Nigerian International Reserves and Nominal Official Exchange Rate Volatility

Ernest Simeon O. Odior and Isaac Chii Nwaogwugwu

Department of Economics, University of Lagos, Nigeria

Abstract

This study examines the long and short-run impact relationship between international reserves and nominal official exchange rate for economy of Nigeria using annually time series data started from 1980 to 2014. Empirically, the study uses the unit root test, cointegration test and an Autoregressive Distributed Lag (ARDL model to dilate an econometrics long run equilibrium international reserves. The empirical evidence show that one lagged value of official exchange rate are negatively associated with the Nigerian international reserves on the long run. This study saw oil export as the major contribution to the Nigerian international reserve, while imports and external debts as the factors that inversely affect the Nigerian international reserves both in long and short run. The study recommended that to increase international reserve holding, it is essential to pursue and implement monetary policies that can considerably relax the binding constraint on the availability of foreign exchange particularly for exporting firms and also, Government should effectively control the volume of imports in order to minimize its import bill whilst at the same time trying to diversify its exports in a bid to boost export earnings in order to accumulate more foreign reserve.

Keywords: Nigerian International Reserves, Exchange Rate

JEL: Classification: F31, F33, C22

1. Introduction

The last 20 years have witnessed a large increase in international reserve holdings by central banks in developing economies. Countries usually hold international reserves to have a favourable level of exchange rate especially with a view to stabilizing it and removing possible volatility. It is essentially held in terms of marketable securities, among others. According to Archer and Halliday (1998), the reasons for holding international reserves include: exchange rate stability, exchange rate targeting, exchange market stability, creditworthy consciousness, provision of emergency fund, and having transactions safeguard. In the view of Akdogan (2010), most of countries increase their quantum level of foreign exchange reserves after the 1990s, financial crisis, because from these financial crisis most of countries gain experience that a large amount of foreign exchange reserve accumulation is better decision for protection of their economy.

Most of theories suggest that a country which have fixed or managed floating exchange rate system should have more reserves accumulation as compare to a country which have freely flexible exchange rate system, because in fixed or manage floating exchange rate system state bank interfere in international market for necessary arrangement to make stable the exchange rate (Choi et al. 2004). Beaufort and Kapteyn (2001) point out that the type of exchange rate system influences reserve demand. Frenkel (1981) found evidence that after the collapse of the Bretton Woods agreement the move to floating exchange rates decreased the level of reserves. This follows macroeconomic theory, that in a fixed exchange rate scenario market forces will still act to change the real exchange rate. Therefore, the government will have to intervene to keep the nominal peg.

Many countries of the world have been holding large foreign exchange reserves especially Asian and Latin American countries. In making the case for a robust level of foreign reserve in Nigeria, the Central Bank of Nigeria (CBN) argued that China has over one billion dollars in her foreign reserves even though her population is very large (Soludo, 2006). Indeed, the people's bank of China Monetary Policy Report stated that foreign exchange reserve of China grew from US$172 billion in 2000 to US$ 3,388 billion in 2012, while the value for Nigeria a developing country, in the same period was about US$11 billion in 2000 and US$ 47 billion in 2013 (IMF, 2013). Dooley et al (2004) argued that the resulting accumulation of foreign reserves can be seen as collateral which is being used for attracting foreign investment. Such holding is also seen as a costly self-insurance strategy for smoothen the vulnerability impacts of domestic and foreign shocks and to intervene in the foreign exchange market.

In this regard, there has been a debate whether there is a need to beef up the level of nations' foreign reserves or trim them back, and this debate is becoming more interesting especially in developing countries like Nigeria. Some individuals, scholars and non-scholars alike, are of the opinion that keeping scarce resources in reserve when there is a series of issues to be attended to domestically, such as education and health among others, may not be a very wise decision (Osabuohien and Egwakhe, 2008). Nonetheless, some others have argued that the foreign reserve position determines the country's rating in the global market. In other words, these proponents hold the view that a robust level of foreign reserves will make the country appear financially responsible and creditworthy in the eyes of other countries, creditors and donors (Ford and Huang, 1994).

Having a floating exchange rate allows Nigeria to let its currency depreciate without using reserves immediately. Because there will be no intervention from the central bank to counteract currency depreciation, Nigeria will continue accumulating reserves due to other factors such as the current account balance or its import activities without regard to its currency's depreciation. This hypothesis works under the assumption that Nigeria doesn't have a managed float, which would mean that they would only allow depreciations and appreciations of its currency up until a threshold level determined by central bank officials. The Research questions we are trying to investigate here is; whether there is a long and short run relationship between the international reserves and official exchange rate? What are the influences of other major control variables (e.g. imports, oil export etc.) on international reserves? The main aim of this paper, therefore, is to empirically investigate the relationship between the two, with specific reference to appropriateness or otherwise of using reserve volatility as an indicator of interventions, more especially in Nigeria.

The present study tries to estimate or understand whether such unprecedented levels of international reserves have a bearing on the exchange rates between 1980 and 2013 in Nigeria. This study is organised into eight sections. Sections one is the introduction, giving a general idea of the research. Section two cover the basic gamut of the existing literature on the issue, both the theoretical and empirical. Section three is the overview of the Nigerian international reserves. Section four shows the theoretical framework and model specification. Section five is the model analytical framework and estimation techniques, while is six the analysis of empirical result of the study. Section seven and eight, give the conclusion and the policy implication and recommendations, of the study, respectively.

2. Literature Review

Muhammad Tahir Khan (2013) his study Models the relationship and causality link between Foreign exchange reserves and Exchange rate (nominal and real exchange rate) for economy of Pakistan using annually data series started from 1983 to 2009. The empirical Methodology uses are cointegration analysis. The cointegration result point out that there is a long run relationship exists between Foreign exchange reserves and Exchange rate. This study also examine causality relationship and also suggest that the causality direction goes from Nominal effective exchange rate and Real effective exchange rate towards foreign exchange

reserves, it means that in Pakistan both Nominal effective exchange rate and Real effective exchange rate effect the Foreign exchange reserves.

David and Yaaba (2012), this study used an Autoregressive Distributed Lag (ARDL) approach to run a slightly modified econometrics 'Buffer Stock Model' of Frenkel and Jovanovic (1981) to estimate the determinants of foreign reserves in Nigeria with focus on income, monetary policy rate, imports and exchange rate. The results debunked the existence of buffer stock model for reserves accumulation and provide strong evidence in support of income as the major determinant of reserves holdings in Nigeria.

Kasman and Ayhan,(2008) explore the association among Foreign Exchange reserve and Exchange rate of Turkey and found that variables foreign exchange reserves and exchange rates have long-run relationship, they also study the causality link between foreign exchange reserves and exchange rate, and they suggest that in case of real effective exchange rate the causality kink goes from foreign exchange reserves to real effective exchange rate in both long and short run, and in case of nominal exchange rate they suggest that in the long-run nominal exchange rate effect foreign exchange reserves. Edwards (1984) and Calvo and Reinhart (2002) observe that demand for foreign exchange reserves accumulation is higher in developing countries because of exchange rate fluctuation, this means that a country which have experience of higher exchange rate fluctuation, their monitory authority intervene in international market and use the reserves stock to reduce the exchange rate fluctuation, this therefore suggest that there is a long run inverse relationship between these two variables.

Prabheesh (2007) explore the demand for foreign exchange reserves using co integration analysis, the result showed that foreign reserves demand is a function of exchange rate flexibility in long run, the result also suggest that accumulation of international reserves is highly responsive to capital account as compare to opportunity cost. (Narayan and Smyth, 2006) explore the short and long run correlation among real, international reserves and interest rate differential and exchange rate, the result suggest that these three variables have single correlation, real exchange rate effect positively on international reserves, interest rate differential also optimistic effect but statistically insignificant, and in short run the relationship between these three variable are non-monotonic.

Ahmed and Pentecost (2006) study the association among exchange rate and international reserves and propose that both variables exchange rate and international reserves have extensive association. (Aizenman and Marion, 2003) and (Flood and Marion, 2002) studied the demand for foreign exchange reserves, the result showed that instability of nominal effective exchange rate significantly reduce the level of international reserves, they also suggest that greater exchange rate flexibility lower reserves holding. Fukuda and Kon (2007) examined that what macroeconomic impacts accumulated foreign exchange reserve have in developing countries, they found that when the government increases their foreign reserve not only a liquid debt but also total debt increase, while the debt maturity becomes shorter, the increase a foreign debt also leads a permanent decline in consumption. Study by (Flood and Perraudin, 1998) Reserves and Exchange Rate Cycle and suggest that there is an inverse correlation among reserves and exchange rate series.

Many other studies available for example Mayuresh et al, (2013); Prasad and Raju (2010), Flood and Marion (2002) and Aizenman and Marion (2003) argues that there is an inverse relationship between nominal effective exchange rate and foreign reserves, grater the exchange rate fluctuation lower will be the foreign reserves, when the nominal effective exchange rate fluctuation increase they significantly reduce the foreign reserves level because of intervention of central bank in international market for necessary arrangement of exchange rate.

3. Overview of the Nigerian International Reserves

International reserves are variously called external reserves, foreign reserves or foreign exchange reserves. Historical Background Over the past three decades, Nigeria has taken numerous policy initiatives and measures in the management of its external reserves. Although very little was achieved because the structure in place then could not support efficient reserves management, enduring lessons could be distilled from the nation's past experience. Thus, Since the 1970s, Nigerian economy has persistently depended on oil as the main source of foreign exchange earnings with the attendant cycles of economic booms and bursts. From 1999, world oil prices began to rise again resulting in another but better managed boom and unprecedented accumulation in the level of reserves from USD4.98 billion in May 1999, to USD59.37 billion as at March 28, 2007. One of the major reasons for foreign reserves accumulation put forward by the CBN is the need to make Nigeria more creditworthy; this is believed to be essential for attracting foreign capital (Hassan *et al*., 2009). Nigeria has accumulated unprecedented foreign

exchange reserves compared to other SSA countries and synchronously has been experiencing a large depreciation in its Naira vies a vis US dollar

With the oil price increase in the global market as a source of huge foreign exchange earnings, Nigeria's foreign exchange reserve has been on the high side. The reserve has grown robustly from US$27.3 billion in 2004 to an estimated US$51.5 billion in 2006 (CBN, 2006). As from March in 2013 the international reserves stands at 47 billion dollars as from March in 2013 which is not consistent with the African trend of accumulating excessive foreign exchange reserves. Nigeria's external reserves have enjoyed a robust growth in recent times and seem to be on track to recover lost grounds since it peaked at $53.60 billion in 2008 (World Bank, 2013). Nigeria's external reserves continued to inch up by day even as threats of price volatility of its main source, crude oil, are becoming palpable. The nation's external reserves last swelled to $50.6 billion in 2009, while the highest level it ever attained was $53.60 billion in 2008 when the international oil price peaked at $164 per barrel.

In March 2013, Nigeria's foreign reserves had risen by 2.5 per cent to $48.6 billion from the previous 2012 level which stood at $47.55 billion (NSSIEN, 2013 and WDI, 2012), making Nigeria the twenty-fourth largest reserves holder in the world. This pace of reserves accumulation is occurring without regard to its diminishing marginal benefits and rising marginal costs. According to Okonjo-Iweala (2014) Nigeria's foreign reserve has hit about $50 billion and declared Nigeria as Africa's current best investment destination. With a foreign reserve of nearly 50 billion dollars, a stable exchange rate, strong banking sector, massive human and natural resources, Nigeria has indeed become one of the most attractive investment destinations in the world". According to Central Bank of Nigeria (CBN), the monetary authorities attempt to control the money supply as well as achieve a balance between demand for and supply of foreign exchange through intervention (that is, offering to buy or sell foreign currency to banks) in the foreign exchange markets. When CBN sells foreign exchange to commercial banks, its level of reserves declines by the amount of the sale while the domestic money supply (in naira) also declines by the naira equivalent of the sale. Conversely, when the CBN purchases foreign exchange from the banks its level of reserves increases while it credits the accounts of the banks with the naira equivalent, thus increasing the domestic money supply.

Exchange rate policy in Nigeria over the years has been the shift from fixed exchange rate to deregulation of Structural Adjustment Programme (1) (SAP) in 1986. Prior to this, the growth rates of macroeconomic variables were low. This was compounded following the collapse of oil price in the world market in 1978, which led to the deterioration of the domestic currency and the depletion of reserve to finance accumulated deficit and attract nominal official exchange rate. The crises led not only to rapid reserve depletion but also large amount of unexpected devaluation and a switch to more liberalized new exchange rate regime. The exchange rate started from a very low base of 0.5464 to $1 in 1980 and depreciated persistently to about 155.1 to $1 in the year 2012 (CBN, 2012, 2014).

4. Theoretical Framework and Model Specification

Various models have been developed to measure the determinants of foreign reserves. Heller (1966) theorizes that reserve demand is essentially an inventory control problem. In other words, he predicts that reserves are buffer stock, which is accumulated in times of abundance and depleted in times of scarcity. His main hypothesis is that a country's holding of international reserves is negatively related to its marginal propensity to import (MPI). He also includes measures for the current account balance and exchange rate regimes in his study.

Frenkel (1978), on the other hand, argues that MPI only measures an economy's openness to external shocks and therefore, would be positively related to foreign currency reserves if the reserves were held as a precautionary measure. His model is that "optimal reserve holdings would increase as the volatility of reserves increased." His empirical study demonstrates that volatility of reserves is indeed a robust predictor of foreign reserve holdings.

Building from this theory, a precautionary theory of international reserve demand has developed. This theory proposes that reserves are held as self-insurance against financial crisis. This theory draws directly from the buffer-stock theory mentioned earlier. Mendoza (2004) views this precautionary theory as a "natural extension of all previous theories." Distayat (2001) builds on this theory and develops a reserve demand model "compatible with the second generation financial crisis. This theory proposes that reserves are held as self-insurance against financial crisis. This theory draws directly from the buffer-stock theory mentioned earlier.

The most widely used of these models in the literature is the "buffer stock model". The model implies that the authorities demand reserves as a buffer to curb fluctuations in external payment

imbalances. This is to avoid macroeconomic adjustment cost arising from imbalances in the external payments. The advantage of the model over others is its adaptability to both fixed and floating exchange regimes. The model is as relevant in a modern floating exchange regime as it was during the Bretton Woods regime.

In their study, Flood and Marion (2002) confirmed the applicability of the buffer stock model in the modern the modern regime of floating exchange rate as it was during the Bretton era. They submitted that with greater exchange rate flexibility and financial openness, the model will perform better if these variables were well represented. Disyatat and Mathieson (2001) adopted Frenkel and Jovanovic model for fifteen countries in Asia and Latin America and submitted that the volatility of the exchange rate is an important determinant of reserves accumulation and that the financial crisis of the late 1990s produced no structural breaks. IMF (2003) standardized the buffer stock model and applied it on the emerging markets economies of Asia. The study concluded that reserves accumulations were driven by increases in current account and capital flow. Aizenman and Marion (2003) used the buffer stock model on sixty four countries over the period 1980 to 1996 and found that the standard variables in the model explain about 70.0 per cent of the movement in the observed reserves holding without country fixed effects and 86.0 per cent with country fixed effects.

Ramachandran (2005) applied the buffer stock model for India covering the period April 1993 –December 2003, which was characterized by flexible exchange rate, and high level of capital flows. He finds that the standard measure of volatility defined as the fifteen years rolling standard deviation of change in trend adjusted reserves used by Frenkel and Jovanovic (1981) produces biased estimates but when he adopted the GARCH approach result of the estimated coefficient were closer to the theoretical predictions.

The buffer stock model of Frenkel and Jovanovic (1981) is given as:

$$dR(t) = \mu dt + \sigma dW(t) \quad (1)$$

Where: Rt = reserves held in time t

Wt = standard Weiner process with zero mean and variance t

μ = deterministic part of the instantaneous change in reserves

σ = standard deviation of the Weiner increment in reserves

At each point in time the distribution of reserves holdings *R (t)* is characterized by

$$R(t) = R^* - \mu t + \sigma dw(t) \quad (2)$$

where: R^* is the optimal stock of reserves, which is obtained by minimizing two types of costs viz: i) the cost of adjustment, which is incurred once reserves reach an undesirable lower bound; and ii) foregone earnings on reserve holdings. The optimal stock of reserves is obtained by minimizing these two costs and it yields an expression:

$$R^* = \sqrt{\left[\frac{2c\sigma^2}{(2r\sigma^2)0.5}\right]} \quad (3)$$

where:

c = fixed cost of adjustment

r = opportunity cost of holding reserves

σ = standard deviation of change in reserves.

$$\log R_t = \beta_0 + \beta_1 \log \sigma_t + \beta_1 \log r_t + u_t \quad (4)$$

whereμ_t is white noise.

Equation (4) is considered as the benchmark for reserves determinant equation in most empirical studies. The theoretical prediction suggest β1 = 0.5 and β2 = -0.25.

Past studies, however, arrived at different results for the elasticities (Flood and Marion, 2002), and (Ramachandran, 2004). The difference in the result were attributed largely to the sensitivity of the model to different proxies for the opportunity cost of holding reserves, estimation methods and modification of the original model by adding new variables.

Model Specification

With inferences to the buffer stock model of Frenkel and Jovanovic (1981) in our theoretical framework and following their empirical work, the empirical model to dilate the relationship between international reserve and official exchange rate in Nigeria in this study after a modification of equations 2, 3 and 4 above the long-run empirical model adopted in this study is thus expressed as

$$INRV_t = \beta_0 + \beta_1 OEXR_t + \beta_2 IMT_t + \beta_3 OEXT_t + \beta_4 EXD_t + \beta_5 MPR_t + \beta_6 GDP_t + \mu_t \quad (5)$$

where INRV is the Total Foreign Exchange Reserves (Includes Gold). This is the total assets of central bank held in different reserves currencies abroad. The reserves currencies includes; US dollar, Pound Sterling, Euro, Japanese Yen etc. OEXR is the Official Exchange Rate. IMT

is the Imports. OEXT is the Oil Export. Value is equal to the price per unit of quantity of oil exports multiplied by the number of quantity units (U.S. dollars). EXD is the External Debt. MPR is the Monetary Policy Rate. This is the rate at which the CBN lends to the deposit money banks (DMBs). The opportunity cost of holding reserve is proxy by monetary policy rate (MPR) in our case, since the CBN, which manages reserves has the duty of lender of last resort. GDP is the Gross Domestic Product.

In order to reduce errors and to improve on the linearity of the model, we introduced log in the model. We get the natural logarithms of sequence INRV, IMT, OEXT, EXD and GDP, respectively LOGINRV, LOGIMT, LOGOEXT, LOGEXD and LOGGDP some of the independent variables included in this study are frequently consider as determinants of growth in cross- country studies.

$$LOGINRV_t = \beta_0 + \beta_1 OEXR_t + \beta_2 LOGIMT_t + \beta_3 LOGOEXT_t + \beta_4 LOGEXD_t + \beta_5 MPR_t + \beta_6 LOGGDP_t + \mu_t \quad (6)$$

The a-priori assumptions for the above model based on (equation 6) are: β_1 is ambiguous, $\beta_2 < 0$, $\beta_3 > 0$, $\beta_4 < 0$, $\beta_5 > 0$, $\beta_6 > 0$. Equations (6) above is designed to measure the relationship that exists between the dependent variable, the foreign reserve and the independent variables. $\beta_{,S} > 0$ implies a positive relationship between the dependent variable. This implies that an increase in these independent variables will lead to an increase in the foreign reserve. $\beta_{,S} < 0$ means that there is a negative relationship between the dependent variable and the independent variables, This means that an increase in the independent variables will lead to a decrease in the foreign reserve and vice-versa.

5. Analytical Framework and Estimation Techniques

The long-term behaviour of variables propose an intermediate estimator that allows the short-term parameters to differ in the short run, while imposing equality of the long-term coefficients. The long-term movements of the real effective exchange rate and other macroeconomic fundamentals are expected to be stable, but short-term movements are expected to be not stable within the period under review. The dynamic heterogeneous time series model is an unrestricted error correction autoregressive distributed lag (ARDL) (p,q) representation (see (see Combes, et al, 2011).

$$\Delta y_t = \phi_i y_{t-1} + \beta_i^{'} x_{t-1} + \sum_{j=1}^{p-1} \lambda_{ij} \Delta y_{t-j} + \sum_{j=0}^{q-1} \delta_{ij}^{'} \Delta x_{t-j} + \varepsilon_t \quad (7)$$

The time series are denoted by *t = 1, 2, ..., T* represent time periods; y_t is the dependent variable; x_t the matrix of regressors ; ϕ_i the coefficient on the lagged dependent variable; β_i the vector of coefficients on the explanatory variables; λ_{ij} the coefficients on the lagged first-differences of the dependent variable; and δ_{ij} the coefficients on the first-differences of the explanatory variables and their lagged values. The disturbances, ε_t , are supposed to be norm distributed across *t* with zero mean and variances $\sigma^2 > 0$.

With $\phi_i < 0$, there is a long-term relationship between y_t and x_t in the form

$$y_t = \theta_i^{'} x_t + \eta_t \quad (8)$$

where $\theta_i^{'} = \frac{\beta_i^{'}}{\phi_i}$ represents the long-term coefficient, and the error terms of the long-term relationship (η_t) are stationary.

Considering the long-term relationship, equation 8 can be written as;

$$\Delta y_t = \phi_i \eta_{t-1} + \sum_{j=1}^{p-1} \lambda_{ij} \Delta y_{t-j} + \sum_{j=0}^{q-1} \delta_{ij} \Delta x_{t-j} + \varepsilon_t \quad (9)$$

The error correction term, η_{t-1}, is derived from the long-term equation (6), and the associated coefficient, ϕ_i measures the speed of adjustment to long-run. By allowing short-term coefficients, intercepts, and error variances in the time series and by constraining long-term coefficients to be identical ($\theta^{'} = \theta$), the mean estimator of the parameters with the maximum likelihood technique, with the likelihood estimators defined as; $\hat{\phi}_i$, $\hat{\beta}_i$, $\hat{\lambda}_{ij}$, $\hat{\delta}_{ij}$,and $\hat{\theta}$

In line with the above analytical framework, the estimation technique in this study consists of four steps procedures. The first step is the unit root test which involves the determination of the order of integration, using the ADF - Fisher Chi-square test. The second aspect is to test for cointegration, using the Engle-Granger single-equation cointegration test. The third aspect is the estimation of the long and short run dynamic relationship impact, between the dependent and the independent variables which is run over the sample period, using the Vector Error Correction Model (VECM). Error correction model produce best linear unbiased estimate. The parameter estimates obtained through this estimation technique are best because they are efficient (possess smallest variance among all estimation techniques), they are unbiased

because their expected values equal to population parameters and they are easy to compute. Assuming that all variables are I(1) and co-integrated, v_{it} is supposed to be I(0)for all *i* and is independently distributed across *t*. More specifically, with a maximum of one lag for all variables, the equilibrium error correction representation of the ARDL(1,1) model (after a modification of the above stated equations), that is used to justified the long-run and short run empirical analysis in this study is given by the following relation;

$$\begin{aligned} D\log INRV_t = {} & \omega_i[\log INRV_{t-1} - \omega_0 - \omega_1 OEXR_t - \omega_2 \log IMT_t - \omega_3 \log OEXT_t - \omega_4 \log EXD_t \\ & - \omega_5 \log MPR_t - \omega_6 \log GDP_t] - \psi_1 DOEXR_t - \psi_2 D\log IMT_t - \psi_3 D\log OEXT_t \\ & - \psi_4 D\log EXD_t - \psi_5 DMPR_t - \psi_6 D\log GDP_t + u_t \end{aligned} \qquad (10)$$

The coefficients of interest are both ω and ψ for the long run and for short run the error correction equilibrium model (ECEM), the first and second part of the analysis. We assess the differential impact of each type of nominal official exchange rate on the INRV.

The data for this study were generated in line with the period covered by the study which is 1980-2014, a period of 35. This choice is predicated by the research method adopted for this work and following the purposes and objectives of the study. The data used for this study such as international currency reserves and other variables are obtained from the publications of World Bank website and the Central Bank of Nigeria (CBN) Statistical Bulletin, Annual Reports on major economic indicators.

6. Analysis of Empirical Result

6.1 StationarityTest

Table 1 presents the summary of the unit root tests on the REER and other fundamental variables. That is the results of the intermediate Augmented Dickey-Fuller (ADF) tests for the order of integration of the variables under investigation using the ADF - Fisher Chi-square method. Although, ARDL does not require pretesting of the data but we decided to determine the order of integration of all the data before running the ARDL. From the unit root test result in Table 1, the tests confirm that all variables are nonstationary and could be considered as integrated of order one I(1) or they were stationary at first difference by comparing the variables first difference t-static values with the various probabilities and the T-bar critical values. All the variables were statistically significant at 1%, 5% and 10% critical values in first difference. This implies that all the series are non-stationary at levels. Therefore the null

hypothesis ($\rho = 1$) is accepted at levels and the null hypothesis ($\rho = 1$) that the series are non-stationary after the first difference is rejected for all the series.

Maximum lags were set at 1and lag length was determined by AIC. The correct lag length in the underlying ARDL is determined to be 1 lag. Since the variables were found to be integrated of the same order, the study then proceeds to establish a cointegrating relationship among the variables.

Table 1: Stationarity Test Result

Method		Statistic	Prob.**
ADF - Fisher Chi-square		71.0181	0.0000
ADF - Choi Z-stat		-7.21241	0.0000
T-bar critical values ***:	1% level	-2.89800	
	5% level	-2.67900	
	10% level	-2.56900	

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate ADF test results

Variable	1st Differenc t-Stat	Probability	Order of integration	Maximum Lag
D(LOGINRV)	-5.9581	0.0001	I(1)	1
D(LOGOEXR)	-5.1279	0.0008	I(1)	1
D(LOGIMT)	-7.3945	0.0000	I(1)	1
D(LOGOEXT)	-7.0624	0.0000	I(1)	1
D(LOGEXD)	-5.1346	0.0008	I(1)	1
D(LOGMPR)	-7.0525	0.0000	I(1)	1
D(LOGGDP)	-9.2616	0.0000	I(1)	1

Source: Author's Computation

6.2. Engle-GrangerSingle-Equation Cointegration Test

In the second step, the Engle-Granger single- equation conintegration test is used to confirm the existence of a cointegrating vector and the results are reported in Table 2. Looking at the test description, we first confirm that the test statistic is computed using constant and Trend as deterministic regressors, and note that the choice to include a single lagged difference in the ADF regression was determined using automatic lag selection with a Schwarz criterion and a maximum lag of 1.

Table 2: Engle-GrangerCointegration Test Results

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
LOGINRV	-5.594014	0.0603	-33.24348	0.0723
OEXR	-3.737518	0.5702	-23.16570	0.4449
LOGIMT	-4.295244	0.3364	-33.20972	0.0728
LOGOEXT	-5.903321	0.0542	-36.68673	0.0280
LOGEXD	-4.761965	0.1851	-30.68611	0.1280
MPR	-5.183911	0.0814	-59.68006	0.0000

LOGGDP	-6.215316		0.0162		-39.49085		0.0127
*MacKinnon (1996) p-values.							
Intermediate Results							
	LOGINRV	OEXR	LOGIMT	LOGOEXT	LOGEXD	MPR	LOGGDP
Rho - 1	-0.736183	-0.626534	-0.803926	-1.081621	-0.791074	-1.325025	-1.091285
Rho S.E.	0.169775	0.167634	0.187167	0.220589	0.166123	0.255603	0.175580
Residual variance	0.169580	260.8678	0.046227	0.037524	0.469077	5.831464	0.162746
Long-run residual variance	0.169580	260.8678	0.091178	0.082036	0.469077	11.45180	0.162746
Number of lags	0	0	1	1	0	1	0
Number of observations	33	33	32	32	33	32	33
Number of stochastic trends**	7	7	7	7	7	7	7
**Number of stochastic trends in asymptotic distribution							

Source: Author's Computation

As to the tests themselves, the Engle-Granger tau-statistic (t-statistic) and normalized auto-correlation coefficient (which we term the z-statistic) both reject the null hypothesis of no cointegration (unit root in the residuals) at the 5% significance level. The probability values are derived from the MacKinnon response surface simulation results. Given the small sample size of the probabilities and critical values there is evidence of four cointegrating equation at the 5% level of significance using the tau-statistic (t-statistic) and evidence of six cointegrating equation at the 5% level of significance using the z-statistic This implies that the both rejected the null hypothesis of no cointegration among the variables at the 10 per cent level of significance. On balance, using the tau-statistic (t-statistic) the evidence clearly suggests that LOGINRV, LOGOEXT, MPR and LOGGDP are cointegrated, while, LOGINRV, LOGIMT, LOGOEXT, MPR and LOGGDP are cointegrated using the z-statistic. This implies that there exists a long-run relationship or cointegration between international reserve and some of its determinants.

In Table 2, the middle section of the output displays intermediate results used in constructing the test statistic that may be of interest. First, the "Rho S.E." and "Residual variance" are the (possibly) degree of freedom corrected coefficient standard error and the squared standard error of the regression. Next, the "Long-run residual variance" is the estimate of the long-run variance of the residual based on the estimated parametric model. The estimator is obtained by taking the residual variance and dividing it by the square of 1 minus the sum of the lag difference coefficients. These residual variance and long-run variances are used to obtain the denominator of the z-statistic. Lastly, the "number of stochastic trends" entry reports the value used to obtain the p-values.

6.3. Long-Run Steady-State Analysis

The next step after establishing the cointegration is to estimate the long-run coefficients by estimating the ARDL model in equation 8. This procedure begins with an autoregressive distributed lag (ARDL) specification of an appropriate lag. The consideration of the available degrees of freedom and type of data determine the decision on lag length. With annual data, one lag would be long enough. Under this ECM procedure, the long run relationship is embedded within the dynamic specification. The long-run properties or steady-state long-run relationship between INRV and OEXR, IMT, OEXT, EXD, MPR and GDP can be derived or solved from the estimations shown in Table 3.

The coefficient of the equilibrium correction term (ECT), is significant, confirming that a long-run (cointegrating) relationship exists between the logarithm of the export real exchange rate and the set of explanatory variables. The size of this coefficient implies that adjustment to disequilibria via the equilibrium correction term (ECT) (-0.50) is relatively quick, as 50 percent of a disequilibrium in a given year is corrected in the following year. The ECM appears reasonably well specified judging by the behavior of the fitted and actual values of the corresponding residuals between the logarithm of the international reserve and the official exchange rate, which are shown in Figures 1a and 1b, respectively.

Table 3: Long Run Coefficients Estimate and ECM of ARDL Model

Dependent Variable: LOGINRV			
Variable	Coefficient	Std. Error	t-Statistic
ECM(-1)1/	-0.502415	0.222056	-2.262565
constant	11.24736		
OEXR(-1)	-0.808515	0.43563	-1.85596
LOGIMT(-1)	- 0.344807	0.17073	-2.01956
LOGOEXT(-1)	0.870952	0.37282	2.33611
LOGEXD(-1)	-0.523718	0.17718	-2.95585
MPR(-1)	0.168654	0.14710	1.14624
LOGGDP(-1)	0.238405	0.09437	2.52627
D(LOGINRV(-1))	0.371324	0.473083	0.784901
D(LOGINRV(-2))	0.072421	0.572471	0.126505
D(OEXR(-1))	0.002486	0.012093	0.205554
D(OEXR(-2))	-0.004900	0.011416	-0.429248
D(LOGIMT(-1))	-1.286748	0.435572	-2.954160
D(LOGIMT(-2))	-0.992107	0.410521	-2.416702
D(LOGOEXT(-1))	1.358189	0.456052	2.978146
D(LOGOEXT(-2))	0.974263	0.398550	2.444518
D(LOGEXD(-1))	-0.270100	0.205956	-1.311445
D(LOGEXD(-2))	-0.211967	0.388358	-0.545803
D(MPR(-1))	0.067883	0.034176	1.986292
D(MPR(-2))	0.012630	0.035149	0.359315
D(LOGGDP(-1))	0.117259	0.191262	0.613080
D(LOGGDP(-2))	-0.035881	0.167207	-0.214592
constant	0.381401	0.125546	3.037936
Adjusted R-squared	0.731300		
Durbin-Watson stat	1.996985		

Source: Author's Computation

Table 3 presents the long-run coefficients with their standard errors and *t*-values extracted from the estimated ECM. With cointegration analysis, the potential endogeneity between the international reserve and official exchange rate and other fundamentals does not affect the long-run coefficients.). A look at the regression result in Table 3 indicates conformity of the result with the postulated theories such as; the buffer stock model of Frenkel and Jovanovic (1981).

First, the estimations present the long run impact of aggregated official exchange rate on the international reserve. The results in show that official exchange rate are negatively associated with the international reserve. The one period lag value of official exchange rate has a negative impact on international reserve. The estimated coefficient of OEXR(-0.809) which has the expected sign, indicates that a once-and-for-all unit increase in the rate of annually official exchange rate to annually international reserve will cause a long-run reduction of the international reserve of about 0.81 per cent when measured by the true value. In other words, a 1% percentage point increase in the ratio of official exchange rate implies a 0.81 per cent decrease of the international reserve and is statistically higher at -1.856. This implies that a depreciation (a rise in official exchange rate) in naira as against the dollar in a particular period reduce the international reserve in another period. A rise in official exchange (fluctuation) rate are associated with a dollar appreciation and reduction in the Nigeria international reserve.

With respect to other fundamental variables that determines the behaviour of the Nigeria international reserve, the results show that regression coefficient of LOGIMT is -0.3448, which implies that 34.48% of the decrease in international reserves (INRV) in the long run is accounted for by a 100% increase in imports. This result corroborates the fact that imports is vital to Nigeria foreign external reserves and it availability, to some extent, determine the availability of other factors.

Another important variable estimated in this model is oil export. The estimated regression line in shows that oil export (OEXT) has a high positive relationship with Nigeria international reserves. The regression coefficient of OEXT is 0.870952 which implies that 87.10% of the increase in the long run is accounted for by a 100% increase in oil export. Which implies that the relationship between international reserves and oil export is positive and

statistically significant. This high impact implies that oil export is the major contributor to Nigeria international reserve.

Finally, also, in Table 3 the result show that excess external debt growth are associated with the reduction of the international reserves in the long run with an elasticity of 0.52. This shows an inverse relationship between the external debt and Nigeria international reserves while the increases in the monetary policy rate and GDP with an elasticity of 0.17 and 0.24 respectively are associated with increase in the Nigerian international reserves in the long-run. Although, MPR is positively related to reserves but it is not significant. This is consistent with most empirical studies on the determinants of reserves, this not significant relationship provides evidence in support of opportunity cost of reserves holding in Nigeria. A decline in MPR in any proceeding period will induce the deposit money banks to borrow more from the CBN, hence restrain CBN from building more reserves. The MPR elasticity, which is the measure of opportunity cost, is found to be 0.168654 in the long run. This result support some scholars such as Ben-Bassat and Gottlieb (1992) have argued that it could take positive sign. And the result shows that there is a positive relationship between nominal GDP and Nigerian international reserves. This shows direct relationship between the GDP and Nigeria international reserve.

The variables in equation 8 explain fairly well the stochastic behaviour trend of rate international reserves and official exchange rate as shown in Figures 1a and 1b, which plots the corresponding residuals for the period 1980 -2014. Figure 1a and 1b shows the stochastic response of international reserves to changes in official exchange rate and other fundamentals. Figure 1b witnessed a real stochastic trend in the official exchange rate from 1980 to 2014.

Figure 1a revealed the inconsistence that characterized the Nigerian international reserve residual trend as a result of the changes in the fundamentals. Nigeria's foreign external reserve in its naira equivalent was ₦5813.14m, ₦1690.86 and ₦46356.83,₦37405.83, ₦1031206.26, ₦3783639.74 and ₦7488845.21, ₦6685764.01, ₦5752572.5 in 1985, 1985, 1990, 1995, 2000, 2005, 2012, 2013 and 2014 respectively. Figure 1a shows the stochastic trend of foreign reserves for the Nigerian economy for the period 1980 to 2014. The trend shows that foreign

external reserves have been on the increase especially from 1994 up the present period, 2012 after a sharp drop in 2010.

Fig 1a: Stochastic Trend of LOGINRV

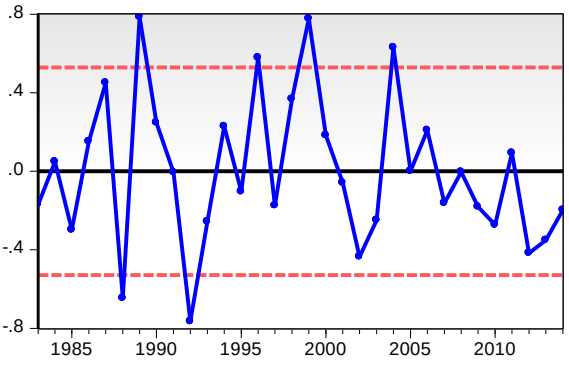

Fig 1b: Stochastic Trend of OEXR

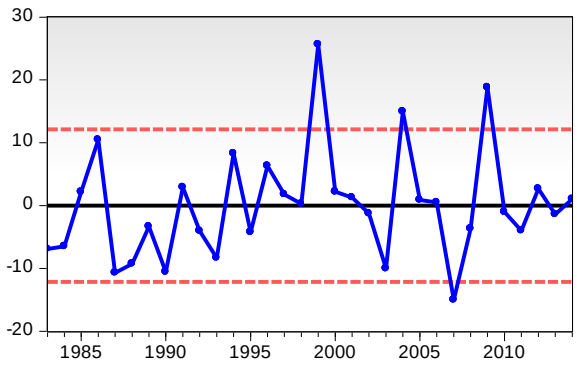

Figure 1b show the residual trend of official exchange rate derived from the fluctuation of this variable from 1980 to 2014. From 0.5464 in 1980, it rose to 8.0378 in 1990, and further rose to 102.9702 in 2000. It rose further to 128.65 in 2006, N150.30 in 2010 and to 168.00 in 2014. This has implication for the rate of growth of inflation, for the fact that the variables witnessed a shape increase compares between 1999 and 2009.

6.4 Equilibrium-Correction Single-Equation Model

Also, the short-run properties can be derived from the estimated ECM result shown in Table 3. The results in Table 3 reported the regression estimate of equation 8 in the context of equilibrium error-correction representation of the autoregressive-distributed-lag model. Given cointegration, movement in the international reserve is estimated using an error correction model because, the estimation of international reserve model largely took place during a period in which there are large real fluctuations in the official exchange rate, introduction of structural reforms, and a change in the exchange rate regime. Therefore, there must also be an error correction model (ECM) that describes the short-run dynamics or adjustment of the cointegrated variables towards their equilibrium values. Although, the model estimated here is often called an error correction model, technically speaking it is an equilibrium correction model.

The ECM estimation implies that the first and second difference of INRV is regressed on explanatory variables. The error correction term can be used to determine the speed of adjustment of the deviation of the international reserve from its equilibrium. As already mentioned, the coefficient of the lagged error term or equilibrium error correction model (ECM) (-0.50), is negative and highly significant, confirming that a long-run cointegrating relationship exists

between the logarithm of the international reserve and the set of explanatory variables. The implication of this is that it takes about a year to eliminate 50% of deviation between the actual and equilibrium international reserve as determined by the fundamentals. The ECM appears reasonably well specified judging by the behaviour of the corresponding residuals values, which are shown in Figures 1a and 1b respectively. It is also shown that the international reserve is quick to adjust back to equilibrium, implying policy effectiveness or flexibility.

The result of the error correction model shows that most of the variables are not significant in the short term except for imports and oil export. The result of ECM shows that the first period lag value of official exchange rate has a positive impact on the Nigerian international reserve, as against the long-run value, while the second period lag value of official exchange rate has a negative impact on the Nigerian international reserve in line with the long-run value. This implies that an average change in Nigerian official exchange rate to a dollar in a particular year increase/decrease the international reserve the following year in the short run.

Also, the result of the error correction model shows that the increase in imports and external debt leads to a reduction of the Nigeria international reserve in the short run, both in the first and second period lag value, while only in the second lag value of the GDP. Oil export and monetary policy rate and first lag value of the GDP are associated with real short run increase of the international reserve, although, some are not statistically.

The result indicates that the long run overall model is well fitted as the independent variables explained over 73 % Adjusted squared $(\bar{R}^2)$ movement in the dependent variable, while the high Durbin-Watson (DW) statistic of 2.000 strongly suggests the presence of no positive first-order serial correlation therefore, the efficiency of the model will not be affected.

Table 4: ARDL Residual Diagnostic Test Results

Residual Normality Tests		
Orthogonalization: Residual Covariance		
Test	t-stat	*p-valve*
VEC Residual Serial Correlation LM Tests	36.66908	0.4377
Normality (Jarque-Bera*statistic)* Joint	3.195805	0.8584
Skewness test (χ^2) Joint	0.768371	0.5826
Kurtosis (χ^2) Joint	2.812179	0.8283
VEC Residual White heteroskedasticity test (χ^2)	19.50749	0.7316

Source: Author's Computation

6.5. ARDL Residual Diagnostic Test Results Diagnostic Tests

Table 5 shows the results of the residual diagnostics tests in order to determine the robustness of the international reserve model. The null hypotheses for the diagnostic tests are that the residuals do not have serial correlation, are, the model is homoskedastic and that the errors are normally distributed. The test did not indicate any rejection of the null hypothesis at 1% or 5% or 10% level of significance. Diagnostic test results reported in table 5 shows that the statistical insignificance of the tests is an indication of a validation of the null hypotheses. The results thus show that the residuals of the ADRL model are normally distributed, there is no autocorrelation problem, and there is no heteroskedasticity problem.

7. Conclusion and Policy Implication

This study examines the relationship between international reserves and official exchange rate for the economy of Nigeria. The paper employed econometric tools to analyse time series data sourced majorly from CBN Statistical Bulletin and World Bank website (1980–2014) after reviewing the theoretical background for the reasons why countries keep reserves, which include self-insurance, mercantilist and macroeconomic stabilization maxims. This study employs the techniques of unit root test, cointegration and equilibrium error correction model representation of the ARDL in estimating the effect of official exchange rate and its macroeconomic fundamentals on the Nigerian international reserves.

The results show that on the long run the one lag value of official exchange rate are negatively associated with the Nigerian international reserves on the long run. This implies that an average change in official exchange rate in Nigeria in a particular year reduces the international reserves in the following year. With respect to other macroeconomic fundamentals, the results show that on the long run the estimated coefficient of imports and external debt have the expected signs, both also have decreasing influence on the Nigerian international reserves.

The levels of oil export, monetary policy rate and GDP found to exhibit positive impacts on the Nigerian international reserves, specially, oil export exhibit a very high positive increasing influence on the Nigerian international reserves, supporting the self-insurance theoretical base of foreign reserves in the oil producing countries. Whereas the imports and external debt had very strong negative relationship with foreign reserves, which tends to contradict the accumulation of reserves agenda of the CBN. The result reveals that export receipts and export earnings had a positive and statistically significant relationship with reserves in the short run while the one period lagged value of international reserve also accounted for positive changes in actual reserve holding, positive oil price shocks were found positively affect reserve holding, while, Import was found to be negative and statistically significant. This may be attributed to Nigeria's high import bill financing and thus led to persistent reserve depletion. The result provided a strong evidence for the long run relationship among the determinants of

international reserves in Nigeria. It debunked the existence of buffer stock model for reserves accumulation and provides strong evidence in support of oil export as a major determinant of reserves management in Nigeria.

As we said mentioned earlier in this study, international reserves also provides a fall back for the rainy day when economies of nations sometimes experience drop in revenue and would need to fall back on their savings as a life line. A good international reserves position would readily provide this cushion and facilitate the recovery of such economies. The view has predictions for the behaviour of official exchange rates fluctuation that are consistent with the data. Oil export turns out to be the most important factor determining the Nigerian foreign exchange reserve. The empirical estimate shows that long run oil export is elastic with respect to official exchange rate and inelastic with respect to relative oil export and foreign reserves.

This implies that the oil export volume would grow at faster rate than official exchange rate turns out to be statistically significant factor affecting international reserves both in the short run as well as in the long run. However its economic impact is relatively larger in particular to the size of estimated official exchange rate coefficients. Also, imports and external debt constitutes an important determinant of international reserves accumulation. Reserve accumulation in this paper is associated with a depreciating currency. Also, during a crisis, the central bank uses reserves to fight depreciation. We observe the two in the data. The first of these facts has been used to argue that reserve accumulation is the unintended consequence of trade policy that tries to promote exporting.

Going by theory, one would expect reserve holdings to be low in a freely floating exchange rate arrangement. However, the increasing frequent financial crisis and exchange rate uncertainty make emerging countries to build up reserves. The implication of our result is that increase in reserve holdings would serve as a complementary tool with domestic monetary authority in stabilizing the exchange rates especially in a dollarized economy like Nigeria. It is therefore recommended that;

i. To increase international reserve holding, it is essential to pursue and implement monetary policies that can considerably relax the binding constraint on the availability of foreign exchange particularly for exporting firms.
ii. Government should effectively control the volume of imports in order to minimise its import bill whilst at the same time trying to diversify its exports in a bid to boost export earnings.
iii. Also, the long run estimates revealed that the estimates of the opportunity cost variable via the interest rate mechanism is sensitive to reserves and since exchange rates fluctuation affects of reserves, the CBN should continue to manage exchange rate.
iv. Indeed, keeping a high level of external demand for domestically produced good must inevitably lead to inflationary pressure. This, in turn, means an appreciating real exchange rate. In order to maintain present the real exchange rate undervalued, the central bank must them keep depreciating its nominal exchange rate, which requires further reserve accumulation in an unending process. Furthermore, to prevent inflation

from catching up, the central bank must sterilize its foreign exchange market interventions, which then becomes increasingly costly. This shows that the export led strategy goes much beyond exchange rate undervaluation.

References

Ahmed and Pentecost (2006). Exchange rate and International reserves: A Threshold Co integration Analysis, Economics Letters, 1-81.

Aizenman and Marion (2003). The High Demand For International Reserves In The Far East: What Is Going On? Journal of the Japanese and International Economies, 17: 370-400

Akdogan (2010). Foreign exchange reserves Demand: An information value approach. Central Bank review, 10: 33-44.

Archer, D. and J. Halliday (1998). Rationale for Holding Foreign Currency Reserves, Reserve Bank of New Zealand Bulletin, Vol. 61, No. 4, pp. 346–54.

Beaufort and Kapteyn (2001). Reserve Adequacy in Emerging Market Economies, Working Paper, International Monetary Fund

Ben-Bassat, A. and D. Gottlieb (1992). Optimal International Reserves and Sovereign Risk, Journal of International Economics

Calvo, G. A. and C. M. Reinhart (2002). Fear of Floating, Quarterly Journal of Economics 117(2)

Central Bank of Nigeria (2011). Statistical Bulletin, Vol. 21, December, Abuja, Nigeria

Central Bank of Nigeria (2012). Statistical Bulletin, Vol. 22, December, Abuja, Nigeria

Central Bank of Nigeria (2014). Statistical Bulletin, Vol. 24, December, Abuja, Nigeria

Central Bank of Nigeria (CBN). Reserves Management" wwwcenbank.org/intops/reservesmgmt.asp retrieved 19/3/2013.

Choi and Gwan (2004). Exchange Rate Regimes and International reserves, International research journal of finance and economics, 1-28

David Irefin and Baba N. Yaaba Determinants of Foreign Reserves in Nigeria: An Autoregressive Distributed Lag Approach CBN Journal of Applied Statistics Vol. 2 No.2

Disyatat, P and D. Mathieson, (2001).Currency Crises and the Demand for Foreign Reserves, Mimeo

Edwards (1984). The Demand for International Reserves and Monetary Disequilibrium: Some Evidence from Developing Countries, Review of Economics and Statistics, 66: 496-500.

Engle and Granger (1987). Co-integration and error correction: representation estimation and testing, Econometrica, (251-276).

Flood & Marion (2002). Holding International Reserves in an Era of high capital mobility, IMF working paper, 2(62)

Flood and Perraudin (1998). Reserves and Exchange rate Cycle, Journal of International economics, 46: 31-59.

Flood, R.P and N.P. Marion, (2002). International Reserves in an Era of High Capital Mobility, International Monetary Fund, Washington, DC, IMF Working Paper, No. WP/02/62.

Ford, J.L. and Huang, G. (1994). The Demand for International Reserves in China: An ECM Model with Domestic Monetary Disequilibrium" Economica, 67, 1994: 379-97

Frankel, J. A (1978). The Demand for International Reserves under Pegged and Flexible Exchange Regimes and Aspects of the Economics of Managed Float', NBER Working Paper No.287

Frenkel, J. (1978). International Reserves under Pegged Exchange Rates and Managed Float: Corrections and Extensions,' Journal of Monetary Economics, 1980, 6: 2, 295-302

Frenkel, J. A and B. Jovanovic, (1981). Optimal International Reserves, Economic Journal, Vol. 91, No. 362, pp.507-14.

Frenkel, J. A and B. Jovanovic, (1981). Optimal International Reserves, Economic Journal, Vol. 91, No. 362, pp.507-14.

Fukuda and Kon (2007). Macroeconomic Impact of Foreign exchange reserves accumulation: A theory and some international evidence. Journal of Economic Modeling, 2: 75-90

Hassan, I., P. Wachtel and M. Zhou (2009). Institutional Development, Financial Deepening and Economic Growth: Evidence from China, Journal of Banking and Finance, Vol. 33, pp. 157–70.

Heller, R. (1966). Optimal International Reserves, Economic Journal, Vol. 76,No. 302.

IMF (2000): Debt-and Reserves-Related Indicators of External Vulnerability, a paper prepared by the Policy Development and Review Department in Consultation with other Departments, March 2000.

IMF (2001). Guidelines for Foreign Exchange Reserves Management, International Monetary Fund, September.

IMF (2003).Reserve Management Guidelines available at www.imf.org

IMF (2013). International Monetary Fund, Annual Report, availableat www.imf.org/external/2013

Kasman and Ayhan (2008). Foreign Exchange reserves and Exchange rate in Turkey: Structural breaks, unit roots and Cointegration, Journal of Economic Modelling, 25: 83-92.

Mayuresh S. Gokhale and J. V. Ramana Raju (2013). Causality between Exchange Rate and Foreign Exchange Reserves in the Indian, Global Journal of Management and Business Research Finance Volume 13 Issue 7

Mendoza. (2004). International Reserves Holding in the developing world: self-insurance in a crisis – prone era? Emerging market Review, 5: 61-82.

Muhammad Tahir Khan (2013), Exchange Rate As A Determinant Of Fluctuation In Foreign Exchange Reserves: Evidence from Economy of Pakistan' Social Sciences and Humanities, a Causality Analysis

Narayan and K. Smyth. (2006). The Dynamic Relationship Between Real Exchange Rate, Real Interest Rate And Foreign Exchange Reserves: Empirical Evidence From China, Applied Financial Economics, 16: 639-651.

Ngozi Okonjo-Iweala (2014). External reserves now $50b in the Nigerian Vanguard News Paper, Wednesday February 26th,

Nigeria Daily independent (2014). Retooling Nigeria's external reserves for efficacy,

Osabuohien, E.S.C. and A.J. Egwakhe (2008). External Reserves and the Nigerian Economy: The Dual Folded Debate, African Journal of Business and Economic Research, Vol. 3, No. 2 and 3, pp. 28–41.

Prabheesh (2007). Demand for Foreign Exchange reserves in India: A Co integration approach, South Asian Journal of management, 14: 36-46.

Prasad and Raju (2010). Foreign Exchange Reserves management in India: Accumulation and Utilization, Global Journal of Finance and Management, 2: 295-306

Ramachandran, M. (2005). High Capital Mobility and Precautionary Demand for International Reserves" Journal of Quantitative Economics, July 2005

Soludo, C.C. (2006).Can Nigeria Be the China of Africa? Lecture Delivered at the Founders. Day of the University of Benin, Nigeria, 23 November.

World Bank Indicator (2013). Website