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Determinants of Foreign Reserve in Nigeria

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Abstract
This study analyzed the determinants of foreign reserve in Nigeria for the period 1970-2013. Data were sourced from the Central Bank of Nigeria Statistical Bulletin while Ordinary Least Square technique was employed for the analysis. The result revealed that oil price and domestic credit are the major determinants of foreign reserve. Other variables such as domestic income, price level, interest rate and exchange rate can also be considered as determinants of foreign reserve but only in the long run. Furthermore, the granger causality test revealed a unidirectional relationship between oil price and foreign reserve. Among others we recommend that Nigerian government should encourage other sources of foreign reserve apart from oil to minimize the effect of oil price volatility on the foreign reserve as well as the economy.
Keywords: foreign reserve, oil price, domestic credit, Nigeria

1. Introduction

Foreign exchange reserves adequacy is a key component of good macroeconomic management. It can be used to smooth random and temporary balance of payments shocks, to maintain exchange rate parity, avoid the macroeconomic costs of adjustment to temporary shocks and smooth adjustment of the macroeconomic impact on some permanent shocks (IMF, 1993). Foreign exchange reserves can also be used to smooth exchange rate volatility in illiquid foreign exchange markets.

After independence, Nigeria operated the controlled system of exchange rate and therefore, needed to keep high amount of reserves in order to maintain the exchange rate at a pegged level. But later, she witnessed some flexibility in the exchange rate market. Currently, Nigeria is operating the managed-float system which means that the Central Bank of Nigeria (CBN) should intervene occasionally in the exchange rate market to prevent excessive short-term exchange rate volatility. However, for the Central Bank to perform this role effectively, adequate amount of reserves should be kept at all times.

It is observed that Nigeria's international reserves have not been stable over the years. Some increases have been recorded but, they have not been sustainable. The reserve position of Nigeria has continuously seen some improvements since the year 1999. The Gross International Reserves of Nigeria rose from US$ 4.98 billion in May 1999 to US$ 59.37 billion as at March 28, 2007 but has declined drastically to US$29.865 million as at March 25, 2015 (IMF, 2015). Such depletion in foreign reserve have far reaching adverse effects on the economy especially if not tied to specific projects intended to develop infrastructure.

Noteworthy here is that there have been divergent views about reserves holding. Some economists argue that foreign exchange reserves are useless and unutilized, while others argue that reserve holding is necessary to help smooth balance of payments imbalances (Friedman, 1953; Kemal 2002). Friedman (1953) criticized the fixed exchange rate system with the argument that it contains unutilized foreign exchange reserves while, Kemal (2002), argues that foreign exchange reserves should be there to smooth out the imbalances in balance of payments. Therefore, it is believed that the concern of the critics of reserve holdings is about the cost of holding reserves, which is the investment that the nations must forego in order to accumulate reserves.

Figure 1 illustrates the movement of foreign reserve in Nigeria from 1970 to 2013. The trend did not change significantly between 1970 and 1999. In 1999, Nigeria's foreign reserves stood at a meager US$5.42 billion; however, it rose by 80.0 per cent to US$9.90 billion in the year 2000. It further increased by 5.3 percent in 2001 to US$10.42 billion. It then declined in 2002 and 2003 to US$7.90 billion and US$7.47 billion respectively or by 23.3 and 6.6 percent, respectively. The fall in reserves within this period was largely attributed to inadequacy of foreign exchange receipts, as well as huge fiscal spending and the resultant pressure on the country's debt payment obligations.

Furthermore between the year 2003 and 2004, reserves experienced a dramatic upward trend as it rose from US$7.47billion to US$16.96 billion. This indicated a significant increase of 127.0 percent. The increase was due largely to high receipt from crude oil sales coupled with the prudent fiscal and monetary policy stance of the National Economic Empowerment Development Strategy (NEEDS) introduced in 2004. This can be shown in figure 1 (see appendix).

In 2005 and 2006 the reserves positions were US$28.28 billion and US$42.23 billion respectively, representing increases of 66.8 and 49.2 per cent respectively. This positive out-turn was accounted for by a

combination of factors including discipline on fiscal and monetary policy measures, high oil prices in the international markets, as well as low debt services burden. Since may, 2007, the reserves have fluctuated in line with development in the international oil market, rising from US$43.13 billion at that time peaking at US$62billion in September 2008 when oil prices reaches a peak of US$147 per barrel, and falling subsequently to a low of US$31.7 billion in September 2011. This fall in reserves was largely a result of the vicissitudes of the global economy and oil market which caused the Central Bank of Nigeria to intervene using some of the reserves to defend the value of the naira. The excess crude savings, which it should be noted is a component of the reserves, was largely used to cushion the economy at the height of the global financial crisis in 2008 to 2009. As a result, Nigeria was one of the few countries in the world that did not seek assistance from international financial institutions at that time. The fiscal stimulus used to shore up the economy during that period was shared by all three tiers of government. Similarly, savings in the excess crude account were also used to pay for fuel subsidies for the entire nation and that sharing continued after the crises ended. The foreign reserves has suffered massive depreciation of US$5.2 billion in seven months and declined from its peak of US$48.85 billion in May, 2013 to closed year at US$43.61 billion by December 2013. With the balance of payment in deficit and the naira under pressure, investors once more are more cautious than ever. Central Bank of Nigeria shows the nation's foreign reserves stood at US$35.740billion as at December 11 but fell to US$35.196billion as at December 18 2014.

This pace of reserves accumulation is occurring without regard to its diminishing marginal benefits and rising marginal costs. This has led to a debate on what are the determinants factors of reserves accumulation. Although many factors have been said to be the determinant of foreign reserves in Nigeria, but inconsistencies abound from so many conflicting results. Hence the essence of this study is to complement the already existing studies and then ascertain the main determinants of foreign reserves in Nigeria.

The fundamental objective of this study is to analyze empirically the determinants of international reserves in Nigeria. Further, the specific objectives are:

- To quantify the determinants of foreign reserves in Nigeria.
- To identify the relationship between foreign reserve and macroeconomic variables of real domestic income, exchange rate, domestic price level, domestic rate of interest, domestic credit.

2. Review of Related Literature

2.1 Conceptual Review

(a) Reasons for Holding Reserves:

Since the end of Bretton woods, many countries have formed the habit of keeping huge reserve. This phenomenal growth is a reflection of the enormous importance that countries attach to holding an adequate level of foreign reserve. The reasons for holding reserve are discussed below:

- To protect the value of the Domestic Currency: During the gold standard era, many countries kept foreign reserve to back up the value of their domestic currency. This idea continued till the end of Bretton Woods system when most developed countries started using up their reserves.
- To finance international trade obligations: There is need for liquid reserves that can be used to settle trade obligations. Trade obligations include disequilibrium in the Balance of Trade and Balance of payments. In many developing countries like Nigeria, the settlement could be done through commercial banks.
- Store of Value for future Consumption: Some countries hold their reserve in liquid form or as a form of savings for future use. This has been adopted by many oil producing countries like Nigeria that maintain a part of reserve as Sovereign Wealth Fund. The reserve could be held in form of long term securities which cannot be accessed easily. This is to ensure that the country have stored some value for the future generation.
- Exchange rate management: Exchange rate can be managed by foreign reserves to enabling an orderly absorption of international money and capital flows. Through the intervention in the foreign exchange markets, monetary authorities attempt to control the money supply as well as achieve a balance between demand and supply of foreign exchange.
- To improve a country's credit worthiness: The international Credit Agencies consider the holding of reserves in their rating of country's credit worthiness. Therefore, many countries hold reserve in order to improve their credit ratings and credit worthiness.
- To provide a fall back option: Many countries also hold their reserve as an available source of revenue to fall back on in case of natural disasters and other emergencies.

(b) Sources of Nigeria's Foreign Reserve

Nigeria's foreign reserves are mainly from the proceed of crude oil production and sales which includes Direct sales (NNPC), Petroleum Profit Tax (oil companies), royalties, penalty for gas flaring and rentals.

(c) Uses of Foreign Reserve in Nigeria

Nigeria foreign reserves are used for both private and public sectors requirement; they are used for current consumption, pay off of foreign debts, annual debt servicing, Wholesale Dutch Auction Sales in respect of states and government agencies, Joint venture cash call Payments, infrastructural development (PHCN, railways, roads, etc), contribution and subventions (International Organisations and Nigerian Embassies and high commissions), estacodes and government LC, Wholesale Dutch Auction Sales for private sector institutions and individuals, sales of foreign exchange to Bureau de change and banks

2.2 Basic Theories

(a) Mercantilist Theoretical Model

The Mercantilist theory posits that many countries accumulate foreign reserve in order to maintain an effective exchange rate (Durdu, et al., 2007). This is to ensure foreign exchange stability. Countries with stable exchange rate appear more competitive in the international market than countries with volatile exchange rate. Reserves are used to intervene in foreign exchange market to influence exchange rate.

(b) Self-insurance Theoretical Model

Self-insurance theory has two dimensions: ex-ante crisis and ex-post crisis mitigation. Ex-ante self-insurance relies on the fact that reserve accumulation is expected to increase investor confidence, which decreases the probability of a crisis. Ex-post foreign reserves help mitigate the adverse effect of a shock on the economy. This helps to explain, to a large extent, the recent accumulation of reserves in Asian countries in the aftermath of financial crises (Stiglitz,2006; Elhiraika and Ndikumana, 2007).

Aizenman and Marion (2004) argued that apart from any need to hold reserves for exchange-rate management, countries that face conditional access to global capital markets and costly tax collection will accumulate reserves to smooth consumption and distortions inter-temporally. Aizenman and Lee (2007), states that self-insurance view may lead countries to accumulate international reserves in order to mitigate the possible transmission of banking crisis to currency crisis. The recent surge in the stock of foreign reserve in developing countries has been largely interpreted as a form of self-insurance against any form of global economic or financial crisis.

2.3 Empirical Literature Review

Enormous empirical literatures exist on international reserves determination. Some of the pertinent ones are given bellow:

Frenkel and Jovanovic (1981) in their effort to determine the optimal stock of reserves modified Heller's model based on the principles of inventory management using pooled time series for the period 1971-1975 for twenty two countries, they concluded that the estimated elasticities were close to their theoretical predictions.

Choi and Baek (2004) used a new classification of exchange rate arrangements developed by Reinhart and Rogoff (2004) to test whether reserve holdings decrease with increasing exchange rate flexibility. Using pooled data for 137 countries over the period 1980-2000, the study regresses international reserves variable on other variables such as per capita GDP, trade openness(measured as the ratio of exports plus imports to GDP), financial openness(defined as the ratio of gross private capital flows to GDP), interest rate, export volatility and a dummy for exchange rate regime. The study finds that the degree of exchange rate flexibility has an inverted-U relationship with the with the country's reserve holdings.

Lai (2004) examined the demand for international reserves by considering the financial centre status of an economy as well as factors often cited in literature such as the size of an economy, trade openness and the exchange rate regime. Using a sample of over 140 economies, the study examines the empirical evidence for the relationship between reserve holdings and financial sector development and considers how the level of foreign exchange reserves held by Hong Kong compares with the other economies considered. The results confirm that the openness and size of the financial sector are important determinants of the level of reserve holdings. After controlling for the size of the economy, trade openness and financial centre status, the level of reserves in Hong Kong does not appear to be unusually high by international standards.

Khan and Ahmed (2005) analysed the main determinants of reserves holding in Pakistan and also attempted to find the implications of structural shifts such as September 11, military take-over and the autonomy of State Bank of Pakistan for the traditional reserves demand theory and the implications of monetary approach to balance of payments for reserves holding behaviour in Pakistan. The study estimates the long run cointegration relationship between reserves variable and other determinants such as balance of payments variability, money market rate, the average propensity to import, the level of imports and workers' remittances using quarterly data over the period 1982: 1-2003:2. The study finds that there exists a stable long run reserve demand function in case of Pakistan. The estimated cointegration relationship shows that all variables except remittances are significant. The variations in balance of payments and imports have positive relationship while money market rate has a negative impact on international reserves.

Jo (2007) used a cointegration and a vector error correction approach to estimate the magnitude and sources of international reserve accumulation in Korea. The study presents further evidence to support the hypothesis that the large build up of international reserves in Korea might be the by-product of mercantilist objectives to smooth exchange rate movements beyond responses to perceptions of the need for greater reserve hoardings, generated by the 1997-98 Asian crises. The study finds that Korea's recent hoarding of international reserves substantially exceeds any benchmark levels. One explanation is that the large reserve buildup is the by-product of Korea's exchange rate policy to maintain export competitiveness.

Yan (2007), investigated empirically the relationship between the pattern of fiscal policy and the demand for international reserves in developing countries, and how this relationship is associated with political risk and conditional access to global capital markets. Using the Two Stage Least Squares (2SLS), the study finds that for developing countries with low political risk, countercyclical (procyclical) fiscal policies are associated with higher (lower) international reserve holdings in economic downturns. The relationship is stronger when the countries with low political risk rely heavily on external financing. For developing countries with high political risk, the link between reserves holdings and fiscal policy pattern is not clear-cut.

Bentum-Ennin (2008), adopted a modified version of the monetary approach to balance of payments in analyzing the link between Ghana's international reserves and macroeconomic performance and, a buffer stock model to analyze the opportunity cost of holding reserves and how Ghana's reserves levels depart from the benchmark stock of reserves. For him to avoid spurious regression results, he subjected the time series data to stationarity tests. He used the Johansen's cointegration procedure to examine long run relationships that existed among the variables. The short run dynamics was examined by using an error correction model. It is found that an improvement in macroeconomic performance bring about an improvement in the reserve position of a country; increase in domestic credit also has a negative effect on international reserves but, increased openness to trade and financial openness, and increased tourism receipts have positive impacts on international reserves, while higher interest rate differential and exchange rate volatility have negative impacts on international, reserves.

Abdullateef and Waheed (2010), investigated the impact of change in external reserve positions of Nigeria on domestic investment, inflation rate and exchange rate. Using a combination of Ordinary Least Square (OLS) and Vector Error Correction (VEC) methods, it was observed that change in external reserves in the country only influences Foreign Direct Investment (FDI) and exchange rates and no influence of it was found on domestic investment and inflation rates. The study suggested that there is need for broader reserve management strategies that will aim at maximizing the gains from oil export revenue by utilizing more of these resources to boost domestic investment.

Alasan, et al. (2011) investigated the relationships that existed between external reserves management and economic development in Nigeria, using Ordinary least square method of data analysis. The empirical result of the data analysis revealed that there is a statistical significant relationship in the management of Nigeria foreign reserves and economic development in Nigeria.

Anyaogu (2012), investigated the Causality effect of macroeconomic variables in Nigeria, on external reserves. The study employed Vector Auto-regressive (VAR) and Wald tests, which revealed that past value of Gross Domestic Product is significant in explaining the current values of foreign reserves with the causality effect. The model further revealed that the external reserves was statistically significant on the current year (-1) but statistically insignificant in the previous years while among the macroeconomic variables only inflation was significant to external reserves.

Umeora (2013) studied the effect of holding reserve on exchange rate and inflation rate using Ordinary Least Square method. Data were obtained from CBN statistical bulletin for a period of 25 years (1986-2011). They found that exchange rate has a positive effect of Foreign reserve while inflation has negative effect.

It is pertinent to note that the literature reviewed, has revealed various variables that may affect reserve holdings of any nation. The method of analysis differs across different authors prompting the need for further research. Noteworthy here is that Choi and Baek (2004), and Lai (2004), used OLS but did not test for the stationarity of the series they used. However, it has been shown that running regression on non-stationary data using OLS estimation method produces spurious regression results. As a result of this, this study will use the cointegration approach and also tests for the stationarity of the series in order to avoid any spurious regression results. Furthermore, this study adopts a modified version of the monetary approach to balance of payments to analyze the determinants of foreign reserves in Nigeria.

3. Research Methodology

3.1 Model Specification

This model employed some variables identified from previous studies as determinants of foreign reserve, and therefore could be specified as equation (4) below:

Fr = h(Y, P, Ir, E, OP, DC) …….(4)

Where; Y= level of real domestic income

P = domestic price level
Ir = domestic rate of interest
E = nominal exchange rate
OP = Oil Price
DC = Domestic credit
h = functional notation.

To take care of the growth rate of the international reserves and its determinants we have to transform the variables to their logarithmic forms. Therefore, the natural log transformation of equation (4) is given as follows:

$$InFr = a_0 + a_1InY + a_2PL + a_3Ir + a_4ER + a_5\, lnOP + a_6InDC + \mu \ldots\ldots (5)$$

a1>0, a2<0, a3<0, a4<0, a5>0, $a_6>0$

Where, ln = natural log

μ = the white noise error.

a_1 to a_5 are the coefficients of the independent variables

Equation (5) will help us to establish the link between macroeconomic performance and international reserves. Note that price level (PL), interest rate (Ir) and exchange rate are not logged because it is already transformed to rates.

3.2 Source of Data

Secondary data were employed for this analysis covering 1970 to 2013. The data were collected from Central Bank of Nigeria statistical bulletin, various editions. GDP measured at 2005 constant price is the proxy for level of real domestic income. The inflation rate is the proxy for domestic price level, the lending rate is the proxy for domestic rate of interest, nominal exchange rate, and domestic credit were also collected.

4 Data Analysis

The analysis comprises of four different steps which involves unit root test, the cointegration test, the short-run dynamics and then some diagnostic tests.

4.1 Unit Root Test

Ng-Perron (NP) (2001) test for unit root was employed to determine if the variables are stationary, instead of the conventional Augmented Dickey Fuller (ADF) Test or Phillips-Perron (PP) test. This method is a modified version of PP Za and Zt statistics. NP has advantage over ADF and PP because it controls for structural breaks in time series data. This method is adopted in this research as this ensures that data employed for the analysis are non-spurious. This unit root test is carried out individually for all the variables. The null hypothesis is that the variable under consideration has a unit root while the alternative hypothesis is that there is no unit root. The result is presented in Table 4.1 for the MZa and MZt statistics:

It can be seen from table 4.1 that NP test for unit root was carried out at level as well as first difference which were both tested with. The result revealed that there is no presence of unit root in all the variables at first difference. This shows that all the variables are integrated of order one I(1).

4.2 Co-integration Test

One of the conditions for co-integration is that each of the variables be integrated of the same order. Since each of the variables employed in our model are integrated of order one, the above condition has been satisfied, therefore, a test for co-integration was carried out. Johansen Co-integration procedure is employed, in this study, to determine if the variables have a long run relationship. The result is presented in table 4.2a in the next page. The Maximum Eigen Statistics reveal that there exists one co-integrating equation at 5% critical value while the Trace Statistics values revealed two cointegrating equations at 5% critical value. Value of the Maximum Eigen Statistics is 93.97911 which is greater than the 50.59985 critical value at 5 per cent while the value of the Trace Statistics at none is 215.2607 which is also greater than the 5 per cent critical value of 150.5585. The long run coefficients are obtained from the co-integration test and normalized by multiplying the coefficients value by minus one (-1).

4.2b Normalized Long-run Relationship

From table 4.2b, we can infer that all the variables, which are, natural Log of Real Domestic Income (LnY), Price Level (PL), interet rate (IR), Exchange rate (ER), natural log of oil price and natural log of Domestic Credit (LnDC) have significant effect on the level of Foreign Reserve (FR) in the long run. Only oil price reveals significant favorable effect while other variables indicate adverse effect on the Foreign Reserve.

4.3 Error Correction Mechanism

In the estimation of short run dynamics of the model, lag of error term is included as an explanatory variable. The maximum lag length is limited to three for each of the variables. Hendry procedure of general to specific

was also employed. Thus, the variables that were insignificant were deleted and the model was re-estimated. The result of the short run dynamics is reported in table 4.3 in the appendix.

From table 4.3, some variables such as domestic income at lag three, price level at lag two, exchange rate at lag 2, oil price at level and lag three and domestic credit at lag one and two all revealed significant contributors to the foreign reserve in the short run. The coefficient of the lagged Error Correction Model (ECM) is correctly signed although it is insignificant. The coefficient shows that about 60 percent of the disequilibrium in foreign reserve will be corrected within one year. Therefore, the speed of the adjustment of the disequilibrium towards long run equilibrium is high. That is to say, distortion can be minimized at a fast speed in the long run.

4.4 Granger Causality

To test for hypothesis two, the pairwise granger causality test is adopted. This method tests for relationship between the foreign reserve and the macroeconomic variables employed as the independent variables.

The Granger causality test (table 4.4) revealed that there is unidirectional relationship between foreign reserve and oil price, then foreign reserve and Price Level. The result of the granger causality is contrary to the expected result because the result revealed that relationship flow from foreign reserve to the oil price. The reason for this could be that Nigerians react to the expected change in oil price before it actually happens. Meanwhile, only the Domestic Credit has a bi-directional relationship with foreign reserve. This depicts that domestic credit granger causes foreign reserve at 5 percent critical level and foreign reserve also granger causes domestic credit at 10 percent critical level. Domestic income, interest rate and exchange rate did not reveal any relationship with the foreign reserve. In other word, there is no directional relationship between foreign reserve and some macroeconomic variables of domestic income, interest rate and exchange rate.

Since time series data are expected to satisfy the classical linear assumptions, the following diagnostic tests were carried out:- The Jarque-Bera normality test reveals that the error term is normally distributed because the probability of 1.568027 is highly insignificant with the probability of 0.456570. The test for hetroskedasticity using the Breusch-Pagan Heteroskedasticity test reveals that there is no presence of hetroskedasticity which implies that the variance of the error term is constant over time. The F-value is 0.989845 with the probability of 0.5018 which is insignificant. The Ramsey-Reset test helps to determine the stability of the model under consideration. The F-statistics of the Ramsey Reset test is 2.8354 with probability of 0.0533 which is insignificant. This indicates that there is no specification error and that the model is stable. The LM test was adopted to determine if there is presence of auto-correlation in the model. The result of 2.527632 with the probability of 0.1038 indicates that there is no presence of auto-correlation

5. Conclusion

This study sets out to determine the determinants of foreign reserve in Nigeria and to find out if there exists relationship between some macroeconomic variables and foreign reserve. The finding revealed that oil price and domestic credit are the major determinants of foreign reserve. The finding is also in line with the apriori expectation because oil price tend to have positive and significant effect on foreign reserve. Other variables such as domestic income, price level, interest rate and exchange rate can also be considered as determinants of foreign reserve but only in the long run.

Furthermore, the granger causality test revealed a unidirectional relationship between oil price and foreign reserve while domestic credit has bidirectional relationship with foreign reserve. This emphasizes that oil price have relationship with foreign reserve. It also accentuates the need for the Nigerian government to make credit available to the private sector. Therefore, we conclude that oil price and domestic credit are the major determinants of foreign reserve in this country.

Recommendations

Based on the findings of this study, the following policy recommendations are given:

Firstly, the government and the monetary authorities should strive towards policies that will boost the foreign reserve of this country. This is paramount because Nigeria is a developing country that is open to international financial shocks. Low level of foreign reserve will destabilize the economy especially in the face of international financial crises.

Secondly, the government policies should be geared towards making credit available to the private sector because this will help to boost the foreign reserve of the country. The importance of the private sector cannot be over emphasized. They are the stronghold of any economy. With more domestic credit available to the private sector, the domestic investment will improve leading to greater returns to the foreign reserve.

Thirdly, policy geared towards diversification of the economy away from oil wealth is necessary for the country to achieve sustainable development.

Fourthly, policy directed towards improving the standard of living of Nigerian citizens should be adopted by the government. Since, the economic size is too poor to contribute positively to the growth of foreign reserve

in the long run; it means that the standard of living of the people is poor.

Finally, there is need for the government to maintain a stable exchange rate. This is in line with our finding, because with a stable exchange rate, foreigners will have more confidence to invest in the country. The investors will not be afraid to lose their money when there is stable exchange rate.

For further research, we recommend the use of opportunity cost and current account balance as part of the dependent variable. The opportunity cost can be derived by taking the difference between the domestic interest rate and the U.S. interest rate since the foreign reserve is stored in U.S. dollars.

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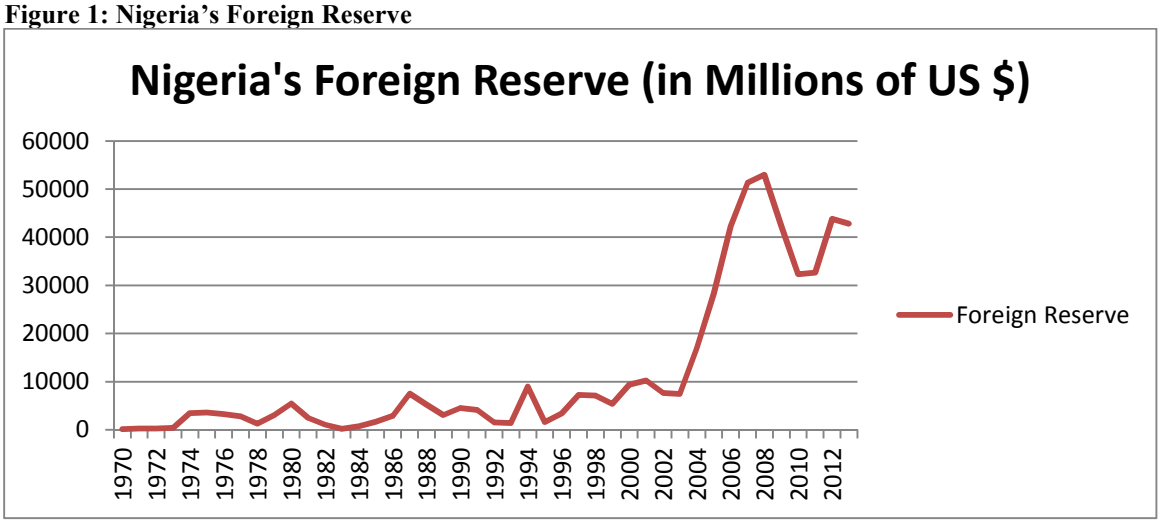
Figure 1: Nigeria's Foreign Reserve



Source: Authors computation based on CBN statistical bulletin 2013

Table 4.1: Ng-Perron Modified Unit Root Test

	Level		First Difference	
Variable	**MZa**	**MZt**	**MZa**	**MZt**
LnFR	-1.85766	-0.73571	-21.4100	-3.25117
LnY	0.44616	0.38277	-21.4700	-3.27550
PL	0.15295	0.09115	-14.0800	-2.63657
IR	-2.28727	-1.02066	-17.1665	-2.92949
ER	1.09052	0.83617	-21.3770	-3.26917
LnOP	0.31721	0.20264	-21.4715	-3.26464
LnDC	1.27978	1.07804	-18.0938	-2.92867
Critical Values				
1%	-13.8000	-2.58000	-13.8000	-2.58000
5%	-8.10000	-1.98000	-8.10000	-1.98000
10%	-5.70000	-1.62000	-5.70000	-1.62000

Source: Author's Computation from E-view 8

Table 4.2a: Results of Co-integration Test (Johansen Technique)

Hypothesized No. of CE(s)	Max Eigen Stat	Critical Value for Max. Eigen Stat.	Trace Statistics	Critical Value for Trace Stat
None*	93.97911*	50.59985	215.2607*	150.5585
At most 1	35.00179	44.49720	121.2816*	117.7082
At most 2	25.26789	38.33101	86.27980	88.80380
At most 3	23.99002	32.11832	61.01191	63.87610
At most 4	20.10668	25.82321	37.02188	42.91525
At most 5	11.30651	19.38704	16.91521	25.87211
At most 6	5.608697	12.51798	5.608697	12.51798

Source: Author's Computation from E-view 8

Table 4.2b Normalized Long-run Relationship

Dependent Variable: LnFr

Variable	Coefficients	Standard Error	T-Statistics
LnY	-4,1205	0.3664	11.245***
PL	-0.1275	0.0131	9.7328***
IR	-0.8205	0.0644	12.7407***
ER	-0.0473	0.0052	9.0961***
LnOP	4.6999	0.3670	12.8063***
LnDC	-13.6093	0.8767	15.5233***

Table 4.3 Short run Dynamics
Dependent Variable: LnFR

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNFR(-1)	1.035761	1.140002	0.908561	0.3730
LNY(-1)	0.303543	0.816125	0.371932	0.7133
LNY(-3)	0.738074	0.229686	3.213405	0.0039**
PL(-2)	0.096960	0.055630	1.742931	0.0947*
PL(-3)	-0.095615	0.061030	-1.566693	0.1308
ER	-0.007342	0.006344	-1.157389	0.2590
ER(-1)	-0.001503	0.012670	-0.118645	0.9066
ER(-2)	0.014244	0.006190	2.301262	0.0308*
IR	-0.034808	0.029212	-1.191572	0.2456
IR(-3)	-0.036597	0.023699	-1.544230	0.1362
LNOP	1.284465	0.315098	4.076394	0.0005***
LNOP(-1)	-1.090032	1.198646	-0.909386	0.3726
LNOP(-2)	-0.506700	0.344188	-1.472159	0.1545
LNOP(-3)	-0.826399	0.365291	-2.262299	0.0334**
LNDC(-1)	1.634023	0.818109	1.997317	0.0578*
LNDC(-2)	-2.692627	0.843513	-3.192158	0.0041
LNDC(-3)	0.861651	0.594174	1.450165	0.1605
C	-0.774143	7.229431	-0.107082	0.9157
ECM(-1)	-0.607592	1.147199	-0.529631	0.6014
R-squared	0.9492	Probability		
Adj. R-squared	0.9094			
F-Statistics	23.8607	(0.0000)		
Normality	1.5680	(0.4566)		
Heteroscedastcity	0.989845	(0.45657)		
Ramsey Reset Test	2.8354	(0.0533)		
LM test	2.5276	(0.1038)		
Durbin-Watson stat	2.1210			

(*)(**) and (***) indicates significant at 10%, 5% and 1% respectively
Source: Author's computation from E-View 8

Table 4.4 Pairwise Granger Causality Tests

Null Hypothesis:	Obs	F-Statistic	Prob.
LNY does not Granger Cause LNFR	43	1.04850	0.3604
LNFR does not Granger Cause LNY		1.58280	0.2186
LNOP does not Granger Cause LNFR	43	0.46661	0.6307
LNFR does not Granger Cause LNOP		2.92983	0.0656*
LNDC does not Granger Cause LNFR	43	4.17103	0.0230**
LNFR does not Granger Cause LNDC		2.50815	0.0948*
PL does not Granger Cause LNFR	43	3.19216	0.0523*
LNFR does not Granger Cause PL		0.72404	0.4914
IR does not Granger Cause LNFR	43	2.00810	0.1482
LNFR does not Granger Cause IR		0.95286	0.3947
ER does not Granger Cause LNFR	43	0.17172	0.8429
LNFR does not Granger Cause ER		1.88493	0.1658