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Crude Oil Production and External Reserves in Nigeria

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Abstract

The study on the impact of crude oil production on the foreign reserves of Nigeria between 1990 and 2022 was conducted to determine to what extent crude oil production has impacted on Nigeria's foreign reserves. The study used foreign reserves as the dependent variable while crude oil production, foreign direct investment, balance of payment, and exchange rate served as the independent variables. The research model is autoregressive distributed lag model (ARDL). The descriptive statistics, unit root tests were the pre-estimation tests while heteroskedasticity and serial autocorrelation were the post-estimation tests. The study found that there is a positive and significant relationship between crude oil production, FDI, balance of payments, exchange rate, and foreign exchange reserves. The research suggested several key actions to enhance crude oil production and sales, including enhancing security measures and strengthening community relationships. These steps would help increase foreign exchange earnings, which could be deposited into the foreign reserves. Additionally, it emphasized the importance of creating and sustaining a favorable business environment to attract more Foreign Direct Investments (FDI) to the economy. An influx of FDI would alleviate pressure on foreign reserves, thereby making a positive contribution to them.

Key words: Crude Oil, Foreign Reserves, FDI, Balance of Payment, Exchange Rate.

Introduction

A frequently echoed sentiment in policy circles often highlights the need for Nigeria to shift its economic focus away from relying solely on oil, aiming for diversification (Awujola et al, 2020). Despite being a longstanding leading oil producer in Africa and possessing the continent's second-largest oil reserves (after Libya), Nigeria's status as a truly oil-dependent economy is questioned. Notably, data from the National Bureau of Statistics, reveal that the petroleum industry's contribution to Nigeria's gross domestic product (GDP) was a mere nine percent in 2015 and eight percent in 2016 (Akighir & Kpoghul, 2020). Notwithstanding oil accounting for less than 10 percent of its GDP, the key objective should be to reduce the Federal Government's reliance on petroleum revenues. The United Arab Emirates (UAE) serves as a successful example of effectively transitioning from an oil-dependent economy to a more diversified economy (Oludimu & Alola, 2022).

The authentic connection between the petroleum sector and Nigeria's economy reveals that the Nigerian State operates as a rentier State (Abdullahi, 2019). It relies heavily on revenue obtained from granting external entities access to its petroleum resources according to the findings of (Abdullahi, 2019).

The recent oil price shock, characterized by a substantial decline in oil prices, has been attributed to several factors, as elucidated by Ujunwa (2015). These factors encompass an unexpected surge in supply, weakened global demand driven by advancements in production technology, particularly shale technology in the United States, increased production by non-OPEC countries,

the rapid recovery of production among some strained OPEC members (e.g., Iran), and OPEC's decision in November 2014 to maintain production levels despite steep price declines. This decision indicates that the prevailing trend may persist. The persistence of the trend will consequently affect foreign exchange revenues from the sales of crude oil as well as external reserves where this foreign exchange revenue would have been saved (Ujunwa, 2015).

Statement of the problem

Nigeria's external reserves has been depleting over the past recent years, further affecting the value of the country's currency, and causing economic and social havocs (Zakari & Umar, 2020).

In the Nigerian context, the oil industry's role is particularly advantageous as Nwosa (2021) highlights. It boasts substantial foreign exchange reserves and is well-positioned to financially support the foreign exchange expenses incurred by the country's ambitious development programs (Henry, 2019). It's important to note that the oil industry's contribution to foreign exchange isn't solely gauged by the gross value of crude oil exports. This is because oil companies typically adopt a practice whereby, they retain the entire proceeds from exports conducted abroad, remitting only the necessary amount back to the producing country to sustain their local operations (Yusuf & Mohd, 2021).

While this analysis primarily focuses on Nigeria, the insights derived from this examination can be applied to other nations sharing similar economic fundamentals. This study takes a different approach in understanding the relationship between crude oil sales and external reserves. As stressed by Nwosa (2021), crude oil sales accounts for over 90 percent of foreign exchange earnings in Nigeria. A portion of these earnings is allocated to be saved as external reserves. Therefore, it is important that the causal relationship between the two variables is understood and harmonized for a better and improved external reserves fed through crude oil sales.

Literature Reviews

Conceptual Framework

Foreign reserves management encompasses the strategic utilization of a country's external assets to effectively address its economic requirements (Adi et al, 2022). In the context of Nigeria, the exclusive responsibility for foreign reserves management rests with the Central Bank (Henry, 2019). The various elements constituting foreign reserves comprise monetary gold, the reserve position maintained at the International Monetary Fund (IMF), holdings of special drawing rights (SDRs), and foreign exchange holdings encompassing convertible currencies from other nations (CBN, 2017).

Nigeria's Oil production

Following the dramatic decline in oil prices, Nigeria's economy underwent a contraction that led to a drop in GDP ranking to 26th place by 2016 (Henry, 2019). As a result, the country relied heavily on the external reserves to buffer importation pending the rebounding of the GDP. Olujobi et al (2022) state that to ensure sustained economic growth, it is imperative to transform the role of Nigeria's petroleum sector from being solely a source of government revenue into a substantial contributor to overall GDP expansion while relying less on its contribution as a major foreign exchange earner.

To effectively augment GDP, improve crude oil production, and consequently increase foreign exchange earnings from its sales, the establishment of additional refineries within Nigeria

becomes imperative as suggested by (Udemba, 2019). These refineries would cater to the domestic consumption of petroleum products. Considerable demand for such products exists across various industries, including electricity and power generation, petrochemicals, and fertilizer production.

Oil Theft

Discussion of crude oil and oil revenue in Nigeria cannot be complete without highlight the issue of oil theft (Wizor & Wali, 2020). The theft of crude oil from Nigeria occurs on a significant and organized scale, with a portion of the stolen oil being illicitly exported to buyers beyond the country's borders (Wizor & Wali, 2020). The proceeds generated from this illicit activity are funneled through intricate international financial networks and money laundering practices (Olujobi et al, 2022). The opacity characterizing Nigeria's oil industry, combined with obscured elements within the official crude oil sales process, allows for the concealment of oil revenue leakages (Okwelum, 2020). This concealed flow of oil and gas revenues compounds the ease with which these leakages can occur and makes it difficult to trace (Okwelum, 2020).

Trends in Nigeria's External reserves since 1999

External reserves are referred to by various terms, including International Reserves, Foreign Reserves, or Foreign Exchange Reserves, as noted by Osuji and Ebiringa (2012). While there exist multiple interpretations of international reserves, the one that has gained widespread recognition originates from the Balance of Payments Manual of the IMF (2007). In this manual, international reserves are defined as "comprising official foreign assets held by the public sector, which are readily at the disposal of the monetary authorities. These reserves serve the purpose of directly financing payment imbalances and exerting direct control over the magnitude of such imbalances. This is achieved through interventions in the foreign exchange markets, aimed at influencing currency exchange rates, and/or for other designated objectives" (IMF, 2007).

Traditionally, nations hold foreign exchange reserves in foreign currencies with the primary aim of influencing exchange rate policies through active interventions in foreign exchange markets, as discussed by Osabuohien and Egwakhe (2008). Given the interconnected nature of global markets, the accumulation of external reserves serves as a precautionary measure against potential financial crises, particularly those of a global magnitude, as highlighted by Mendoza (2004) and cited in Iwueze, Eleazar, and Nlebedim (2013).

Furthermore, these reserves also function as a repository of assets that Central Banks can leverage to impact the valuation of their domestic currency, as indicated by Nugee (2000), Williams (2003), and the IMF (2004). Over time, foreign reserves have proven instrumental in establishing international creditworthiness and facilitating the procurement of external debt for numerous countries. Consequently, the international community places a high degree of confidence in nations boasting substantial foreign reserves, a confidence that is often influenced by the effectiveness of a country's economic policies and the general investment environment, as articulated by UNCTAD (2007).

Nigeria's external reserves have experienced substantial growth primarily driven by developments in the international crude oil market. Foreign remittances and loans also contribute to the fluctuations in external reserves as reported by Oxford Analytica (2023). Essentially, a positive turn of events in the global crude oil market will likely lead to a similar progression in the nation's foreign exchange reserves. In simpler terms, an upsurge in crude oil prices will result in a noticeable augmentation of Nigeria's external reserves.

The trajectory of crude oil prices has been upward since the beginning of the year. Starting at $50.24 per barrel on December 31, 2020, the price of the OPEC basket surged to $83.54 per barrel on October 15, 2021, marking a substantial 66 percent increase compared to the preceding December.

The optimistic sentiment in the global energy market can be attributed to several factors, with one noteworthy factor being the ongoing economic recovery across countries, largely driven by collective vaccination efforts. This has instilled confidence that the world is progressing towards overcoming the COVID-19 pandemic sooner rather than later.

Nigeria is both directly and indirectly reaping benefits from the ascending crude oil prices. Nevertheless, this advantageous situation comes with a notable opportunity cost. The elevated subsidy regime has hindered Nigeria from amassing sufficient resources to execute essential projects, necessitating a greater reliance on foreign loans.

As of July 2021, the then Minister of Finance, Budget, and National Planning, Zainab Ahmed, reported a monthly average subsidy payment of N150 billion. In 2019, the federal government allocated N305 billion for subsidy payments. At current crude oil prices, the landing cost of Premium Motor Spirit (PMS) stands at approximately N290 per liter. Given the monthly PMS consumption of around 45 million liters, an astonishing N7 billion is expended on subsidy payments each month (Oxford Analytica, 2023).

In 2020, when crude oil prices were comparatively lower than in the current period, Nigeria allocated N2.34 trillion for debt servicing out of N3.25 trillion in revenue. Similarly, in 2019, N2.11 trillion was directed towards debt servicing out of N3.86 trillion in revenue. This indicates that debt servicing consumed 72 percent of revenue in 2020 and 54.7 percent in 2019. The elimination of subsidies could have alleviated the need for substantial external loans, thus conserving resources for critical infrastructure development.

Nigeria's external reserves, specifically the liquidity component, surged by $4.54 billion between December 2020 and October 15, 2021, marking a notable growth of 13 percent during this period. In simpler terms, external reserves rose from $35.04 billion to $39.6 billion.

The growth in external reserves was particularly remarkable on two specific days in October. On October 4, 2021, external reserves witnessed a 2.1 percent increase to reach $37.3 billion, up from $36.5 billion on September 30, 2021. This single-day addition of $787.6 million constitutes the most significant augmentation since December 2020. Additionally, on the same day, crude oil prices escalated by 2.5 percent to close at $78.26 per barrel (Okoli & Okafor, 2023).

Another substantial increment occurred on October 11, 2021, with an infusion of $621.8 million into external reserves, elevating the liquid reserves to $38.8 billion. Notably, the trend in crude oil prices indicated a buildup leading to the substantial increase in external reserves on October 11. Specifically, on October 8, crude oil prices surged by 3.7 percent to $81.54 per barrel, followed by a further 1.2 percent rise on October 11, reaching $82.53 per barrel (Okoli & Okafor, 2023).

The monthly augmentation of external reserves reflects an apparent boost in the Central Bank of Nigeria's (CBN) confidence as oil prices climbed. In October 2021, the average daily augmentation of external reserves was $304.35 million. This figure contrasts with $103.13 million in September 2021, $27.15 million in August 2021, $1 million in July, $4 million in April, and $45 million in January 2021 (Okoli & Okafor, 2023).

Conversely, other months witnessed a reduction in external reserves, possibly due to addressing immediate needs. For instance, the average depletion in external reserves was $55.8 million in February, $10 million in March, $34.9 million in May, and $21 million in June. These depletions were attributed to various reasons, including decreased foreign exchange from sources such as non-oil revenues and the repayment of a $500 million Eurobond that matured early in the year (Kajola et al, 2023).

Theoretical Literature Reviews

The Resource Curse Theory: This theory, also known as the "Paradox of Plenty," suggests that countries rich in natural resources, such as crude oil, often experience negative economic and social outcomes (Okpebenyo et al, 2023). The theory posits that an overreliance on resource exports can lead to several problems, including volatile revenue streams, exchange rate appreciation (which can harm other industries through a phenomenon known as "Dutch disease"), corruption, rent-seeking behavior, political instability, and lack of economic diversification (Adebayo et al, 2023). In the context of crude oil, countries heavily dependent on oil production and sales might face challenges in managing their external reserves, as fluctuations in oil prices can lead to significant variations in export earnings and foreign exchange reserves (Onyebukwa & Kinge, 2023).

The Precautionary Saving Theory: This theory focuses on how countries manage their external reserves, especially when they are highly dependent on commodity exports like crude oil (Mihailov & Nasir, 2022). According to this theory, countries that heavily rely on commodity exports tend to accumulate larger foreign exchange reserves as a form of precautionary saving (Mihailov & Nasir, 2022). This is done to mitigate the potential negative effects of commodity price volatility, such as sudden declines in export earnings. By building up external reserves, these countries aim to provide a buffer to smooth out economic shocks and maintain stable macroeconomic conditions (Jeanne & Sandri, 2020). This theory suggests that the level of external reserves a country holds can be influenced by its exposure to commodity price fluctuations, including those related to crude oil (Jeanne & Sandri, 2020).

Empirical Literature Reviews

In his study on the external reserve as a solution to economic growth and in Nigeria, Chike (2019) tested two hypotheses with data spanning from 2004 to 2015 using Ordinary Least Squares (OLS) regression technique. Findings however revealed that external reserve has no positive significant impact on economic growth in Nigeria within the period under review and that external reserves have no positive significant influence on exchange rate in Nigeria. Further findings revealed that foreign reserve of Nigeria has been declining marginally within the period under study and that it was occasioned by the 2007-2008 global financial crisis supported by the nonchalant attitude of the government towards accumulation of international reserves. The study recommended, amongst others, that in accumulating excessive foreign exchange, the country should have proper management of reserves.

Oyeniran & Alamu (2020) adopted the "buffer stock model" advanced by Frenkel and Jovanovic (1981) to estimate the optimal level of foreign reserves for Nigeria. The Autoregressive Distributed Lag Approach (ARDL) was used to estimate the optimal foreign reserve's function. The results show that the Nigeria's optimal reserves level responses to adjustment cost of holding reserves and exchange rate volatility and that important opportunity cost of reserves holding have insignificant impact on Nigeria's optimal foreign reserves. The short run and long run

estimates of the buffer stock model support the theory that foreign reserves holding in Nigeria is more sensitive to the precautionary than mercantilist motives of holding reserves. Thus, it is recommended that the Central Bank of Nigeria (CBN) should implement effective foreign reserves policies that consider exchange rate volatility, oil price volatility and global macroeconomic imbalances.

Omoregie, U. (2019) states that Nigeria is generally referred to as an 'oil economy' because of the country's large amount of oil reserves. Yet, the petroleum sector in Nigeria currently contributes less than 10 percent of the country's gross domestic product (GDP). In comparison, some Gulf States' petroleum sector GDP contribution is usually more than 30 percent. A fundamental reappraisal of Nigeria's petroleum sector's relationship with the economy is required. His research work posits that the missing link between the petroleum sector and Nigeria's GDP growth is the country's petroleum refining capacity. Capacity utilization of Nigeria's refineries dropped to 14 percent in 2014 against a global average refining capacity utilization of 90 percent. The constraints of crude oil supply to Nigeria's refineries are revealed as well as policy interventions by the Federal Government of Nigeria aimed to increase in-country oil refining capacity. Refining capacity is suggested as an antidote to Nigeria's so-called 'resource curse.'

3. Methodology

Data collection method and source

The time series, quantitative data used for this study were obtained from the CBN statistical bulletin, various issues, 2022. Data collected covered the period of 1990 to 2022.

Models Specifications

The analysis will be based on multiple linear regression model. Therefore, the model used for the purpose of this study is stated below:

$FR_t = f(BOP, COS, FDI, EXR)$..... (1)

This is further stated in econometric form below:

$FR_t = b_0 - b_1BOP_t + b_2COS + b_3FDI - b_4EXR_t + U_i$……. .....(2)

The logged forms of the models are stated as:

$Log(FR_t)=b_0 - b_1logBOP_t + b_2logCOS_t + b_3logFDI - b_4logEXR_t + U_i$……. ....(3)

Justification for the use of the variables used

FR_t = This represents the foreign reserve variable. As pointed out earlier, it is the sum of a country's savings outside its boundaries.

BOP_t = The balance of payment helps to show the financial status of a country at every point in time. This affects the FR and influences the occurrence of capital flight in an economy.

FDI_t = The higher this is, the less the government of the country will depend on their foreign reserves.

COS_t = Crude oil sales represents the major source of foreign exchange earnings for Nigeria. It is expected that the more the sales of crude oil, the more the foreign reserves increases and vice versa.

EXR_t = Exchange rate also affects the FR negatively. An increase in the exchange rate, ceteris paribus, the worse the FR is expected the get and vice versa.

U_i = Stochastic term (it covers all the other variables that affect FR but were not included in the model.

In this research, the researcher used EXR, FDI and BOP as check variables.

Apriori Expectations:

In the above model, it is expected that:

$b_1 < 0$, $b_2 > 0$, $b_3 > 0$; and $b_4 < 0$

Techniques of Data Analysis

The data analysis technique used for the analysis includes the Ordinary Least Square regression based on the Augmented Distributed Lag Model (ARDL). Further, Augmented Dickey-Fuller was used to test the stationarity of the variables; Co-integration was used to test the long-term relationship between the variables; Granger Causality was used in testing the causality of the variables; and ARDL Error Correction Mechanism (ECM) was relied upon to analyze the data collected.

Diagnostic or Post-estimation Tests

The analysis used includes the following diagnostic tests to satisfy the assumptions of OLS analysis: normality test, serial correlation test, heteroskedasticity and CUSUM tests.

Software Used

The analysis was conducted with the use of EViews Statistical software, version 10.

4. Results and Discussion

Available data shows that crude oil prices have been fluctuating over the years. From $19.04, it went down to $17.2 in 1995, $20 in 1996, $13.07 in 1998, and $28 in 2000. This increased to $37 in 2004 and peaked at $107 in 2012. However, it has since reduced to $80 in 2023.

Equally, current data from the CBN shows the state of the country's external reserves over the years. From $4.7b in 1991, it increased to $10.65b in 2001. This trajectory of increment continued till 2008 at 53.8b. It declined to $28b in 2016 but rose marginally to $42.8b before declining to $35.5b in 2022.

Descriptive Analysis

	FR	COS	BOP	FDI	EXR
Mean	5.923931	12.46488	3.853177	3.896178	2.867025
Median	4.909319	12.31879	3.815204	3.858538	2.885192
Maximum	3.089099	12.86190	3.985069	4.018525	3.264520
Minimum	3.109122	12.20126	3.793352	3.848593	2.494649
Std. Dev.	0.131826	0.241162	0.021262	0.057048	0.246281
Skewness	-0.431180	0.318455	0.748228	0.927458	0.091313
Kurtosis	2.284314	1.283188	2.006427	2.306197	1.589082
Jarque-Bera	1.282092	4.215858	5.403147	6.313311	2.790514
Probability	0.059017	0.007497	0.067028	0.041309	0.247769
Sum	154.7766	486.1304	150.3246	151.9509	94.61182
Sum Sq. Dev.	0.721853	2.210042	0.161846	0.123670	1.940942
Observations	31	31	31	31	31

Descriptive statistics are important tools in economic studies as it helps the researcher to unravel the type of data they are using immediately (Rossi et al, 2019). From the table above, the research focused on the skewness, kurtosis and JB of the data set to determine whether they are normally distributed or not. Based on the results of the JB, the balance of payment and the exchange rate are not normally distributed while other variables are normally distributed as shown by their respective JB probability ratios (Prob>0.05).

Unit Root: ADF Tests

Test at levels	**Variables**	**P - Value**	**Order of Integration**
	LOGFR	0.1127	Not Stationary
	LOGBOP	0.9609	Not Stationary
	LOGCOS	0.0008	I(0)
	LOGEXR	0.6531	Not Stationary
	LOGFDI	0.7309	Not Stationary
Test at First Difference	**Variables**	**P-Value**	**Order of Integration**
	LOGBOP	0.0238	I(1)
	LOGFR	0.0052	I(1)
	LOGFDI	0.0253	I(1)
	LOGEXR	0.0062	I(1)

Source: Authors computation using Eviews

The unit root test results are shown in the table able shows that the variables are stationary at various levels. However, LOGCOS is stationary at levels. The mixture of the variables in the ADF analysis satisfies the use of ARDL model in the regression analysis.

Bounds Test for Cointegration

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	5.833508	10%	2.75	3.79
k	5	5%	3.12	4.25
		2.5%	3.49	4.67
		1%	3.93	5.23

Source: Authors computation from Eviews

Drawing from the results of the stationarity test, the authors deduced that the order of integration for the variables in the specified model is not the same. A mixed order of integration was evident

in the model. Therefore, the test of cointegration adopted for the model is the ARDL Bounds Cointegration test. This is used to test if there is a long-term relationship between the variables used. The result of the test shows that there is a long run relationship between the dependent and the independent variables over the period.

The ARDL has many advantages. According to Ibukun and Aremo (2017), the main advantage of ARDL lies in its flexibility with both large and small sample study. The other cointegration methods estimate the long-run relationships with various equations; however, the ARDL adopts just a single reduced form of equation (Pesaran & Shin, 1995).

ARDL Model Estimation

		LONG RUN RESULTS				
Dependent: LOGFR						
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**		
LOG_FR_(-1)	-0.578051	0.203848	-2.835696	0.0091		
LOG_COS_	1.165679	0.128858	9.046229	0.0000		
LOG_BOP_	-1.334369	0.262590	-5.081568	0.0000		
LOG_EXR_	-3.834198	1.381586	-2.775214	0.0003		
Dependent: LOGFR SHORT RUN RESULT						
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**		
LOG_COS_	0.265679	0.128858	2.061796	0.0000		
LOG_BOP_	-1.004369	0.162590	-6.177311	0.0000		
LOG_FDI_	3.356198	1.381586	2.429235	0.0003		
LOG_EXR_	-3.312601	1.321256	-2.507160	0.0009		
CointEq(-1)*	-0.615251	0.136447	-4.236441	0.0003		
R-Squared =0.705612	F-Stat = 9.896152	Prob(F-stat) 0.000529	D-W stat=2.191892			

Source: Authors computation (2023)

The results above present both the long run and short run tests results of the ARDL model. The coefficient of determination, which tests for the goodness-of-fit, shows that the independent variables explain the changes in the dependent variable at 71%. The F-test, which tests for the overall significance of the model, is also statistically significant while the speed of adjustment between the short run and the long run is -0.61 (61%) annually.

Breusch-Godfrey Serial Correlation LM Test:				
F-statistic	0.233189	Prob. F(2,22)		0.3275
Obs*R-squared	3.576311	Prob. Chi-Square(2)		0.1226
Heteroskedasticity Test: Breusch-Pagan-Godfrey				
F-statistic	5.711465	Prob. F(7,24)		0.6270
Obs*R-squared	23.00632	Prob. Chi-Square(7)		0.3317
Scaled explained SS	32.55961	Prob. Chi-Square(7)		0.1270

Source: Author's computation from Eviews

Serial Autocorrelation Test

The serial or autocorrelation helps to determine if the variables are serially correlated or not (Farris et al, 2021). As the result shows using the Prob of F-stat (0.3275), there is no problem of serial autocorrelation and therefore, the result from the analysis is reliable.

Heteroskedasticity Test

The variance of the model is also constant based on the results of the heteroskedasticity test. The probability of the f-stat shows that the assumption of heteroskedasticity in OLS is met. An indication that the result of the analysis is reliable.

Granger Causality Test

Pairwise Granger Causality Tests			
Date: 08/14/21 Time: 19:41			
Sample: 1991 2022			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
LOG_COS_ does not Granger Cause LOG_FR_	29	1.08318	0.3506
LOG_FR_ does not Granger Cause LOG_COS_		2.83243	0.4442
LOG_BOP_ does not Granger Cause LOG_FR_	29	1.60697	0.2163
LOG_FR_ does not Granger Cause LOG_BOP_		54.6364	5.E-11
LOG_FDI_ does not Granger Cause LOG_FR_	29	1.74407	0.1910
LOG_FR_ does not Granger Cause LOG_FDI_		54.8089	5.E-11
LOG_EXR_ does not Granger Cause LOG_FR_	29	0.31193	0.7351
LOG_FR_ does not Granger Cause LOG_EXR_		0.16574	0.8483

Source: Author's computation from Eviews

The pair-wise granger causality test shows the direction of cause between the dependent and the independent variables (Rossi et al, 2019). This does not necessarily connote a relationship between the variables. As shown above, there is a bidirectional causality between the FR and BOP, and EXR, and FDI. Interestingly, there is a unidirectional causality between FR and COS over the period.

Tests of Hypotheses

H_{01}: crude oil revenue does not significantly impact on external reserves.

The result shows that there is a positive relationship between FR and COS as expected apriori. As COS increases by a unit, FR increases by 0.265679 and vice versa. Again, COS is statistically significant at 5% level of significance based on the t-test. We will therefore accept the alternative hypothesis, reject the null and conclude that there is a significant relationship between FR and COS over the period.

H_{02}: exchange rate does not significantly impact on external reserves

Further, the result shows that there is a negative relationship between FR and EXR as also expected apriori. As EXR increases by a unit, FR decreases by -3.312601 and vice versa. Again, EXR is statistically significant at 5% level of significance. We will therefore accept the alternative hypothesis, reject the null and conclude that there is a significant relationship between FR and EXR over the period.

H_{03}: balance of payment does not significantly impact on external reserves

Moreover, the result shows that there is a negative relationship between FR and BOP. As BOP increases by a unit, FR decreases by -1.004369 and vice versa. Equally, BOP is statistically significant at 5% level of significance. We will therefore accept the alternative hypothesis, reject the null and conclude that there is a significant relationship between FR and BOP over the period.

H_{04}: foreign direct investment does not significantly impact on external reserves

Finally, the result shows that there is a positive relationship between FR and FDI as expected in a priori. As FDI increases by a unit, FR increases by 3.356198 and vice versa. Moreso, FDI is statistically significant at 5% level of significance. We will therefore accept the alternative hypothesis, reject the null and conclude that there is a significant relationship between FR and FDI over the period.

Discussion of the Findings

The analysis has revealed the extent of the relationships between Nigeria's foreign reserves and the factors that impact on it. Specifically, the study has revealed that as crude oil sales increases, foreign reserves increases and vice versa. This finding agrees with the findings of Kaka & Ado (2020) who also found that oil revenue has positive and significant impact on the foreign reserves of Nigeria. Further, the analysis revealed that balance of payment, which encompasses import and export trade balances, has negative and significant relationship with foreign exchange. This is as a result of the over-reliance on oil sales as a major source of foreign exchange income. In addition, there is a significant relationship between FDI and foreign reserve. This positive relationship implies that an improvement in FDI, improves foreign exchange earnings and exerts less pressure on the foreign reserves. Omoregie, U. (2019) also suggests that the FDI will improve the foreign exchange earnings of the country while allowing them to keep the one they saved in their coffers. On the other hand, the exchange rate has a negative but significant relationship with foreign reserves. Changes in exchange rates automatically change the value of the foreign reserve. A decrease in the foreign exchange value reduces the total amount in the reserves and vice versa. Oyeniran & Alamu (2020) and Kaka &

Ado (2020) suggest that foreign exchange impacts strongly on the value of foreign reserves, which agrees with the findings of this study.

Conclusion and Recommendations

The research focused on the economic relationship between crude oil production and Nigeria's external reserves with the intent of exploring how crude oil sales affect the foreign reserves of Nigeria over the years. Using the autoregressive distributed lag model, the study analyzed the relationship between foreign reserves, crude oil sales, FDI, BOP, and exchange rate. It revealed that crude oil and FDI have a positive and significant impact on foreign reserves, while BOP and exchange rate have negative but significant impacts on the foreign reserves of Nigeria over the study period. Based on these findings, the study recommends that critical measures, such as improving security and community relationships, be taken to enhance crude oil production and sales. This would generate more foreign exchange earnings that could be saved in the foreign reserves. A conducive environment must be created and maintained to attract more FDI into the economy. With increased FDI, the pressure on foreign reserves decreases and contributes positively to them. Additional sources of income should be established through import/export substitution to reduce the negative impact of BOP on foreign reserves.

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