1}^{m} \beta_3 \Delta RER_{t-i} + \sum_{i=1}^{m} \beta_4 \Delta COP_{t-i} + \delta_1 OLP_{t-i} + \delta_2 REV_{t-i}$$
$$+\delta_3 RER_{t-i} + \delta_4 COP_{t-i} + \varepsilon_t \quad \text{.....(5)}$$

$$\Delta RER_t = \alpha_0 + \sum_{i=1}^{m} \beta_3 \Delta RER_{t-i} + \sum_{i=1}^{m} \beta_1 \Delta OLP_{t-i} + \sum_{i=1}^{m} \beta_2 \Delta REV_{t-i} + \sum_{i=1}^{m} \beta_4 \Delta COP_{t-i} + \delta_3 RER_{t-i} + \delta_1 OLP_{t-i}$$
$$+\delta_2 REV_{t-i} + \delta_4 COP_{t-i} + \varepsilon_t \quad \text{.....(6)}$$

$$\Delta COP_t = \alpha_0 + \sum_{i=1}^{m} \beta_4 \Delta COP_{t-i} + \sum_{i=1}^{m} \beta_3 \Delta RER_{t-i} + \sum_{i=1}^{m} \beta_1 \Delta OLP_{t-i} + \sum_{i=1}^{m} \beta_2 \Delta REV_{t-i} + \delta_4 COP_{t-i} + \delta_3 RER_{t-i} +$$
$$\delta_1 OLP_{t-i} + \delta_2 REV_{t-i} + \varepsilon_t \quad \text{.....(7)}$$

Where REV denoted foreign reserve, OLP is the oil price, RER is the real exchange rate, and COP is the crude oil production.

Equation (4) with REV as the dependent variable, the null hypothesis of no cointegration and normalization method for equation (5) to (7) : H_0: $\delta_1 = \delta_2 = \delta_3 = \delta_4 = 0$ Absence of co-integration while H_1: $\delta_1 = \delta_2 = \delta_3 = \delta_4 = 0$, presence of co-integration.

Decision rule: reject the null hypothesis. If the F-statistic value is less than Pesaran tabulated critical lower bound I(0): there is no cointegration and if the F-statistic value is greater than Pesaran tabulated critical upper bound I(1): there is Co-integration. Also, if the F-statistic value falls within the lower bound I(0) and upper bound I(1): the test is inconclusive.

The Long-run model specification is presented as follows;

$$REV_t = \delta_0 + \delta_1 OLP_t + \delta_2 RER_t + \delta_3 COP_t + U_t \quad \text{.....(8)}$$

And the short run model is stated thus;

$$\Delta REV_t = \beta_0 + \sum_{i=1}^{m} \beta_2 \Delta OLP_{t-i} + \sum_{i=1}^{m} \beta_3 \Delta RER_{t-i} + \sum_{i=1}^{m} \beta_4 \Delta COP_{t-i} + \varphi ECM_t + U_t \quad \text{.....(9)}$$

All variables are as defined in eq(4) to (7) above.

RESULT AND DISCUSSION

4.1 Descriptive statistics

	REV	OPAL	RER	COP
Mean	249015.6	45.25	95.18	2119.13
Maximum	712262	116.28	314.04	2649.56
Minimum	10542.57	12.19	0.72	1332.59
Std. Dev.	210035.9	31.55	85.07	299.88
Sum	34862185	6335.72	13325.24	296677.5
Observations	140	140	140	140

Source: Author computation

Table 4.1 above shows descriptive statistics for the variables. There are 140 observations with four (4) time series variables namely national reserves (REV_t), oil prices (OPL_t), Real Exchange Rate (RER_t) and crude oil production (COP_t). The descriptive statistics showed the mean of REV_t is 249015.6 while the maximum and minimum values of REV_t were 712262 and 10542.57 with a standard deviation of 210035.9. Also, the mean of oil prices (OP_t) is 45.25, and the maximum and minimum values were 116.2862 and 12.19188, with a standard deviation of 31.5599. In addition, the mean value of crude oil production (COP_t) and Real Exchange Rate (RER_t) were 95.18 and 2119.13, respectively. While maximum and minimum values for COP_t and RER_t were 2649.558 and 314.0359. Also,

1332.594 and 0.729375, respectively, with standard deviations of 299.88 and 85.07, respectively.

Unit Root Test

The unit root test was conducted to determine the series' stationary status and the order of integration. The results of the tests are provided in table 4.2 using the ADF unit root test.

Table 4.2: Unit Root Test Results

Variable	ADF Statistic	Prob. Value	Status	Order of integration
		LEVELS VARIABLES		
REV	1.3986	1.3986	Not stationary	Unknown
OLP	1.3986	1.3986	Not Stationary	Unknown
RER	1.3986	1.3986	Not Stationary	Unknown
COP	-3.0399	-1.3986	Not Stationary	Unknown
		FIRST DIFFERENCED		
ΔREV	-5.346741	0.0000	Stationary	I(1)
ΔOP	-5.346741	0.0279	Stationary	I(1)
ΔEER	-3.800666	0.0037	Stationary	I(1)
ΔLOGCOP	-4.329751	0.0006	Stationary	I(1)

Source: Authors Computation

Table 4.2 presents the unit root test result, which shows that all variables were non-stationary at level and were difference once, they became stationary since the test statistics for these variables are less than 5% critical values, with the P-values being greater than 0.05.

The ARDL Cointegration Result

Table 4.3 below presents the ARDL bounds test cointegration result for the level relationship among the variables in eq(4) above.

Table 4.3 ARDL BOUNDS TEST Results, Null Hypothesis: No Long-run Relationship

Test Statistic	Value	K
F-statistic	3.8686	3
Critical Value Bounds		
Significance	**I0 Bound**	**I1 Bound**
10%	2.37	3.2
5%	**2.79**	**3.67**
2.5%	3.15	4.08
1%	3.65	4.66
N=137		

Source: Authors Computation

Table 4.3 present the result of the bounds test approach to Cointegration. The result produced F-statistic of 3.8686, which is greater than the upper bound critical value of 5%, as shown in the lower part of table 4.3. It confirms the presence of Cointegration among the variables in the model within the period of the study. Therefore, we reject the null hypothesis of no level relationship among the variables and conclude that there is a level relationship (cointegrated) among the variables.

Long and short runs results

Having established a long relationship among these variables implementing ARDL bound test approach to Cointegration. The next step is the estimation of long-run and short-run regression coefficients with Error-correction terms to ascertain the speed of adjustment among the cointegrated variables. Table 4.4 below presents both long and short-run estimates.

Table 4.4 Long and Short Run Estimates

Dependent Variable: LREV				
ARDL Long-Run Estimates				
Variables	**Coefficient**	**S.E**	**t-values**	**P-Value**
C	5.043	2.457	2.052	0.042
LOPL	0.016	0.002	9.102	0.000
LCOP	0.729	0.328	2.226	0.028
RER	-0.006	0.001	-6.232	0.000
ARDL Short-Run Estimates				
Variables	**Coefficient**	**S.E**	**t-values**	**P-Value**
C	0.002	0.009	0.253	0.801
Δ(LREV(-1)	1.379	0.206	6.689	0.000
Δ(LREV(-2)	-0.283	0.146	-1.934	0.055
Δ(LREV(-3)	-0.215	0.082	-2.633	0.009
Δ(LOPL)	0.113	0.053	2.132	0.002
Δ(LCOP)	-0.317	0.390	-0.814	0.417
Δ(RER)	0.001	0.001	0.088	0.929
ECT(-1)	-0.933	0.225	4.154	0.000

Diagnostic Tests	**Statistic**	**P-Values**
R-squared	0.640	
Adjusted R-squared	0.618	
Durbin-Watson stat	2.017	
F-statistic	20.293	

Prob(F-statistic)	0.000	
X^2 Normal	88.714	0.147
X^2 Serial	0.533	0.088
X^2 ARCH	0.395	0.395
X^2 RESET	1.089	0.299
X^2 HETRO	2.214	0.949

*Note: *** Statistical significance at the 1 per cent levels,**Statistical significance at the 5 per cent levels, *Statistical significance at the 10 per cent levels,* **Source:** Authors computation

We begin our discussion with the long-run estimates; it was found that oil price and crude oil production has a positive and significant effect on foreign reserve in Nigeria. It means that an increase in oil price and crude oil production will lead to the accumulation of foreign reserves in Nigeria, while the real exchange rate negatively affects foreign reserves and is significant. The policy implication of this result is that oil price is essential when formulating macroeconomic economic policy as it relates to exchange rate stability and foreign reserves, which are aimed at stabilizing the economy. The result is consistent with Uguru, (2015); Osuji, (2015); Stober, (2015); Bankole and Shuaibu, (2013) who found that oil price positively impacts foreign reserves. However, our result contradicted Aigbovo (2018) and Olayungbo (2019), who found a negative relationship between oil prices and foreign reserves.

The short-run result is relatively similar to the long-run. Where oil price has a significant positive effect on foreign reserves and crude oil production has a negative and significant effect on foreign reserves, while the real exchange rate has a positive and insignificant effect on foreign reserves in Nigeria. The change in exchange rate sign and significance could partly be attributable to the fact that it takes some time for the effects of foreign sector activities to appear or for its impact to be fully reflected in the economy. Also, the lags of foreign reserves significantly impact foreign reserves' position in Nigeria.

Finally, the error correction term is correctly signed and statistically significant at a 5% level; that is, any disequilibrium in the short run 95% is corrected each quarter and reinforces the earlier cointegration relationship among the variables. Also, the model is well fitted to explain the explanatory variable.

The diagnostics tests show that the model is correctly specified, there is no serial correlation (autocorrelation), and residuals are homoskedastic and normally distributed.

Stability Test

The stability test is an important test to check if the ARDL model estimated is stable. The stability of the coefficients is usually determined using the cumulative sum of recursive residuals test and the cumulative sum of squares. Tables 4.1 and 4.2 present the graphs below:

Figure 4.1

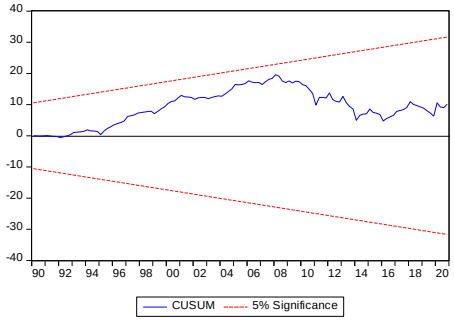

Figure 4.2

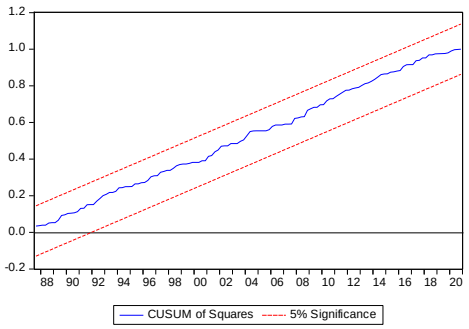

Figure 4.1 presents the CUSUM statistics' plots, which were well within the critical bounds at 5%, while figure 4.2 plots for CUSUM of squares statistics are slightly outside the critical bounds at 5%. It confirms that the ARDL estimates are reliable and consistent.

Conclusion and Recommendations

The paper examined the effect of oil price on foreign reserves in Nigeria using quarter data from 1st 1986 to 4th 2020 (1986:1-2020:4). The study employed the Autoregressive distributed lag method (ARDL) and Augmented Dickey-Fuller unit root tests. The variables were stationary at the first difference, order one I(1) variables and cointegrated. The study found that oil price has a positive and significant effect on foreign reserves in the long and short run, and crude oil production has a significant positive effect in the long and negative short run. At the same time, the real exchange rate was negative and significant in the long run and positive and

insignificant in the short run, and 93% of the disequilibrium in the short run is corrected each quarter. The paper concludes that an increase in oil prices leads to the accumulation of foreign reserves in Nigeria, while depreciation of the exchange rate leads to the depletion of foreign reserves. We recommend incorporating oil price change when formulating and implementing macroeconomic policies such as foreign reserve holding and exchange rate policy.

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