EXTERNAL RESERVE AND EXCHANGE RATE IN NIGERIA: A SIMPLE GRANGER CAUSALITY TEST APPROACH

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Abstract

A plethora of studies have investigated the impact of External Reserve on Exchange rate in Nigeria but the causal link between these variables have received less attention. It is on this basis that this study investigates the causal link between external reserve and exchange rate with an implication for monetary policy direction in Nigeria. Annual time series data from Central Bank of Nigeria (CBN) and World Development Indicators (WDI) were used in this study as we applied different econometrics analytical techniques such as the Unit root test, Johansen Cointegration test and the Granger causality test in our empirical investigation. The result from our study suggests that there exist a long run and unidirectional relationship between external reserve and exchange rate. External reserve was found to granger cause exchange rate. We therefore recommend the formulation and implementation of key policies that will aid in augmenting external reserve and proper implementation of a managed floating exchange rate regime.

1. INTRODUCTION

The availability of foreign reserve in large amount is very crucial in maintaining economic stability of a nation. This is because adequate external reserve remains a key factor in absolving external shock and maintaining the stability of an economy (Adekunle, 2020). The ideal external reserve nations are expected to maintain is one that does not surpass six (6) months import of a country or not lower than her quarterly import (Marjonovic & Markovic 2019). Maintaining a level below the minimum can be detrimental to the country's credit rating and international trade difficulties due to exchange rate volatility. Depletion of the external reserve are due to some obligation expected of the monetary authority such as offsetting of payment imbalances, external indebtedness (debt servicing and repayment), stability of the local currency etc. The management of Nigeria's external reserve is under the purview of the monetary authority (the Central Bank of Nigeria) through a legislative

Act of 1991. This Act mandates the monetary authority to maintain a reserve of foreign assets made up of gold, treasury bills etc.

Nigeria's currency which is the naira has been on steady decline in terms of depreciation in respect to the dollar over the past years and most recently the last few months. The rapid fall of the value of the nation's currency (Naira) has been attributed to the decision by the monetary authority to float the naira. The reason adduced by the monetary authority for floating the naira is to encourage investors, but this stand has been rejected by many who are of the opinion that the central bank lacks the financial capacity to defend the naira. Divergent views have been made as regards the external reserve of the country. The financial report of the central bank of Nigeria (CBN) revealed a drastic drop of the nation's foreign reserve. International reserve declined drastically from $28.63billion in 2005 to $28.02billion in 2016, increased to $42.83 in 2018 after which it has been on a steady decline. In 2019 external reserve dropped to $38.33 billion, it further reduced to $36.72 billion and $35.5 billion in 2020 & 2022, respectively. The months of August, September and October experienced the highest drop in the value of the nation's currency as one naira exchange above a thousand naira in the parallel market. The major source of Nigeria's foreign exchange and external reserve is the sale of crude oil, which over the years have experience volatility in its price which has a transmitting effect on foreign exchange and reserve (Osigwe & Uzonwanne 2015)

The issue of external reserve accumulation still remains controversial. External reserve is believed to crowd out public sector investment as funds needed to carry out various developmental project are kept as external reserve (Elhiraika, et al. 2007). The other side of the controversy maintains that accumulation of external reserve helps in the appreciation of the local currency overtime which is also expected to culminate in decrease in inflation (Ishioro, 2014).

This paper will empirically analyses the relationship between external reserve and exchange rate stability and its implication for exchange rate regime; thus, providing policy direction. If there is a causal link between external reserve and exchange rate, what exchange rate regime should the monetary authority adopt? Following the introductory section, the rest of this paper is structured into various sections. Section two reviews related literatures; section three is methodology. Results presentation, interpretations and findings are contained in section four while section five is conclusion and recommendations.

2. LITERATURE REVIEW

There have been empirically divergent views as regards the relationship between EXRSV and EXRT as well as their implication for economic growth.

In examining the implication of external reserve holdings in Nigeria on investment, inflation and exchange rate, Ibrahim (2010) opined that growth of external reserve is influenced by many factors such as Foreign Direct Investment and appreciation of the exchange rate. Both the OLS and VECM model established same findings of which FDI and exchange rate were seen as key determinants of external

reserve accumulation although the build-up of external reserve in Nigeria has a reducing effect on domestic investment (Ibrahim, 2010). But Ozigbu (2019) included oil and non-oil export as determinants of external reserve build in Nigeria. Applying Error Correction Mechanism (ECN) oil export had positive impact on external reserve. In corroborating the above views, Abuh-Amasi et al. (2022) in their study, revealed that export and exchange flexibility greatly influence external reserves accumulation in Nigeria. Exchange rate negatively affects external reserve, same with the opportunity cost of holding external reserve as this accumulation will not be appealing if the opportunity cost is high (Abuh-Amasi et al., 2022).

Ekesobi et al. (2016) as cited in Ozigbu (2019) argued that although non-oil exports exert a postitive influence on foreign reserve, its impact is insignificant. This can be an indication that volume of non-oil export is low and insignificant in boosting the country's foreign reserve. The implication of the above assertions is that Nigeria can boost her external reserve if her oil and non-oil exports increase. Also concerted efforts must be in place through policy formulation and implementation aimed at export promotions so as to increase export earnings.

In a different finding, Kalu et al. (2019) distinguished between real and nominal exchange rate, wherein real exchange rate and foreign reserve had a positive and significant relationship while nominal though positive, had insignificant impact on reserves accumulation.

In examining the causality between exchange rate and foreign, Osigwe et al. (2015) applied a multivariate causality; using VAR approach and data from 1970-2013, the study revealed a unidirectional causality between foreign reserve and exchange rate i.e. exchange rate was found to granger cause foreign reserve. Bayat et al. (2014), Nkire, Atayi, Inikun & Ogunbiyi (2021) and Marjonovic et al. (2019) in their various research also arrived at same conclusion of a unidirectional relationship.

The study by Adekunle (2020) focused on the connection that exists between external reserve and economic growth in Nigeria. This study asserted the view that external reserve accumulation helps in maintaining internal stability whenever there is external shock, which leads to economic growth as the coefficient of external reserve was both positive and significant (Meshak, 2014; Kashif & Sridharan, 2015 and Awoderu et al., 2017). Crude oil price volatility also impacts on the country's reserve. But this is a contrary finding to that of Ozigbu (2019).

In contrast to most findings, Izekor & Aigbovo (2018) while analyzing the short and long run relationship between exchange rate instability and foreign exchange reserve, established a negative but insignificant relationship. Thus, the rise in exchange rate instability will lead to a reduction in Nigeria's foreign reserve. This finding was also reached by Akanni et al. (2016) and Onoja (2015) as cited in Izekor et al. (2018). The effect is considered inconsequential by the researchers; implying that the depletion of the country's external reserve could not be attributed to exchange rate instability. But Ozigbu (2021) gave a contrary finding as he established a positive relationship between EXRSV and EXRT both in the long and

short run period. With this, an increase in external reserve will encourage exchange rate stability in Nigeria as the CBN will have the needed financial backing in intervening to defend the naira. Trade openness also enhances foreign earnings thereby promoting set targets of exchange rate stability (Ozigbu, 2021). These findings are also in tandem with Hayat & Jabbar (2022).

3. METHODOLOGY

3.1 THEORETICAL FRAMEWORK

This paper adopted the "Buffer Stock Model" by Frenkel and Jovanovic (1981). The buffer stock model is a model that shows the effect of external transactions and forgone earnings on the demand for international reserves. From this model, optimal reserve holding depends on changes in international transactions as the role of reserve is to act as a "buffer stock" in accommodating international transactions fluctuations. The buffer stock model is determined by two component cost

1. Cost of adjustment: This cost arises whenever reserves reach an undesirable lower bound. The aim of this cost is to reduce expenditures relative to income in order to achieve desired balance of payments surplus which is a key factor in the accumulation of external reserves. In the Nigeria context, a key variable that is expenditure relative to income that is likely to affect external accumulation is Debt Servicing.
2. Cost of forgone earnings: Once there is a higher stock of external reserve, then there is a cost of forgone earnings

According to the literature, money is demanded for transaction and precautionary purposes (Frenkel et al. 1980). This model is based on a key element of a stochastic process guiding payments and receipts. It is therefore assumed that changes in optimal reserve holding $dR_{(t)}$ is expressed as

$$dR_{(t)} = -\mu dt + \sigma^2 dW(t) \tag{1}$$

where
$W(t)$ = Standard Wiener process with zero mean and constant variance t.
μdt = Mean of change in reserves in small time interval
σ^2 = Temporally independent variance.

The distribution of reserve holdings (Rt) is characterized by

$$R_{(t)} = R_0 - \mu_t + \sigma W(t) \tag{2}$$

And $R_{(t)} \tilde{} N (R_0 - \mu_t, \sigma^2 t)$

R_0 in equatioin (2) is the initial stock of reserve i.e. the assumed optimal level

μ is the deterministic part of the instantaneous change in reserves. If the balance of payment is balanced, μ will be zero (0) and the stochastic process that monitors the changes in reserves will not have a drift.

The optimal stock of reserves therefore enables a country to finance deficit by drawing on reserves as well as reduce expenditure related to income when there is a deficit.

Using cross sectional and time series data for selected developed countries the estimated equation by Frenkel et al. is

$$lnR = \beta_0 + \beta_1 ln\sigma + \beta_2 lnr + \mu \tag{3}$$

Where
μ = Stochastic error term
r = Interest rate

The estimate of interest rate which was expected to be positive turned out to be negative and Frenkel concluded that interest rate is measure of forgone earning and may not always be appropriate as equation (3) can be affected by different time period. In this paper, interest rate will be dropped, and more variables will be included to accommodate factor that affects optimal reserve holdings of a developing economy (especially Nigeria).

3.2 MODEL SPECIFICATION

The model for this study is patterned following the work of Changkyu et al.(2008) and Frenkel et al. (1981) in analyzing the determinants of external reserve. Both models were patterned using data from developed countries. Therefore, this paper will accommodate peculiar factors (variables) that affect optimal reserves accumulation in Nigeria.

The demand for external reserve model for this paper is specified as

$$EXRSV = \gamma_0 + \gamma_1 EXRT + \gamma_2 IMPT + \gamma_3 EXPt + \gamma_4 EXDS + \gamma_5 OILRV + \gamma_6 GDP \tag{4}$$

Where EXRSV = External Reserve
EXRT = Exchange rate
IMPT = Import to GDP
EXPT = Export to GDP
EXDS = External Debt Servicing
OILRV = Oil Revenue
GDP = Gross Domestic Product

The a-priori expectation for γ_1, γ_3, γ_5, γ_6 is > 0. The implication of this is that as Exchange rate appreciates and export increases, external reserve is expected to increase. Also, an increase in national output and revenue from sales of crude oil leads to an increase in external reserve. This is an indication of a positive relationship between EXRSV and each of EXRT, EXPT, OILR and GDP. The major source of Nigeria's external reserve is Oil revenue.

Our a-priori expectation for γ_2, γ_4 is < 0. As import and external debt servicing increases, foreign exchange earnings needed to boost external reserve will be diverted to clear import and fulfil to debt obligations. Hence the hypothesized relationship for IMPT and EXDS is negative.

3.3 DATA SOURCE AND METHOD OF ANALYSIS

All data used for this study were sourced from the Statistical Bulletin of the Central Bank of Nigeria (CBN) for various years and World Bank Development Indicators (WDI) for various years. Specifically, EXPT, IMPT, and OILRV were sourced from CBN while EXRSV, DBSV, GDP and EXRT are WDI data

Table 1: *Variables*

S/N	Variable	Symbol	Definition	Source
1	External Reserves	EXRSV	Total external reserve of Nigeria	WDI
2	Exchange Rate	EXRT	Value of the naira to the dollar	CBN, 2022
3	Import	IMPT	Import to GDP	CBN, 2022
4	Export	EXPT	Export to GDP	WDI, 2022
5	External Debt Servicing	EXDS	Interest on foreign debts	WDI, 2022
6	Oil Revenue	OILRV	Revenue from sale of crude oil	CBN, 2022
7	Gross Domestic Product	GDP	Total national output	WDI, 2022

Source: Authors Compilation

3.4 ESTIMATION TECHNIQUE

The Augmented Dicker Fuller (ADF) test is used to test for stationarity of variables. Since the data employed for analysis are time series data, it becomes imperative to test if the probability distribution remains constant at different times (Ishioro, 2022).

The ADF model is generally specified as

$$\Delta Y_{t=} \ \beta_1 + \beta_{2t} + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha i \ \Delta Y_{t-i} \ + \ \varepsilon_t \tag{5}$$

To test for causality between the variables in this paper, the Granger causality test by Granger (1969) will be applied. The Granger test of causality is used to determine if changes in external reserve causes changes in exchange rate and/or if changes in external reserves are accounted for by changes in exchange rate (EXRT). In other words, the granger causality test will determine the direction of causality if it is unidirectional or bidirectional. This will have implication for monetary authorities in adopting a particular exchange rate regime. The Granger causality test is used to test for causality amongst two (2) variables (bilateral causality), but when the approach involves testing for causality for more than two variables (multivariate causality), the Vector Autoregressive (VAR) technique is applied (Gujarati, 2009). The Granger test will test causality for the following two (2) equations

$$EXRSV_t = \ \sum_{i=1}^{n} \alpha_1 \ EXRT_{t-1} + \sum_{j=1}^{n} \beta_j EXRSV_{t-j} + \mu_{1t} \tag{6}$$

$$EXRT = \ \sum_{i=1}^{n} \gamma_1 \ EXRt_{t-1} + \ \sum_{j=1}^{n} \delta_j EXRSV_{t-j} + \ \mu_{2t} \tag{7}$$

$\mu_1 \& \mu_2$ are the error terms for equation 6 and 7, respectively. These error terms are assumed uncorrelated.

The null hypothesis for both equation is that EXRSV (EXRT) does not granger cause EXRT (EXRSV). If the null hypothesis is rejected by applying the F test, we accept the null hypothesis that changes in external reserve (exchange rate) is caused or explained by changes in exchange rate (external reserve).

4. ANALYSIS OF RESULTS

4.1. RESULTS OF STATIONARITY TEST

Table 2: The Augmented Dickey Fuller unit root test

Variable	ADF Statistic (Level)	Mackinnon Critical Value at 5%	ADF Statistic (1st Difference)	Mackinnon Critical Value at 5%	Order of Integration
EXRSV	1.522115	2.971853	4.804631		I(1)
EXRT	1.805530	2.963972	3.783680	2.967767	I(1)
GDP	10.68527	2.963972			I(0)
IMPT	4.635658	2.998064			I(0)
EXPT	0.361216	2.971853	5.301164	2.971853	I(1)
DBSV	2.199453	2.967767	5.769732	2.971853	I(1)
OILRV	1.767135	2.963972	5.578975	2.967767	I(1)

Source: Author's Compilation from E-views13

The result from the Augmented Dickey Fuller unit root test as presented in the above table indicate that two variables (GDP & IMPT) are stationary at levels while the other listed variables are stationary at first difference. Therefore, the order of integration for the included variable is mixed.

4.2. JOHANSEN CO-INTEGRATION TEST

Table 3: The Johansen Cointegration test

Johansen Cointegration Test Using the Trace Statistic Criterion					
Null Hypothesis	Alternative Hypothesis	Trace Statistic	0.05 Critical Value	Probability	Conclusion
r = 0	r = 1	283.3995	125.6154	0.0000	Reject Null Hypothesis
r< = 1	r = 2	170.9531	95.75366	0.0000	Reject Null Hypothesis
r < = 2	r = 3	105.1862	69.81889	0.0000	Reject Null Hypothesis
r < = 3	r = 4	63.79403	47.85613	0.0008	Reject Null Hypothesis
r < = 4	r = 5	30.49937	29.79707	0.0415	Reject Null Hypothesis

r < = 5	r = 6				Accept Null Hypothesis
		11.88060	15.49471	0.1628	
r < = 6	r = 7				Accept Null Hypothesis
		0.424875	3.841465	0.5145	

Source: Author's computation from E-views13

From table 3 above, the Johansen Cointegration test using the Trace Statistic, indicates that there is at least 5 cointegrating equations (CE). At 5% critical level, the trace statistic been higher than the critical value, validates the rejection of the null hypothesis that there is no cointegrating equation. The implication of the existence of at least one cointegrating equation is that there is at least a unidirectional causality between the variables. For the key variables in this study i.e. EXRSV and EXRT, it is either external reserve granger causes exchange rate or exchange rate granger causes external causes. Therefore, to avoid a negative effect in the long run, formulation of EXRT (EXRSV) policies must take EXRSV(EXRT) into cognizance.

Table 4: *Pairwise Granger Causality Tests*

External Reserves Accumulation and other indicators				
Null Hypothesis	**F-Statistic Probability**	**Type of causality**	**Direction of Nature Causality**	**Decision**
EXRSV does not Granger Cause EXRT	2.70299 (0.0874)		EXRSV→EXRT	Reject Null Hypothesis
EXRT does not Granger Cause EXRSV	0.95078 (0.4005)	Unidirectional		
EXRSV does not Granger Cause OILRV	0.97879 (0.3903)		Nil	Accept Null Hypothesis
OILRV does not Granger Cause EXRSV	1.36869 (0.2736)	No Causality		
EXRSV does not Granger Cause IMPT	0.38922 (0.6818)		Nil	Accept Null Hypothesis
IMPT does not Granger Cause EXRSV	0.25386 (0.7779)	No Causality		
EXRSV does not Granger Cause GDP	0.52023 (0.6009)		Nil	Accept Null Hypothesis
GDP does not Granger Cause EXRSV	0.20873 (0.8131)	No Causality		
DBSV does not Granger Cause EXRSV	1.19123 (0.3219) 0.10983 (0.8965)	No Causality	Nil	Accept Null Hypothesis

Null Hypothesis	F-Statistic Probability	Type of causality	Direction of Nature Causality	Decision
EXRSV does not Granger Cause DBSV				
EXPT does not Granger Cause EXRSV	0.37131 (0.6937)		Nil	Accept Null Hypothesis
EXRSV does not Granger Cause EXPT	0.31786 (0.7307)	No Causality		
Exchange Rate and other Indicators				
Null Hypothesis	**F-Statistic Probability**	**Type of causality**	**Direction of Nature Causality**	**Decision**
EXRT does not Granger Cause GDP	5.33307 (0.0121)		EXRT → GDP GDP → EXRT	Reject Null Hypothesis
GDP does not Granger Cause EXRT	5.08683 (0.0144)	Bidirectional		
EXRT does not Granger Cause OILRV	1.00933 (0.3794)		Nil	Accept Null Hypothesis
OILRV does not Granger Cause EXRT	1.09203 (0.3516)	No Causality		
EXRT does not Granger Cause IMPT	5.46714 (0.0111)		EXRT → IMPT IMPT → EXRT	Reject Null Hypothesis
IMPT does not Granger Cause EXRT	2.85832 (0.0770)	Bidirectional		
EXPT does not Granger Cause EXRT	2.89282 (0.0749)		EXPT → EXRT EXRT → EXPT	Reject Null Hypothesis:
EXRT does not Granger Cause EXPT	10.7644 (0.0005)	Bidirectional		
DBSV does not Granger Cause EXRT	0.02593 (0.9744)		EXRT → DBSV	Reject Null Hypothesis
EXRT does not Granger Cause DBSV	3.69548 (0.04060	Unidirectional		
Imports and other indicators				
IMPT does not Granger Cause OILRV	0.11855 (0.8887)	No Causality	Nil	Accept Null Hypothesis

OILRV does not Granger Cause IMPT	0.86486 (0.4338)			
GDP does not Granger Cause IMPT	6.35675 (0.0061)		GDP → IMPT IMPT → GDP	Reject Null Hypothesis
IMPT does not Granger Cause GDP	4.28212 (0.0257)	Bidirectional		
EXPT does not Granger Cause IMPT	3.28662 (0.0548)		EXPT → IMPT	Reject Null Hypothesis
IMPT does not Granger Cause EXPT	19.9125 (8.E-06)	Unidirectional		
DBSV does not Granger Cause IMPT	0.54047 (0.5897)		Nil	Reject Null Hypothesis
IMPT does not Granger Cause DBSV	2.09680 (0.1457)	No Causality		
Exports and other indicators				
EXPT does not Granger Cause GDP	1.05273 (0.3645)		GDP → EXPT	Reject Null Hypothesis
GDP does not Granger Cause EXPT	5.13282 (0.0139)	Unidirectional		
DBSV does not Granger Cause EXPT	0.04096 (0.9599)		Nil	Accept Null Hypothesis
EXPT does not Granger Cause DBSV	0.67933 (0.5168)	No Causality		
EXPT does not Granger Cause OILRV	1.72409 (0.1997)		Nil	Accept Null Hypothesis
OILRV does not Granger Cause EXPT	1.13009 (0.3396)	No Causality		
DBSV does not Granger Cause OILRV	0.22434 (0.8008)		Nil	Accept Null Hypothesis
OILRV does not Granger Cause DBSV	0.04538 (0.9557)	No Causality		

DBSV does not Granger Cause GDP	0.42095 (0.6614)		GDP → DBSV	Reject Null Hypothesis
GDP does not Granger Cause DBSV	2.61846 (0.0945)	Unidirectional		
GDP does not Granger Cause OILRV	1.24902 (0.3048)		Nil	Accept Null Hypothesis
OILRV does not Granger Cause GDP	0.23411 (0.7931)	No Causality		

Source: Author's compilation from Eviews13.

The results of the Granger causality test are presented in table 4. The Null hypothesis for granger causality is that EXRSV (EXRT) does not granger cause EXRT (EXRSV). The result shows that external reserve (EXRSV) and exchange rate (EXRT) exhibits unidirectional causality. Specifically, the causality test shows that EXRSV Granger cause EXRT. This implies that Nigeria's accumulation of external reserve will significantly improve the exchange rate. Accumulation of foreign reserve will therefore absorb the supply-shortage of foreign exchange that is seen as the major cause of exchange rate instability. In essence, changes in exchange rate can be explained or accounted for by previous values of external reserve. This finding agrees with Osigwe et al. (2015), Bayat et al. (2014), Adegboyo O.S et al. (2019), Nkire et al.(2021). Furthermore, policies or inventions aimed at increasing external reserve accumulation are very essential in achieving exchange rate stability. The monetary authority can as well adopt a managed float exchange rate policy as the accumulated external reserve can be relied on in providing needed foreign exchange in such regime.

On the contrary, the causality results reveal that EXRT does not granger cause EXRSV. The null hypothesis is therefore accepted. This indicates that changes in the nation's external reserve cannot be accounted for by exchange rate. The exchange rate is therefore not a significant variable that affect external reserve accumulation.

Furthermore, the results as presented in table 5 shows that EXRT has a bidirectional causality with GDP and IMPT; an indication that EXRT stability contributes to GDP growth rate and vice versa. The bidirectional causal link between EXRT and IMPT is evidence that proper implementation of import-reduction policies has significant tendencies of achieving EXRT stability. EXPT and EXRT also have bidirectional causal relationship; increase in EXPT will facilitate the inflow of foreign exchange and a stable exchange rate contributes to increase in export earnings.

The empirical result also reveals that DBSV and GDP have a unidirectional causality with EXRT; with the direction of causality from EXRT to DBSV and GDP respectively an indication that increase in DBSV obligation reflects a depreciating

EXRT. It therefore means that achieving a stable EXRT and increase in the growth rate of GDP are vital in DBSV (interest on debt) and EXRSV-Withdrawal reduction.

If EXRSV Granger cause EXRT and EXRT has bidirectional causal link with IMPT, EXPT and GDP , then EXPT, EXRT and GDP are key determinants of external reserves accumulation and exchange rate stability . Increase in EXPT and reduction in IMPT will augment foreign exchange supply.

5. CONCLUSION

This paper examined the causality relationship between external reserve and exchange rate in Nigeria. The paper also employed time series data on EXRSV, EXRT, GDP & OILRV spanning 1992-2022. Different estimation techniques were used for diagnostic test and in examining the causal link amongst the included variables. The findings from the granger causality test shows a unidirectional causality between exchange rate and external reserve. Specifically, external reserve granger cause exchange rate. This is an indication that accumulation of external reserve can be used to achieve exchange rate stability and adoption of a managed float exchange rate regime can be implemented. This study therefore recommends that policy framework such as export promotion, foreign investment drive, etc., that will drive the improvement of external reserve in Nigeria should be implemented as the increase in the reserve can be used to achieve exchange rate and economic stability.

REFERENCES

Abuh-Amasi A.S, Joshua J.N & Onoyom M.O (2022). Determinants of International Reserves in Nigeria. *International Journal of Research and Innovation in Social Science* (IJRISS), 6(5)

Adegboyo S.O, Efuntade O.O & Efuntade A.O (2019). The Relationship between External Reserve and Trade: Evidence from Nigeria. Journal of Economics and Finance. 10(5), 21-27

Adekunle E.O (2020). ARDL – Bound Testing Approach to the Connection Between External Reserve and Economic Growth in Nigeria. *Journal of Academic Research in Economics*. 12(2), 184-197

Akanni, A., & Bukola, R. (2016). External reserves management and its effect on economic growth of Nigeria. IJBFMR, 4(2016), 36–46

Awoderu, B.K., Ochalibe, A.I. & Obekpa, H.O. (2017). Policy implications of long-run relationship between external reserve and economic growth in Nigeria. International Journal of Academic Research and Reflection, 5(1), 82 - 95

Bayat, T., Senturk, M. & Kayhan, S. (2014). Exchange rates and foreign exchange reserves in Turkey: nonlinear and frequency domain causality approach. *Theoretical & Applied Economics*, 21 (11), 83–92.

Central Bank Of Nigeria (2018), "foreign exchange reserves report", Abuja: CBN.

Changkyu Choi & Seung-Gwan Baek, 2008. Exchange-Rate Regimes and International Reserves. *Korean Economic Review, Korean Economic Association,* 24(1), 105-129.

Ekesiobi, S., Maduka, A., Onwuteaka, I., Akamobi, G. (2016). Modelling Non – Oil Exports and Foreign Reserves in Nigeria. *Developing Country Studies*, 6(6),126-132

Elhiraika, A. and L. Ndikumana (2007). Reserves Accumulation in African Countries: Sources, Motivations and Effects. *University of Massachusset Economic Department Working paper*, 12, 1-27.

Frenkel, J.A. and Jovanovic, B.C. (1981). Optimal international reserves, *Economic Journal*, 507-514.

Granger, C. W. (1969). Investigating Causal Relations by Econometric Models and Cross Spectral Methods, *Econometrica: Journal of the Econometric Society*, Vol. 37(3), 424-438

Gujarati D.N. (2009) Basic Econometrics. Tata McGraw-Hill Education, New Delhi

Hayat MU & Abdul Jabbar (2022). Impact of Foreign Exchange Reserve on Exchange Rate in Selected South Asian Economies. *Pakistan Journal of Economic Studies*, Vol. 5(2), 353-376

Ibrahim, W. (2010). External reserve holdings in Nigeria: Implications for investment, inflation and exchange rate. *Journal of Public Administration and Policy Research,* 3(4), 106-112

Ishioro B.O (2014). External Reserves Accumulation and Economic Growth in Nigeria: A simple Causality Test. *Journal of Social and Management Sciences*. 9(3), 89-101

Ishioro B.O (2022). Oil Production - GDP Nexus: Empirical Insights From The Nigerian Economy. *International Journal of Applied Research in Social Sciences*. 4(11), 1-14

Izekor, A. O. & Aigbovo, O. (2018). Exchange Rate Instability and Nigerian Foreign Exchange Reserves (1993 – 2016): Short Run and Long Run Analyses. 3(1), 50–60.

Kalu, E. U., Ugwu, O. E., Ndubuaku, V. C., &Ifeanyi, O. P. (2019). Exchange Rate and Foreign Reserves Interface: Empirical Evidence from Nigeria. *The Economics and Finance Letters*, 6(1), 1–8

Kashif, M. & Sridharan, P. (2015). International reserves accumulation and economic growth: Evidence from India. International Journal of Engineering and Management Research, 5(2), 583-589.

Marjanovic I & Markovic M (2019) Causality Between Exchange Rates and Foreign Exchange Reserves: *Serbian Case Facta Universitatis Series: Economics and Organization* .16(4), 443 – 459

Meshak, I. (2014). External reserve composition and economic growth in Nigeria: A time series analysis. Canadian Open Economics Journal, 1(1), 1 – 13

Nkire N.L., Atayi A.V., Ibukun F.O., & Ogunbiyi A.O. (2021). Effect of Exchange Rate Fluctuation and Foreign Reserves on Macroeconomic Performance in Nigeria. *International Journal of Multidisciplinary Research and Analysis*. Vol. 4(10), 1361-1369

Onwuka, E. M & Igweze, A. H. (2014). Impact Of External Reserve and Foreign Debt on Naira

 Exchange Rate. *Journal of International Academic Research for Multidisciplinary*, 2(6), 416-423

Osigwe A. C & Uzonwanne M.C (2015) Causal Relationship among Foreign Reserves, Exchange Rate and Foreign Direct Investment: Evidence from Nigeria. *International Journal of Economics and Financial Issues*, 2015. 5(4), 884-888

Osigwe, A.C., Okechukwu, A.I., & Onoja, T.C. (2015). "Modelling the determinants of foreign reserves in Nigeria, *Developing Country Studies*, 5 (19), 72-77

Ozigbu C.J (2019) Building Foreign Reserve In Nigeria: The Role Of Oil And Non-Oil Exports *International Journal of Business and Management Review* Vol.7, No.6, pp.42-52, September 2019

Ozigbu C.J (2021). Modeling the Asymmetric Effects of External Reserve Accumulation on Exchange Rate Stability in Nigeria. *American Journal of Humanities and Social Sciences Research* (AJHSSR). Vol. 5(5),324-330.

World Bank (2022) *World Development Indicators*. Washington D.C., World Bank.