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External Trade and its implications on Foreign Exchange Reserves in Nigeria

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Abstract:*The fluctuations in Nigeria's foreign exchange reserves and the increase in both import and export trade make it imperative to determine how trade has influenced the country's foreign reserves. Utilizing data on foreign reserves, oil imports, non-oil imports, oil export, non-oil exports and exchange rate in Nigeria during the period 1980 – 2015 and analysing it using the cointegration and Vector Error Correction Model, the findings revealed that foreign trade has serious implications for Nigeria's foreign reserves. This is evidenced from the causality test results which revealed that oil import, non-oil imports, oil exports, non-oil exports and exchange rate propelled foreign reserves. Also the Vector Error Correction result indicates that oil and non-oil export are positively and correctly signed hence have positive implication on foreign reserves while oil and non-oil imports were negatively signed implying that they retarded foreign reserves in Nigeria. Specifically, oil export, non-oil imports and exchange rate were significant at 5 percent. This implies that they impacted significantly on foreign exchange reserves in Nigeria during the period covered by the study. Based on these findings, we suggestthe need to diversify the country's export base and eliminate frivolous imports as possible measures of improving foreign reserves in Nigeria.*

I. Introduction

In recent years, global foreign exchange reserves have increased tremendously and significantly. This growth in foreign exchange reserves is a reflection of the huge concern countries attach to holding sufficient volume of international exchange reserves. Some of the reasons for keeping foreign exchange reserves include:to protect the value of the local currency,settle international payment responsibilities, especially, financing foreign trade needs, accumulation of wealth,exchange rate management, improving the credit worthiness of an economy, and to provide a safety net for future external shocks among others.

Foreign exchange reserves accumulation in emerging economies is directly related to the rise in the currentaccount deficit in countries whose currency is used for accumulation, especially in the United States. Consequently,adjustments in the United States dollar have serious costs implications for other countries of the world, mostly in countries which foreign exchange reserves accumulation is in dollars. The emerging economies experience show the importance of theaccumulation of foreign exchange reserves in order to solve precautionary problems, capital flows instability and other developments that may negatively affect expectations (Kruskovic & Tina 2014).

For over thirty years now, numerous policy initiatives and strategies in the administration of its foreign exchange reserves have been taken by the Nigerian government. However, very marginal outcome was realized due to the fact that structures put in place then could not provide enough support for efficient foreign reserves management. Since the 1970s, the Nigerian economy has consistently relied on oil exports as the major source of her foreign exchange earnings and local revenue source with the enormous cycles of economic booms and recessions.Fortunately for Nigeria and most oil dependent economies, world oil prices began to rise again in the year 1999 resulting in a well-managed boom and unprecedented accumulation in the level of foreign reserves rising from USD4.98 billion by the end of May 1999, to USD59.37 billion by the end of first quarter of 2007.

Building on the earlier works of Lardell-mills (1989) and Borodo andEichengreen (1998), Lane and Barke (2001) in their investigation and concluded that "tradeopenness is easily the most important factor in explainingcross-country variation in external reserve". They further note that "there are facts that financial development mostly among industrial countries, country size and external volatility are association with an increase in thereserves/GDP ratio". Their study found developing and low income countries to have negative partial correlation between external debt andreserves.

In a study by Usman and Ibrahim (2010) on aggregation of foreign exchangereserves with implications for investment,price level and change in exchange rate, using Vector Error Correction(VEC), the authors found that demand for externalreserves in Nigeria was majorly influenced by currentaccount variability, actualrate of exchange and opportunitycost of reserves accumulation (estimated by the variationbetween the real return on domestic investments and real return on reserves. They argued that their findings are in tandem with those of Adam and Leonce (2007) who found that "demand for foreign exchange reserve in Africa is determined by

export trade, real national income growth and forgone cost of holding reserves. These are shreds of evidence to show that external reserve in most countries including Nigeria depends significantly on external trade.

Given the vagaries in trade and external reserves accumulation in Nigeria over the years, it is pertinent to investigate the implication of external trade on the level of foreign exchange accumulation in Nigeria over the period 1985 – 2014. Hence the objectives of this paper are to analyse the trend in external trade and external reserve accumulation in Nigeria and the extent to which external trade has impacted on the accumulation of external reserve. In the remaining part of this paper, we shall review relevant literature, explain the methodology adopted to achieve the objectives, analyse the data and expose the findings and recommendations.

II. Literature Review

The benefits of foreign reserves as a shock absorber of crisis associated with external economic transactions cannot be overemphasized. Fischer (2001), emphasizes this position by positing that there is a restriction to the level of foreign exchange reserves required to prevent thefinancial crisis, given the fact that accumulation of large foreign reserves implies higher costs. If foreignexchange reserves holding is spurred by preventable desires, it should terminate at thelevel where the country has reached its optimal level. In addressing the issue of what constitute an adequate foreign reserves.Frenkeland Jovanovic (1981) argued that some of the conditions for the demand for foreignexchange reserves of an economy centre on variables, like total trade (import and export), external debt, possible trade shocksseverity and considerations of monetary policy. Also in his study, Shcherbakov (2002) argued that, there are some common parameters used to assess the adequacy of foreignreserves for an economy. To the author, some of these measures show the level of foreign weakness of an economy and the ability of foreign exchange reserves to guide against this vulnerability. These parameters are: sufficiency of imports, adequacy of debts and monetarysufficiency.

Notwithstanding, recently, an active strategy for foreign exchange reserves administration appears to centre on the creation of future wealth for a country. This happens when exchange rate, debt management and monetary policy issues to central banks are of marginal interest. On the other hand, when weaknesses in thefinancial and corporate sectors are low; when government seriously drives a flexibleexchange rate policy; and when the government has an efficient fiscal policy and sound management framework as well ashighly developed domestic financial markets, in this case, the foreign exchange reserves portfolio is organised into active and non-active parts. The inactive portfolio centre on macroeconomic objectives concentrating on mainly finance while the active portfolio is used for maximising profit, taking into consideration the objective of liability management (Carlos et al 2004).

Peter and Machiel(2004) arguing in tandem with the motive of profit maximization to foreign exchange reserves administration, posit that, "over a decade now, foreign currency reserves administration has changed itsaim from sustaining liquidity and economic protection objectives to that of maximizing total profit".

In analysing the impact and factors that influence external reserves, Umeora (2013) investigated accumulation of external reserves and its effects on exchange rates and inflation in Nigeria using ordinary least squares regressionanalysis. He found that foreignexchange reserves do not have significant effect on foreign exchange rate. The study also discovered that foreign exchange reservesdo not have significant effects on inflation in Nigeria.

In analysing the factors that influences foreign exchange reserves in Nigeria over the period of 1999 to 2011, Irefin and Yaaba (2012) used the Autoregressive Distributed Lag (ARDL) to investigate restructured econometrics the 'Buffer Stock Model' of (1981) by Frenkel and Jovanovic with emphasis on level of income, interest rate, imports and exchange rate. Their findings altered the presence of buffer stock model forforeign exchange reserves aggregation and provided vital indicators in support level of income as the key variable influencing reservesaggregation in Nigeria.

Chowdhury et al (2014) recently conducted an empirical analysis of the factors influencing foreignexchange reserves in Bangladesh, applying the Augmented Dicky Fuller (ADF) test,to analyse unit roots properties of the variables and Engle Granger residual based co-integration test to examine the long run relationship among thevariables, and some diagnostic tests for better modelling, results of the analyses revealed thepresence of strong relationship among foreign exchange reserves, exchange rate, remittances, domestic interest rate,broad money, United Payment Interface (UPI) of export and import, and per capita income. The study therefore suggested an efficient exchange rate administration, strong remittance related policies, quality products for exports trade and sustainable national income level as possible measures thatcan enhance healthy amount of foreign exchange reserves for a developing country like Bangladesh.

Abdullateef and Waheed (2010) extended the study on the factors contributing to foreign exchange reserves byinvestigating the effect of variation in external reserve positions of Nigeria on domestic investment, price level,and exchange rate during the period 1986 to 2006. Using the Ordinary Least Square (OLS) and vector error correction (VEC)estimation techniques, they found that change in foreign exchangereserves in the country

affects only foreign directinvestment (FDI) and exchange rates, and does not affect local investment and price level.

The results further indicated that there is the need for comprehensiveforeign reserve management strategies that will focus onmaximizing the benefits from oil export revenue by usingmore of these resources to improve local investment. Chin-Hong, et al (2011) affirms the nexus between foreign exchange reserves and factors affecting it suchas, income level, exchange rate, balance of payments and the real cost of foreign exchange reserves aggregation in Malaysiafor the period 1975 to 2007. The co-integration test technique was used to analyse the data and the findings showed that the foreign exchange reserves and the identified factors affecting it were co-integrated. The implicationsof the findings are that the government needs to understand the vital variables which can significantly influence thevolume of foreign exchange reserves to enable the country have better focus on how to maintain foreign exchange reserve sufficiency.

Charles-Anyaogu (2012) in his study on the relationship between selected macroeconomic factors and external reserve inNigeria, utilized econometric analytical techniques of VAR and Wald tests and discovered that past values of gross domestic product explain the current values of foreign exchange reserves significantly. The result of the model further indicated thatexternal reserve was significant statistically in the year of study but insignificant in past years;while among the macroeconomic variables only inflation was found to have serious implication on foreign exchange reserves while trade balanceand exchange rate were found to have less impact on foreign exchange reserve.

In a study by Osuntogun, et al (1997), theypointed out the strength in expandingthe Nigeria's non-oil exportto non-traditional markets and found that the country could not fully maximize her productive potentials due to thefact that execution of export promotion policies followed basic market concentration strategy i.e. concentration onadvanced economies like Europe or USA, thereby leading to less focus on assembling trade facilitatinginformation that may further widen Nigeria's export market to underdeveloped economies such as the economies in Sub-Saharan Africa. To them,trade within the continent, if pursued, will require cheaper transport andenhance the competitiveness of goods and services traded and ensure market clearing of export goods therebydiminishing the problems faced in exports by developing economies.

Lyakurwa (1991) argued further that export diversification is very crucial because it plays a vitalrole in minimizing the variation in exports earnings of less developed economies and increasing the growth rates of both exports and local production. However, the constituents of a diversifying economy's exports have to be in tandem with theimport composition of the target economies. Lewis (1980) in hisstudy also discoveredthat diversification of exports could assist most economies achieve asustainable high level of economic growth and development. Opara (2010) submittedthat exports trade is the background of any economic prosperity which is centred meaningfully on export of non-oil commodities in most economies of the world. He added that the encouragement non-oil export could lead to a reduction of an economy's level of dependence on crude oil.

The review above shows that very few studies have been done on the impact of trade on foreign reserve accumulation. For instance, Charles-Anyaogu (2012) in his study examined trade under macroeconomic factors that affect external reserve. Also Chin-Hong, et al (2011) in investigating the determinants of external reserve in Malaysia identified balance of payment as a proxy for trade. This study deviated from others by examining the impact of trade: imports and exports on external reserve in Nigeria over the period 1980 – 2015.

III. Methodology

Theoretical and Analytical framework

The theoretical basis for this paper is centred on the argument that as most countries engage in international trade, foreign reserves would be important to ensure that trade would not be interrupted in the event of a drastic drop in the inflow of foreign exchange into the country, due to, financial crisis. Conventionally, it is expected that the Central bankshould hold,at least, an amount of foreign currency equivalent to three months of imports. As commercial openness increases it could increase foreign reserves. Also, as imports rises, reserves should grow as well to maintain the ratio. Though few studies reviewed emphasized the relationship between export trade and foreign reserve accumulation. For instance, Charles-Anyaogu (2012) in his study on external reserve and macroeconomic variables inNigeria, employed econometric tools of VAR and Wald tests and found that only inflation has serious implication on external reserves while trade balance and exchange rate were insignificant. Chin-Hong, et al (2011) studied the relationship between international reserves and its determinant suchas, economic size, exchange rate, balance of payments and the opportunity cost of reserves holding in Malaysia for the period 1975 to 2007. Using the Cointegration approach, the resultsshowed that the international reserves and the specified determinants were cointegrated. The implicationsof the study were that the government needs to know the important factors which can significantly affect thelevel of international reserves to enable it gain better insight on how to maintain reserve adequacy. Given the critical role trade play in enhancing foreign reserve accumulation, the paper

specified a functional nexus between foreign exchange reserve as dependent variable and external trade as independent variable thus:

FERX = f(OMP, NOMP, OEX, NOEX, EXR) (1)

Where: FERX = Foreign exchange reserve, OMP = oil import, NOMP = non-oil imports, OEX = oil export, NOEX =non-oil exports, EXR = exchange rate of the naira to the United States Dollar. In the estimation process, parameters and a disturbance term "U" are incorporated into the model to take care of variables not included in the model but affect foreign exchange reserves. Therefore, equation 1 above could be transformed as follows:

$FERX_t = \alpha_o(OMP_t)^{\alpha 1}(NOMP_t)^{\alpha 2}(OEX_{it})^{\alpha 3}(NOEX_t)^{\alpha 4}(EXR_t)^{\alpha 5}e^{Ut}$ (2)

In order to estimate the above model using ordinary least squares, equation 2 could be transformed into a log - linear form by taking the natural log of the variables as follows:

$LnFERX_t = \alpha_o + \alpha_1 lnOMP_t + \alpha_2 lnNOMP_t + \alpha_3 lnOEX_t + \alpha_4 lnNOEX + \alpha_5 EXR + U_t$ (3)

$\alpha_1, \alpha_2, \alpha_3, \alpha_4,$ and α_5 are elasticities of oil imports, non-oil imports, oil exports, non-oil export, and exchange rate in Nigeria. Apriori expectation is that $\alpha_1<0$, $\alpha_2<0$, $\alpha_3>0$, $\alpha_4>0$, and $\alpha_5<0$.

IV. Estimation Procedure and Results

To really ascertain the impact of external trade on external reserve in Nigeria, annual data was collected on foreign reserve, oil import, non-oil import, oil export, ono-oil export and exchange rate for the period 1980 - 2015. To enhance detail analysis, we undertook a descriptive analysis of the data using the descriptive statistics, this is followed by the unit roots test using the Augmented Dickey Fuller (ADF) and Philip –Perron methods, cointegration and Vector Error Correction Mechanism (VECM), Granger Causality tests on the foreign exchange reserve model. The results of the analyses are presented as follows:

Table 1. Descriptive Statistics of the Variables in the Model

Statistic	FERX	OMP	NOMP	OEX	NOEX	EXR
Mean	15.60720	563.1286	1789.003	3590.209	187.7486	66.73036
Median	7.298546	166.9000	650.9000	1169.500	23.30000	21.88610
Maximum	53.59929	3064.300	8323.700	14323.20	1130.200	158.5500
Minimum	0.932990	0.100000	5.100000	7.200000	0.200000	0.550000
Std. Dev.	18.11571	886.3001	2565.016	4866.790	329.7958	64.09348
Skewness	0.994049	1.767604	1.446662	1.150452	1.733303	0.253326
Kurtosis	2.320846	4.934207	3.699260	2.827943	4.502901	1.239995
Jarque-Bera	6.436763	23.68167	12.92125	7.763817	20.81926	4.891708
Probability	0.040020	0.000007	0.001564	0.020611	0.000030	0.086652
Sum	546.2521	19709.50	62615.10	125657.3	6571.200	2335.563
Sum Sq. Dev.	11158.09	26707945	2.24E+08	8.05E+08	3698020.	139671.1
Observations	35	35	35	35	35	35

The descriptive statistics result in *table 1* indicates that foreign exchange reserves has mean value of $15.6billion with minimum value of $0.9billion, maximum value of $53.6billion and standard deviation of $18,1billion. Oil import stood at N565.1billion on an average with a minimum value of N0.1billion, maximum value of N3064.3billion and standard deviation of N886.3billion. Non-oil imports under the period under investigation stood at N1789.0bilion on the average with minimum import value of N5.1billion, maximum of N8323.7billion and standard deviation of N2565.0billion.

Oil export in Nigeria has mean value of N3590.2billion with minimum oil export value of N7.2billion, maximum value of N14323.2billion and standard deviation of N4866.8billion. Nigeria's non-oil export stood at N187.7biilion on the average with minimum value of N0.2billion, maximum value of N1130.2billion and standard deviation of N329.8billion. Exchange rate of the naira to the United States Dollar averaged N66.7 with minimum rate of N0.56, maximum rate of N158.6 and standard deviation of N64.1 to a dollar. The results above show that the variables all witnessed increasing trend over the period under investigation. However, Nigeria has fared poorly possibly due to inappropriate application of resources.

The stationarity tests results reported in *tables 2* show that all the variables under consideration- foreign exchange reserve(FERX), oil import (OMP), non-oil import(NOMP), oil export (OEX) non-oil export (NOEX) and exchange rate attained stationarity at first difference. This implies that the variables are integrated of order one i.e i(1). These results show that the null hypotheses of non-stationarity for the variables under investigation are rejected. Based on the stability of the variables, we went further to establish whether or not there is a long run cointegrating relationship among the variables by using the Johansen full information maximum likelihood method.

Table 2: Unit Root Tests Result

Augmented Dickey Fuller (ADF) Test Statistic						Philip-Perron (PP) Test Statistic				
Variable	ADF Statistic	1%	5%	10%	Decision	PP Statistic	1%	5%	10%	Decision
Log(FERX)	-4.941248	-3.653730	-2.957110	-2.617434	i(1)	-5.417770	-3.646342	-2.954021	-2.615817	i(1)
Log(OMP)	-6.899154	-3.639407	-2.951125	-2.614300	i(1)	-6.892795	-3.639407	-2.951125	-2.614300	i(1)
Log (NOMP)	-7.320029	-3.639407	-2.951125	-2.614300	i(1)	-7.223385	-3.639407	-2.951125	-2.614300	i(1)
Log (OEX)	-5.790116	-3.639407	-2.951125	-2.614300	i(1)	-5.789090	-3.639407	-2.951125	-2.614300	i(1)
Log (NOEX)	-6.477332	-3.639407	-2.951125	-2.614300	i(1)	-7.517711	-3.639407	-2.951125	-2.614300	i(1)
Log(EXR)	-5.257780	-3.639407	-2.951125	-2.614300	i(1)	-5.257780	-3.639407	-2.951125	-2.614300	i(1)

The Johansen cointegration tests indicates that the trace and maximum eigenvalue statistics show the existence of four (4) and two (2) cointegrating equations/relationships respectively between foreign reserves and the variables influencing it at 5 percent level of significance. The implication of this result is that there exists a unique long run relationship between foreign reserves, oil import, non-oil import, oil export, non-oil export and exchange rate. The identified cointegrating equation(s) can then be used as an error-correction term (ECM) in the error correction model.

Table3.Cointegration Test Result

Series: LOG(FERX) LOG(OMP) LOG(NOMP) LOG(OEX) LOG(NOEX) LOG(EXR)				
Lags interval (in first differences): 1 to 2				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.898281	171.1775	95.75366	0.0000
At most 1 *	0.744342	98.04035	69.81889	0.0001
At most 2 *	0.469694	54.39506	47.85613	0.0107
At most 3 *	0.463813	34.09744	29.79707	0.0150
At most 4	0.280023	14.15275	15.49471	0.0788
At most 5	0.107508	3.639597	3.841466	0.0564
Trace test indicates 4 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				

**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.898281	73.13719	40.07757	0.0000
At most 1 *	0.744342	43.64529	33.87687	0.0025
At most 2	0.469694	20.29762	27.58434	0.3209
At most 3	0.463813	19.94469	21.13162	0.0726
At most 4	0.280023	10.51316	14.26460	0.1804
At most 5	0.107508	3.639597	3.841466	0.0564
Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Table 4: Parsimonious Vector Error Correction Model

Dependent Variable: DLOG(FERX)				
Sample (adjusted): 1983 2014				
Included observations: 32 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.160013	0.088604	1.805934	0.0853
DLOG(OMP)	-0.265771	0.139519	-1.904915	0.0706
DLOG(NOMP)	-0.589801	0.278855	-2.115078	0.0465
DLOG(NOMP(-1))	-0.319568	0.160127	-1.995723	0.0591
DLOG(OEX)	0.706237	0.218596	3.230780	0.0040
DLOG(NOEX(-2))	0.065803	0.134554	0.489047	0.6299
DLOG(EXR)	-0.601452	0.204934	-2.934855	0.0079
DLOG(EXR(-1))	0.438228	0.182130	2.406125	0.0254
DLOG(FERX(-1))	0.290747	0.129474	2.245604	0.0356
DLOG(FERX(-2))	0.204640	0.137710	1.486020	0.1521
ECM(-1)	-0.620674	0.162005	-3.831196	0.0010
R-squared	0.724829	Mean dependent var		0.092769
Adjusted R-squared	0.593795	S.D. dependent var		0.459650
S.E. of regression	0.292954	Akaike info criterion		0.648687
Sum squared resid	1.802269	Schwarz criterion		1.152534
Log likelihood	0.621001	Hannan-Quinn criter.		0.815698
F-statistic	5.531613	Durbin-Watson stat		2.054303
Prob(F-statistic)	0.000484			

V. Findings

The results so far show that the variables in the foreign exchange reserve model in equation 3 tend to move together in the same direction in the long run as predicted by economic theory. In the short run, variations from this relationship could occur due to shocks to any of the variables. Also, the dynamics governing the short run behaviour of foreign reserves are distinct from those in the long run. As a result of this distinction, the short run interactions and the adjustments to long run equilibrium are vital because of policy implications. Engle and Granger (1987) argued that, if cointegration exists between nonstationary variables, then an error-correction is applicable for these variables just like the one specified in equation 1. Based on the fact that the variables of the foreign exchange reserves equation are cointegrated, the next procedure is the analysis of the short run dynamics within a Vector Error Correction model (VECM). This takes the simple instance of estimating a model involving only two variables, Y and K, and the general form of the VECM could be written thus:

$$\Delta Y_{it} = e + f\Delta_{it} + g_j\sum\Delta K_{it-1} + h_j\sum\Delta Y_{it-1} + nECM_{it-1} + u_{it} \quad (4)$$

Where:

i = number of banks

Δ = first difference of a series

e,f,g,h, n are the parameters of the model to be estimated

j = the number of lags included for the first difference of both the dependent and explanatory variables

ECM_{t-1} is the lagged error correction term, that is, the fitted residuals from the co-integrating equation; t represents time period and u_t is a white noise error term.

The result in table 4, shows that oil and non-oil exports are positively signed. However, only oil export is statistically significant at 5 percent level. The positive sign of oil and non-oil exports is consistent with the prediction of economic theory, and it suggests that as exports trade increase, foreign reserves of Nigeria also increased over the period of this study. This result highlights the crucial role of exports trade in foreign exchange reserves accumulations.

Oil and non-oil import are consistent with theoretical economic expectations with negative sign. This implies that import trade retarded foreign reserve accumulation in Nigeria over the period of this study. An increase in imports lead to depletion in a country's external reserves since its serves as a backup for trade. It is also important to note that import constitute a leakage to the resources of an economy. Nigeria has been an import dependent economy hence the continuous depletion of her foreign reserves. (see appendix A).

Exchange rate has mixed result with a positive sign at lag 1 and negative sign at level. However, the variable is significant at 5 percent level both at level and lag 1. This implies that exchange rate has significant negative and positive implications on foreign reserve of Nigeria. For an export based country, a fall in domestic exchange rate boosts export trade and spur external reserves but in an import dependent country, depreciation in exchange rate will lead to depletion in foreign reserves.

The VECM indicate how the model/variables adjusts to the long run equilibrium as demonstrated by the cointegrating equations. As expected, the error-correction term (ECM_{t-1}) is of the expected negative sign and significant in the foreign reserves function. This result substantiates the findings of cointegration among the variables reported earlier.

The coefficient of determination indicates that about 59 percent of the total variation in Nigeria's foreign reserves is influenced by changes in oil import, non-oil imports, oil export, non-oil export and exchange rate over the period under investigation. At 2.05, the Durbin Watson statistics does not suggest evidence of autocorrelation. Furthermore, the crucial issue for empirical analysis is the stability of variables of the performance equation. It is pertinent to incorporate short-run dynamics in testing for stability of the long run parameters of the foreign reserves model. To this end, this study adopted the Bahmani-Oskooee and Shin (2002), stability test procedure as well as the cumulative sum of recursive residual (CUSUM) to the residuals of the parsimonious model. For stability of the short run dynamics and the long run parameters of the foreign reserves function, it is inevitable that the recursive residuals and CUSUM of squares stay within the 5 percent critical bound represented by two straight lines whose equation are detailed in Brown et al (1975). As shown in figures 1 and 2, neither the recursive residuals nor CUSUM of squares plots cross the 5 percent critical lines, therefore, we can conclude that the estimated parameters for the short- run dynamics and the long-run of the foreign reserves function are relatively stable. That is, a stable foreign reserves function exists over the period under investigation.

Figure 1. Stability Tests- Recursive Residual

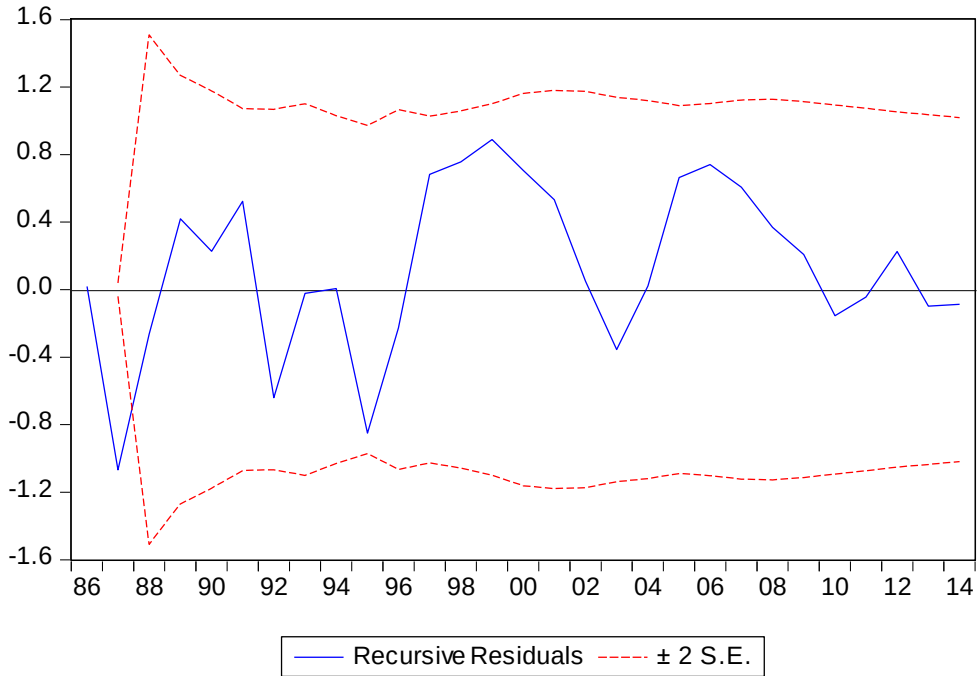

Figure 2. Stability Tests- CUSUM

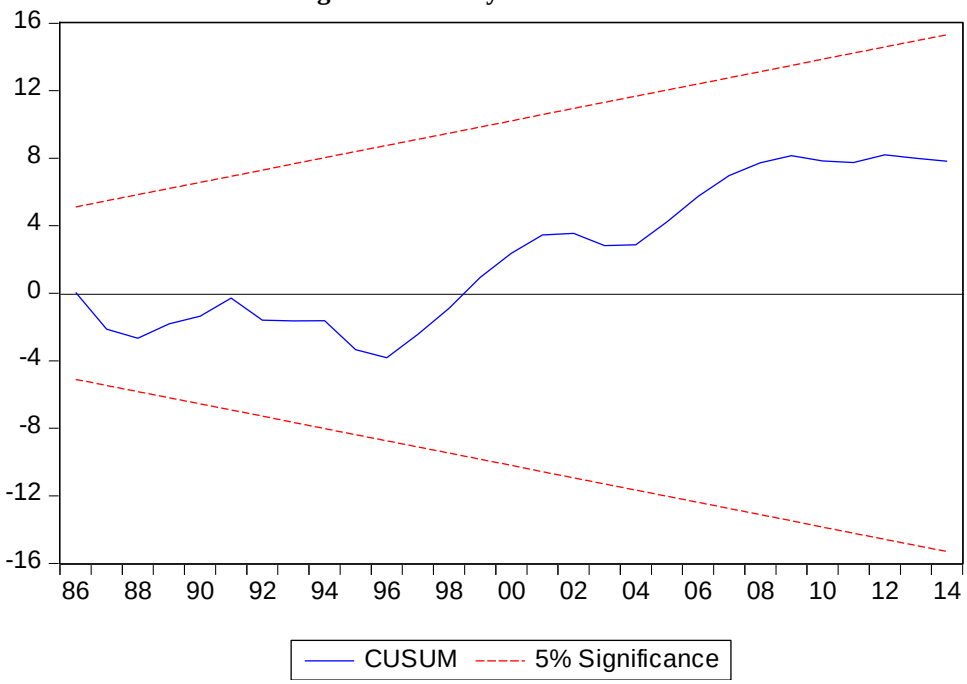

Table 5. Pairwise Granger Causality Tests Result

Pairwise Granger Causality Tests			
Sample: 1980 2015			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
LOG(OMP) does not Granger Cause LOG(FERX)	33	4.92616	0.0147
LOG(FERX) does not Granger Cause LOG(OMP)		0.28716	0.7526
LOG(NOMP) does not Granger Cause LOG(FERX)	33	5.76877	0.0080
LOG(FERX) does not Granger Cause LOG(NOMP)		1.02262	0.3727
LOG(OEX) does not Granger Cause LOG(FERX)	33	6.98842	0.0035
LOG(FERX) does not Granger Cause LOG(OEX)		2.41601	0.1077
LOG(NOEX) does not Granger Cause LOG(FERX)	33	6.87674	0.0037
LOG(FERX) does not Granger Cause LOG(NOEX)		0.23638	0.7910
LOG(EXR) does not Granger Cause LOG(FERX)	33	4.71890	0.0171
LOG(FERX) does not Granger Cause LOG(EXR)		0.04169	0.9592
LOG(NOMP) does not Granger Cause LOG(OMP)	34	0.11904	0.8882
LOG(OMP) does not Granger Cause LOG(NOMP)		9.61007	0.0006
LOG(OEX) does not Granger Cause LOG(OMP)	34	0.09304	0.9114
LOG(OMP) does not Granger Cause LOG(OEX)		6.14170	0.0060
LOG(NOEX) does not Granger Cause LOG(OMP)	34	1.32571	0.2812
LOG(OMP) does not Granger Cause LOG(NOEX)		2.57776	0.0932
LOG(EXR) does not Granger Cause LOG(OMP)	34	2.46835	0.1023
LOG(OMP) does not Granger Cause LOG(EXR)		1.28141	0.2929
LOG(OEX) does not Granger Cause LOG(NOMP)	34	5.51150	0.0094
LOG(NOMP) does not Granger Cause LOG(OEX)		0.37660	0.6895
LOG(NOEX) does not Granger Cause LOG(NOMP)	34	1.66407	0.2069
LOG(NOMP) does not Granger Cause LOG(NOEX)		0.32949	0.7219
LOG(EXR) does not Granger Cause LOG(NOMP)	34	8.82550	0.0010
LOG(NOMP) does not Granger Cause LOG(EXR)		0.07663	0.9264
LOG(NOEX) does not Granger Cause LOG(OEX)	34	0.29054	0.7500
LOG(OEX) does not Granger Cause LOG(NOEX)		0.88908	0.4219
LOG(EXR) does not Granger Cause LOG(OEX)	34	7.89375	0.0018
LOG(OEX) does not Granger Cause LOG(EXR)		0.69876	0.5054
LOG(EXR) does not Granger Cause LOG(NOEX)	34	2.84401	0.0745
LOG(NOEX) does not Granger Cause LOG(EXR)		1.01754	0.3740

Source: computed result

The pairwise Granger causality test result in table 5 shows that oil imports, non-oil imports, oil exports, non-oil exports and exchange rate have unidirectional causation with foreign reserves. This implies that oil imports, non-oil imports, oil exports, non-oil exports and exchange enhanced foreign reserve but foreign reserve did not

determine oil imports, non-oil imports, oil exports, non-oil exports and exchange rate in Nigeria over the period of this study.

3.3. Concluding Remarks

The results and findings of this work have demonstrated that foreign trade has serious implications on foreign reserves of Nigeria. This is evidenced in the causality test results which shows that oil import, non-oil imports, oil exports, non-oil exports and exchange rate propelled foreign reserves. Also the Vector Error Correction result indicates that oil and non-oil export are positively and correctly signed hence has positive implication on foreign reserves while oil and non-oil imports were negatively signed implying that they retarded foreign reserves in Nigeria. Specifically, oil export, non-oil imports and exchange rate were significant at 5 percent. This implies that they impacted significantly on foreign reserves in Nigeria over the period of this study. Based on these results, the paper suggests the improvement in exports base, diversification of exports and review of imports trade as possible measures of improving foreign reserves in Nigeria.

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Appendix: Exchange Rate, Oil Imports, Non-oil Imports, Oil Exports, Non-oil Exports and Foreign Reserves in Nigeria 1980 - 2015

Year	Exr (N =$)	Omp (Nb)	Nomp(Nb)	Oex (Nb)	Noex (Nb)	FERX (S)
1980	0.55	0.2	8.7	13.6	0.6	10.63979
1981	0.6369	0.1	12.7	10.7	0.3	4.168453
1982	0.6702	0.2	10.5	8.0	0.2	1.926434
1983	0.7486	0.2	8.7	7.2	0.3	1.251987
1984	0.8083	0.3	6.9	8.8	0.2	1.674114
1985	0.9996	0.1	7.0	11.2	0.5	1.891868
1986	3.3166	0.9	5.1	8.4	0.6	1.349903
1987	4.1916	3.2	14.7	28.2	2.2	1.497832
1988	5.353	3.8	17.6	28.4	2.8	0.9329898
1989	7.65	4.7	26.2	55.0	3.0	2.041078
1990	9.0001	6.1	39.6	106.6	3.3	4.12879
1991	9.7545	7.8	81.7	116.9	4.7	4.678023
1992	19.6609	19.6	123.6	201.4	4.2	1.196053
1993	22.6309	41.1	124.5	213.8	5.0	1.640444
1994	21.8861	42.3	120.4	200.7	5.3	1.649172
1995	21.8861	155.8	599.3	927.6	23.1	1.709113
1996	21.8861	162.2	400.4	1,286.2	23.3	4.329392
1997	21.8861	166.9	678.8	1,212.5	29.2	7.781251
1998	21.886	175.9	661.6	717.8	34.1	7.298546
1999	92.5284	211.7	650.9	1,169.5	19.5	5.649725

2000	109.55	220.8	764.2	1,920.9	24.8	10.09945
2001	113.45	237.1	1,121.1	1,839.9	28.0	10.6466
2002	126.9	361.7	1,151.0	1,649.4	94.7	7.566806
2003	137	398.9	1,681.3	2,993.1	94.8	7.415088
2004	132.85	318.1	1,668.9	4,489.5	113.3	17.25654
2005	129	797.3	2,003.6	7,140.6	106.0	28.63205
2006	127	710.7	2,397.8	7,191.1	133.6	42.73547
2007	116.8	768.2	3,143.7	8,110.5	199.3	51.90704
2008	131.25	1,315.5	4,277.6	9,861.8	525.9	53.59929
2009	148.1	1,068.7	4,411.9	8,105.5	500.9	45.50982
2010	148.8127	1,757.1	6,406.8	11,300.5	711.0	35.88492
2011	156.7	3,043.6	7,952.3	14,323.2	913.5	36.26366
2012	155.92	3,064.3	6,702.3	14,260.0	879.3	47.5484
2013	155.75	2,429.4	7,010.0	14,131.8	1,130.2	46.25476
2014	158.55	2,215.0	8,323.7	12,007.0	953.5	37.49724
2015	**193.2792**	1,725.2	9,350.8	8,184.5	660.7	28.284.82

Source: Central Bank of Nigeria Statistical Bulletin and the World Bank 2015