

Macroeconomic Implications of External Reserves Management in Nigeria: 1986–2016

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Abstract: This study investigated the macroeconomic implications of external reserves management in Nigeria. Specifically, the study examined the impact of exchange rate, trade openness, inflation rate, external debt, economic growth rate and real interest rate on external reserves in Nigeria. Ex-Post Facto research design and Autoregressive Distributed Lag - ARDL Regression Model were used. Time series data for the period 1986-2016 sourced from Central Bank of Nigeria Statistical Bulletin were analyzed with the aid of E-view 9.0 statistical software. The study found that exchange rate has significant and positive impact on external reserves in Nigeria; trade openness has insignificant and negative impact on external reserves in Nigeria; inflation rate has significant and negative impact on external reserves in Nigeria; external debt has significant and negative impact on external reserves in Nigeria and economic growth rate and real interest rate has insignificant and positive impact on external reserves in Nigeria. The implication of the finding is that in the long-run, exchange rate, inflation rate and external debt affect external reserves in Nigeria but in the short-run, past values of three dynamic variables (exchange rate, inflation rate and external debt) affect external reserves in Nigeria. It was concluded that volatility in inflation rate; exchange rate and external debt are significant in determining the external reserves position in Nigeria. The study recommended that government should continue to pursue dynamic monetary and fiscal policies that will ensure stability in exchange and inflation rates; control the rising external debt profile of government through efficient fiscal responsibility measures and government should evolve more friendly economic and trade policies that will enhance domestic and international trade thereby leading to robust economic growth and external reserves accumulation in Nigeria.

Keywords: Trade Openness, Inflation Rate, External Debt, Economic Growth Rate, External Reserves

I. INTRODUCTION

The Central Bank of Nigeria (CBN) Act 1991 confers the custody and management of the Nigeria's external reserves on the Central Bank of Nigeria. [1] defines external reserves as the external stock of assets that a country's monetary authorities hold and are composed of foreign banknotes, bank deposits in foreign currencies, and in foreign bonds, treasury bills, and other government securities. External Reserves also known as foreign exchange reserves or foreign/international reserves refer to official international reserves which are assets of Central Banks held in different reverses currencies such as US Dollar, British Pound Sterling, Euro and Japanese Yen. Nigeria like other developing countries relies on external reserves for import cover, and also for exchange rate stability [2]. According to [3] total external reserves constitute monetary gold holdings, Special Drawing Rights, holdings of foreign exchange, and external reserves of International Monetary Fund (IMF) member countries, under the management of Central Banks, which are expressed in US dollars. Stable macroeconomic environment is essential in achieving robust external reserves.

External reserves in Nigeria are accumulated from the proceeds of crude oil production and sales by Nigerian National Petroleum Corporation, petroleum profit tax (Oil Companies), royalties, penalty for gas flaring and rentals. The rationale for maintaining external reserves includes among other to provide support for the domestic currency; to finance international trade settlements especially when there is trade deficit; to provide a framework for holding Sovereign Wealth Fund; it helps the monetary authority to deal with exchange rates volatility; it is used to shore up the country's credit ratings and credit worthiness as credit agencies consider the holding of reserves in their rating of a country; holding of reserves serves as a form of shock absorber in times of shocks in the economy and more over, external reserves are accumulated for the purposes of meeting up with other emergencies and natural disasters. The CBN as the apex bank uses external reserves to meet the country's transactionary motives and for precautionary purposes in order to provide a framework necessary to absorb unexpected fiscal shocks in terms of trade and capital outflows [4].

External reserves are managed with a view to optimizing a nation's external resources in order to meet the economic needs of a country [5]. Economic needs of a nation are most likely to be met when the

macroeconomic variables are stable. [6] noted that Nigeria has taken numerous policy initiatives and measures in the management of her foreign reserves. Between 1986, 1999 and 2005, the Nigeria's external reserves holdings amounted to ₦3587.4 million, ₦546873.1 million and ₦3835433 million respectively and in 2008 it increased to ₦7025860 million [7]. However, in 2014 and 2015, the external reserves declined to ₦5444398.5 million and ₦5430681.6 million [8]. On a global scale, China currently holds the world's largest external reserves amounting to 3.5 trillion of assets held in foreign currencies (mostly in US dollars) and Saudi Arabia hold external reserves amounting to USD 554 billion as of October 2016).

The level of external reserve in a country is influenced by macroeconomic variables such as external sector developments such as international trade transactions, exchange rate, external debt and other related external obligations. Macroeconomic variables are those variables that affect the whole economy rather than just a small or single unit. These macroeconomic variables include economic growth, exchange rate, balance of payment, trade openness, external debt, inflation rate and unemployment rate. [9] states that the macroeconomic factors that influence external reserves level in Nigeria are exchange rate, GDP, inflation and trade openness. The likely impact of macroeconomic variables on external reserves might vary depending on the economic growth and development of an economy. When an economy booms, it is likely that more external reserves might be accumulated depending on the economic or financial policy of the government at the time. In the period of price instability (inflation), it is more likely that rate of external reserves accumulation might decline because economic activities will experience a gradual downturn. Therefore, unstable macroeconomic environment might not be able to provide the required framework for accelerated accumulation of external reserves.

Statement of the Problem

Nigerian external reserves position has been fluctuating over the past two decades with external reserves declining from its highest value of US\$53.60 billion in 2008 to US\$37.50 billion in 2014 and this decline has been continuous [10]. In spite of the various policy measures (such as diversification of the economy and devaluation of Naira from N155/USD to N198.6/USD between November 2014 and March 2015) put in place to manage external reserves accumulated over the years in Nigeria, volatility in macroeconomic variables such as exchange rate, trade openness, external debt and inflationary pressures still persist unabated.

Macroeconomic stability is essential for the accumulation of external reserves and growth of the economy at large. The fall in Nigeria's external reserves has been of great concern and the continuous decline in external reserves portends a great danger for the economy. Despite the relevance of stable macroeconomic factors to external reserves management; this area of study to the best of our knowledge has remained less investigated.

Furthermore, Nigeria being an import dependent economy accumulates external reserves through the export of crude oil which is highly susceptible to the vagaries of international oil shocks as a major source of revenue. The frequent swings in crude oil prices has far reaching implications on accumulation of external reserves and might lead to substantial reduction in external reserve and a further depreciation of the exchange rate in the country. Since Nigerian budget is prepared based on the variability of crude oil price and about 80% of government revenue is derived from crude oil export; any shock in international oil prices could adversely affect the stability of the economy and external reserves accumulation.

The rising instability in macroeconomic variables such as exchange rate, trade openness, economic growth rate, inflation rate and external debt over the years is worrisome and might portend serious threat to accumulation of external reserves. The implication of the declining foreign reserves is that the country might not be able to sustain import cover beyond prescribed limits and the ability to manage exchange rate volatility is not guaranteed. Similarly, the exchange value of the Nigerian currency has experienced a continuous downfall thereby discouraging traders from engaging in imports and exports activities as their rate of return on investment is threatened.

The fall in the value of the Nigerian currency which has made it a less attractive investment and store of value option might largely be attributed to low level of external reserves accumulation as there seems to be inadequate reserves to ensure stability in value of our local currency. According to [11] the surplus demand of foreign currencies for international transactions by Nigerians has further continued to exert more pressure on the Nigerian currency. This situation might discourage traders in the foreign exchange market and Nigerians in Diaspora from engaging in international transactions that would boost our economy and the propensity to accumulate external reserves.

Objectives of the Study

The broad objective of the study is to investigate the impact of macroeconomic variables on external reserves in Nigeria. The specific objectives include:

- i. To determine the impact of exchange rate on external reserves in Nigeria.

- ii. To examine the impact of trade openness on external reserves in Nigeria.
- iii. To determine the impact of inflation rate on external reserves in Nigeria.
- iv. To investigate the impact of external debt on external reserves in Nigeria.
- v. To investigate the impact of economic growth rate on external reserves in Nigeria.
- vi. To ascertain the impact of real interest rate on external reserves in Nigeria.

Research Questions

- i. What impact does exchange rate have on external reserves in Nigeria?
- ii. What impact does trade openness rate have on external reserves in Nigeria?
- iii. Does inflation rate have impact on external reserves in Nigeria?
- iv. What impact does external debt have on external reserves in Nigeria?
- v. Does economic growth rate have impact on external reserves in Nigeria?
- vi. What impact does real interest rate have on external reserves in Nigeria?

Research Hypotheses

In order to achieve the objectives of the study, the following hypotheses are formulated in null forms only:

- Ho₁: Exchange rate has no significant impact on external reserves in Nigeria.
- Ho₂: Trade openness has no significant impact on external reserves in Nigeria.
- Ho₃: Inflation rate has no significant impact on external reserves in Nigeria.
- Ho₄: External debt has no significant impact on external reserves in Nigeria.
- Ho₅: Economic growth rate has no significant impact on external reserves in Nigeria.
- Ho₆: Real interest rate has no significant impact on external reserves in Nigeria.

REVIEW OF RELATED LITERATURE

Conceptual Review

There have been divergent view on whether there is a need to beef up the level of nations' external reserves or trim them back, and this controversy is becoming pertinent in developing countries like Nigeria. Some scholars and non-scholars are of the opinion that keeping scarce resources in reserve when there is a series of issues to be attended to domestically may not be a very wise decision [12]. Nonetheless, some others have argued that the external reserve position determines the country's rating in the global market. In other words, these proponents hold the view that a robust level of external reserves will make the country appear financially responsible and creditworthy in the eyes of other countries, creditors and donors [13].

External reserves are employed by monetary authorities of countries to curb exchange rate fluctuations and to boost the confidence of foreign investors, which in turn boosts foreign direct investment (FDI) into the country [14]. Adequate external reserves enhance the value of a country's currency; encourages traders to embark on imports and exports transactions that will boost the economy; it provides an economy with a buffer against external shocks as well as provides cushion against such back drop in revenue and facilitates the recovery of such economies [15]; [16]. The monetary authorities use external reserves as a store of value to build up additional wealth and also to enhance a country's international rating and credit worthiness by ensuring regular servicing of external debt thereby avoiding additional penalties [17]. [18] states that macroeconomic variable influences the economy as a whole. External reserves are influenced by a number of macroeconomic variables such as exchange rate, inflation rate, economic growth rate, real interest rate, international oil price, external debt, trade openness and balance of payment.

Empirical Review

[19] examined the impact of exchange rate on trade deficit and foreign exchange reserve in Nepal. Specifically, the study examined the impact of nominal exchange rate on trade deficit and foreign exchange reserve in Nepal. The study used ordinary least square regression techniques. The study found that one percentage point depreciation of the Nepalese Rupee (NPR) with respect to US dollar results in an increase in reserve by 0.82 percentage points and decline in trade deficit by 0.75 percentage points. This suggests that maintaining NPR undervalued with US dollar can improve trade deficit and increase foreign exchange reserves. However, because of pegging with Indian currency, NPR sometimes appreciates in line with Indian currency. This situation could be counterproductive for improving trade deficit and increasing foreign exchange reserve of Nepal. In conclusion, considering the external sector stability as one of the major policy objectives, exchange rate policy can be fine-tuned to correct the trade deficit and maintain adequate foreign exchange reserve to sustain imports and service external debt.

[20] carried out a study on the determinants of foreign reserve in Nigeria for the period 1970-2013. Ordinary Least Square technique was employed for the analysis. The study indicated 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 affects foreign reserve only in the long run. The granger causality test revealed a unidirectional relationship between oil price and foreign reserve. The study recommended 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.

[21] carried out a study on the impact of foreign exchange reserves on the macro economy in Gulf and Cooperation Council countries between 1996-2015 using panel regression models. The study found that there is a positive and significant relationship between foreign exchange reserves accumulation and oil prices, GDP, the ratio of current account to GDP, and the ratio of broad money to GDP. The study equally found that there is a negative and significant relationship between foreign exchange reserves accumulation and real effective exchange rate, the ratio of debt to GDP, and call money rates.

[22] examined the policy implications of external reserve on economic growth in Nigeria using time series data from 1980 to 2014. The study utilized multiple linear regression analysis and the results showed that there is a presence of long run relationship between external reserve and economic growth. The policy implication of this is that measures that will enhance the stability in the amount of foreign reserve should be encouraged. Additionally, policies should be geared toward a permanent (long-run) increase in reserves rather than temporarily exchange reserve. They recommended that the government should always be prepared to have a hedge against unforeseen periods of macroeconomic instability or external shocks by making policies that focus on more accumulation of the external reserves by, for example, increasing exports and reducing imports.

[23] investigated external reserves as a panacea for economic growth in Nigeria from 2004 to 2015 using Ordinary Least Squares (OLS) regression technique. Findings revealed that external reserve has no positive significant impact on economic growth in Nigeria within the period under review and that external reserves have no positive significant influence on exchange rate in Nigeria. It was recommended amongst all that in accumulating excessive foreign exchanges, the country should have proper management of reserves.

[24] examined the impact of economic growth on Brazilian international reserves holdings in the context of Error Correction Mechanism using data over the 1980-2014 period. The study found that economic growth is highly significant. From the estimation of our model, we argue that economic growth and international reserves have positive long run relationship. Besides, our model suggested that economic growth has short run relationship too. The speed of adjustment is more than 40% which indicated that error correction term corrects previous year disequilibrium at the rate of 40.4%.

[25] investigated external reserves management and its effect on economic growth of Nigeria from 1985 to 2013. Data sourced were subjected to Durbin Watson auto-correlation test, for reliability of the data sourced and diagnostic tests such as unit root test (Augmented Dickey Fuller) and Johansen co-integration test, for the stationary and non-stationary of the data and long run relationship between the dependent and independent variables. The study revealed that there is a significant relationship between external reserves and the explanatory variables. The results from regression analysis further shows that explanatory variables explain and account for 90% variations in external reserves which is an evidence of good fit of the model. In addition, the multiple regression results show that GDP, MPR and FDI are highly statistically significant while IFR and EXR are statistically insignificant. This implies that FDI, MPR and GDP contribute immensely to the external reserves position in Nigeria. It also implies that a good performance of the economy is a positive signal for inflow of foreign direct investment which impact the reserves position of the economy.

[26] examined the impact of Nigeria's foreign reserves accumulation on macroeconomic environment between 2004 and 2014 using the ordinary least square (OLS) econometric model. The co-integration result obtained from the analysis showed the existence of a long run relationship between foreign reserves and the explanatory variables. The study concluded that foreign reserve is a necessary tool in the macroeconomic stability of the country. It was recommended that government should adopt proper and well-articulated strategies of managing the nation's reserve in order to achieve the desired objectives.

[27] investigated the effect of macroeconomic factors on external reserves in Nigeria from 1981 to 2014. The specific objectives include; to determine the effect of international oil prices on external reserves in Nigeria; to establish the effect of nominal exchange rate on external reserves in Nigeria; to determine the effect of real interest rate on external reserves in Nigeria; to establish the moderating effect of balance of trade on the relationship between international oil price and external reserves; to determine the moderating effect of balance of trade on the relationship between nominal exchange rate and external reserves; to establish the moderating effect of balance of trade on the relationship between real interest rate and external reserves in Nigeria. The study used the time series regression analysis model (Autoregressive Distributed Lag approach) was employed in the study. The study found that macroeconomic factors namely international oil price, nominal exchange rate and real interest rate have a significant effect on external reserves in Nigeria. Also, there is no evidence of a moderating effect of balance of trade on the relationship between international oil price and external reserves. However, there was evidence of a moderating effect of balance of trade on the relationship between nominal exchange rate and external reserves. Lastly, there is no evidence of a moderating effect of balance of trade on

the relationship between real interest rate and external reserves. It was recommended that the Federal Government of Nigeria should put in place measures that will boost exports and discourage imports.

[28] examined the implications of external trade on foreign exchange reserve in Nigeria for the period 1980 – 2015 using the Co-integration and Vector Error Correction Model. The study found that that oil and non-oil export are positively and correctly signed hence have positive implication on foreign reserves while oil and non-oil imports were negatively signed implying that they retarded foreign reserves in Nigeria. The study concluded that external trade impacted significantly on foreign exchange reserves in Nigeria.

[29] modeled the long-run relationship between the Bureau De Change (BDC) exchange rate and external reserves in Nigeria in a Threshold Vector Error Correction Model (TVECM) framework using daily data that spans from Jan 1, 2014 to Jul 31, 2015. Modeling exchange rate and external reserves within this context can be motivated by the fact that the transition mechanism between the variables is controlled by the degree of BDC exchange rates premium which is within central bank of Nigeria's policy oversight. The result indicates that there is a non-linear long-run relationship between the series, providing empirical support in favor of a TVECM specification. The study also found that the error correction coefficients for both the bureau de change exchange rate and external reserves equations were not statistically significant at the 5 per cent significance level. While in the second regime, error correction coefficient for the external reserves equation was found to be statistically significant at 10 per cent. This implies that the adjustment mechanism between the two variables flow from external reserves to BDC exchange rate.

[30] investigated crude oil, exchange rate and the convergence of foreign reserve in Nigeria over the period 1970-2014 using Vector Error Correction Model (VECM). The study found that external reserves will converge back to steady state in 5 years, Crude oil price in approximately 4 years while foreign exchange rate will return to its steady state in 96 years. The study concluded from the co-integrating long run equation that a 1% increase in crude oil price will lead to 1.8% increase in external reserves

[31] examined the relationships between foreign exchange reserves and inflation for four West African countries (Cote d'Ivoire, Senegal, Ghana and Nigeria) by an Autoregressive distributive lag model (ARDL) proposed by [32] using annual data running the period of 1972 to 2014. The empirical result showed that the relationship between the change in foreign exchange reserves and inflation rate is positive for the countries cited above in long run but the overall short run estimation of our model is insignificant at the conventional level. This meant that rise in foreign exchange reserves leads to increase the rate of inflation. The study suggests that governments of these countries cited above should pay more attention to foreign exchange system management by enlarging open market operations. Moreover, they can use sterilization or other policy instruments to reduce foreign exchange reserves to stabilize domestic economy. Based on the overall empirical results, the authors proposed the following suggestions. First, the central bank expands the base money supply channels and offers a variety of sterilization methods. Second, reinforce coordination of monetary and fiscal policy, and adopt comprehensive measures to promote the international payments balance.

[33] investigated the long-run relationship between exchange rate and external reserves in Nigeria during 1990Q1 – 2012Q4 using the two-regime threshold vector error correction model (TVECM) via maximum likelihood procedure. They confirmed the existence of threshold co-integration between the variables in Nigeria, as against linear co-integration. Consequently, the results indicated that co-integration between the variables occurs only when the equilibrium error exceeds an estimated threshold parameter of 0.52. Based on the obtained threshold, the result showed that the error correction coefficients of the exchange rate in the two regimes were not significant, implying that exchange rates do not respond to equilibrium error during the estimation period. Conversely, external reserves adjust to correct past divergence, albeit only when the equilibrium error exceeds the threshold parameter. Their result also revealed that external reserves adjust to maintain long run equilibrium; while exchange rates do not. They concluded that their findings aligned to the monetary authority's action of deploying external reserves to maintain exchange rate stability in Nigeria.

[34] analyzed the effect of the accumulation of foreign exchange reserves on economic growth in emerging countries. The study utilized balanced panel data for Brazil, China and Russia for the period from 1993 to 2012. The study found that increase in foreign exchange reserves causes the growth of GDP, while in the opposite direction causality has not been proven. Exchange rate depreciation that occurs as a result of the accumulation of foreign exchange reserves is not inflationary because it is a one-time, non-persistent shock, unlike the sudden depreciation of the exchange rate that occurs as a result of maintaining an overvalued exchange rate in the long term and leads to currency crisis. Moreover, the accumulation of foreign exchange reserves does not lead to inflation if the rate of accumulation of foreign exchange reserves does not exceed the rate of economic growth.

[35] carried out a study on foreign exchange management and economic growth in Nigeria from 1970-2012 ordinary least square estimation techniques and Error Correction Model (ECM). The study showed that export and foreign direct investment are statistically significant in determining economic growth. However,

exchange rate, import and inflation rate were found to be statistically non-significant with foreign exchange management.

[36] examined the impact of Nigeria's foreign reserves on the domestic economy, using both descriptive and econometric analysis. In the descriptive analysis, Greenspan-Guidotti method was used for the annual time series data on reserves accumulation from 1970 to 2011 while two multiple regression model were formulated, in the econometric analysis, to test the impact of external reserves on the domestic economic level and to check the effect of external reserves on the domestic investment. The results show that external reserves negatively influence the level of domestic economic productivity and investment. Therefore, the Nigerian government should reduce the level of excess reserves and rather use it for investment in the domestic economy.

[37] examined the asymmetric relationship between foreign exchange reserves and nominal and real exchange rate in the Turkish economy. The study employed monthly data covering January 2003 - January 2014. The study found that there was a causal positive relationship from foreign exchange reserves to nominal and real exchange rate. The study equally found that foreign exchange reserves do not influence nominal and real exchange rates in Turkey at any period, but there was a positive causality running from nominal exchange rate to foreign exchange reserves in the short run and a positive causality running from real exchange rate to foreign exchange reserves in both the short and the long run.

[38] investigated foreign exchange reserves and inflation in China using monthly data from January, 2008 to December, 2011. The study found that China's foreign exchange reserves growth promotes consumer price index increase and that the contribution degree of foreign exchange reserves to consumer price index is more than 20%. The result from the impulse-response analysis also found that the foreign exchange reserves will sustain the growth in the price level in the later several months.

[39] examined the relationship between foreign exchange reserves and inflation rate using monthly data from Jan. 2008 to Dec. 2011 for People Republic of China. The study found that China's foreign exchange reserves growth significant effect on consumer price index (CPI). The implication of the finding is that increase in foreign exchange reserves will influence the monetary policy by increasing money supply which consequently will increase inflation rate (CPI).

[40] investigated the effect of foreign exchange reserves on inflation rate in Nigeria. Time series data for a period of 25 years were collated from Central Bank of Nigeria Statistical Bulletin. The study showed that inflation rate has positive relationship with foreign exchange reserves. This study has shown that accumulation of reserves is essential for price stability in the Nigerian economy.

[41] examined the relationship between exchange rate and external reserves in the Indian from 1980-2010. The study employed Vector Auto Regression (VAR) using time series data for the period of 20years. The findings showed that there is no long and short term relationship between exchange rate and external reserves in India. .

[4] examined the causal relationship between exchange rate and foreign exchange reserves in India using a time series data of the variables between 1980 and 2010. Results obtained using Johansson Co-integration test and Vector Auto Regression (VAR) showed that there is no long and short term association between exchange rate (EXR) and foreign exchange reserves (FOREX) in the Indian.

II. THEORETICAL FRAMEWORK

The theoretical frameworks adopted for the study include; Purchasing Power Parity Theory (PPPT) and Liquidity Preference Theory (LPT).

Purchasing Power Parity Theory (PPPT)

Purchasing Power Parity Theory (PPPT) was propounded by Cassel (1916). The theory assumes that nominal exchange rate of a country's currency reflects the purchasing power of that country's currency, when compared with another country's currency. According to the purchasing power theory, movements of exchange rates are influenced by the difference between the domestic and foreign rates of inflation. Thus, when domestic inflation relative to changes in foreign prices increases, there would be an appreciation in exchange rate value [12]. Therefore, equilibrium rate of exchange (Naira/Dollar) is established by the interception of supply of and demand for dollars in the Nigerian foreign exchange market.

The supply of dollar primarily arises from funds received from the country's exports while the demand for dollars emanates from the need for imports. A rise in exports without a corresponding rise in imports will tend to raise the supply of dollars relative to demand. This will in turn create a high supply of dollars in the foreign exchange market that will pressure the exchange rate downwards thus, resulting to an increase in the value of Naira against the dollar. Conversely, an increase in imports implies a rise in the demand for dollars. Without a corresponding rise in exports, an increase in imports will create excess demand over supply, which will exert an upward pressure on the rate of exchange, thereby, leading to a depreciation of the naira against the dollar.

Liquidity Preference Theory (LPT)

Liquidity Preference Theory was propounded by Keynes (1936). Liquidity preference theory assumes that the motives for holding liquidity (external reserves) are for transactionary, precautionary and speculative purposes. Countries hold external reserves for transactionary motive which entails meeting up with business motive, day to day financing of activities and business transactions; for precautionary motive which involves having funds to meet up with unforeseen emergencies and lastly for speculative motive which attributes the demand for money to take advantage of the uncertainty of the future due to fluctuations in rate of interest in the market.

Liquidity preference theory is relevant to this study because it explains the rationale behind accumulation of external reserves by countries. [19] opines that the Federal Government of Nigeria holds external reserves, which constitute mainly revenue from oil exports for transactionary, precautionary and speculative motives. The need to finance foreign trade gives rise to demand for liquid reserves which are readily accessible and easily convertible for use to settle trade obligations. Furthermore, maintaining adequate external reserves ensure stability of the economy as the higher the external reserves position, the better the capacity of monetary authorities to curb the volatility in exchange rate, inflation rate and balance of payments. More so, external reserves are used as a form of backing or support for the local currency.

III. METHODOLOGY

Research Design

This study adopted the Ex-Post Facto research design because the study relied on historic accounting data. The study adopted Autoregressive Distribution Lag regression approach. The statistical package used for data analyses was E-view 9.0 Version. Data for this study was sourced from secondary sources namely the Central Bank Nigeria Statistical Bulletin and World Bank Annual Report over the period 1986-2016.

Model Specification

This study employed time series regression model (Autoregressive Distributed Lag - ARDL Model). The ARDL equation models exchange rate, trade openness, inflation rate, external debt, economic growth rate, real interest rate and external reserves. The ARDL model is specified in this study as:

$$Y_t = \alpha_i + \sum_{i=1}^A \beta_1 X_{1t-i} + \sum_{i=1}^B \beta_2 X_{2t-i} + \sum_{i=1}^C \beta_i X_{3t-i} + \sum_{i=1}^D \beta_i X_{4t-i} + \sum_{i=1}^E \beta_i X_{5t-i} + \sum_{i=1}^F \beta_i X_{6t-i} + \mu_i \dots \quad 1$$

Where:

X_{1t-i} = Exchange rate on annual basis at time t

X_{2t-i} = Trade openness on annual basis at time t-i.

X_{3t-i} = Inflation rate on annual basis at time t-i.

X_{4t-i} = External debt on annual basis at time t-i.

X_{5t-i} = Economic growth rate on annual basis at time t.

X_{6t-i} = Real interest rate on annual basis at time t.

Y_t = Dependent variable (external reserves)

$X_1, X_2, X_3 \dots X_6$ = Independent variables (exchange rate, trade openness, inflation rate, external debt, economic growth rate, real interest rate)

A, B, C, D, E, F. = Possible number of lags per variable. The number of lags per variable was determined by the Akaike Information Criteria (AIC).

$\beta_1, \beta_2, \beta_3 \dots \beta_6$ = Regression coefficients. The regression coefficients are used to measure the sensitivity of the dependent variable to unit change in the independent variables.

α_i = Constant term

μ_t = Error term. Error term captures the unexplained variations in the model at time t. and it is assumed to be normally distributed with a mean of zero.

Method of Data Analysis

The study used descriptive test (statistics statistics, trend analysis) and diagnostic tests (Serial correlation test, Heteroscedasticity test, Stationarity test, Model specification test using the Ramsey-Reset test and test for cointegration using the ARDL bounds test) to analyze data in order to transform it to a more suitable form for use. Decision Rule: Accept the alternate hypothesis and reject the null hypothesis if the P-value is less than the chosen level of significance (0.05).

IV. RESULTS

Descriptive Statistics

Descriptive statistics are employed in a research study to describe the basic features of data in a research (Wooldridge, 2003). Descriptive test was used to examine the characteristics of the dependent and independent variables. The descriptive result is presented in table 1.

Table 1: Summary of Descriptive Statistics

| | LEXTR | LEXCHR | LINTOP | TOP | INFR | LEXTD | GDPGR | RINT |
|-----------|----------|----------|----------|----------|----------|----------|-----------|-----------|
| Mean | 13.03001 | 3.882218 | 7.354996 | 53.74194 | 20.76774 | 6.704872 | 4.741935 | -0.609677 |
| Median | 13.87857 | 4.717963 | 7.943868 | 58.00000 | 13.70000 | 6.475140 | 5.000000 | 2.600000 |
| Maximum | 15.92356 | 5.720312 | 9.751714 | 82.00000 | 72.80000 | 8.495003 | 33.70000 | 25.30000 |
| Minimum | 8.093371 | 0.703098 | 3.307985 | 24.00000 | 5.400000 | 3.724488 | -10.80000 | -43.60000 |
| Std. Dev. | 2.623711 | 1.384861 | 1.986909 | 15.22491 | 18.76284 | 1.158012 | 7.191837 | 17.60326 |

Source: Author’s Computation 2018 from E-view 9.0 Version

Table 1 shows the descriptive statistical analysis between the dependent (external reserves) and independent variables (exchange rate, trade openness, inflation rate, external debt, economic growth rate and real interest rate). Whereas the mean is an average value of the series determined by dividing the total value of the series by the number of observations; Standard deviation is a measure of spread or changes in a series of data. The average percentage of external reserves (EXTR) within the period under review (1986–2016) stood at 13.03%. This indicates that the level of external reserves accumulation in Nigeria is low. Exchange rate (EXCHR) averaged 3.88% with the corresponding standard deviation of 1.384861 over the study period. It implies that the Naira to Dollar exchange rate is low and this might adversely affect external reserve accumulation in Nigeria. Trade openness (LTOP) had a mean value of 7.35% and a standard deviation value of 1.986909. This suggests that on average, trade openness affects external reserves by just 7.35%. External debt (LEXTD) and economic growth rate (GDPGR) had average values 6.70% and 4.74% with corresponding standard deviation values of 1.158012 and 7.191837 respectively. This indicates that rising external debt burden in Nigeria have adverse effect on external reserves and that might have accounted for the low external reserves accumulation in Nigeria. Economic growth rate on average suggest that external reserves is adversely affected if the growth rate of an economy is low.

The mean of inflation rate and real interest rate were 20.76% and -0.60% with standard deviation of 18.76% percent and 17.60% respectively. This implies that inflation rate and real interest rate are highly volatile. Large variations in inflation rate and real interest rate may signify instability in monetary and foreign exchange environment in Nigeria which in turn impacts on external reserves.

Diagnostic Tests

Stationarity Test: The test for stationarity is essential when conducting a time series analysis. This is because non stationary variables can result to several model mis-specifications. Stationarity was tested using Augmented Dickey fuller test. Table 2 presents the result of stationarity test.

Table 2: Stationarity Tests Results

| Variables | Level/1 st Diff. | Test Statistic | Critical Value | Remarks |
|-----------|-----------------------------|----------------|----------------|--|
| EXTR | Level | -1.8754 | -3.5683 | Stationary at 1 st Difference and Integrated of order one 1(1). |
| | 1 st Diff. | -6.7795 | | |
| EXCHR | Level | -2.4264 | -3.5683 | Stationary at 1 st Difference and Integrated of order one 1(1). |
| | 1 st Diff. | -5.3713 | | |
| TOP | Level | -2.0934 | -3.5683 | Stationary at 1 st Difference and Integrated of order one 1(1). |
| | 1 st Diff. | -6.2407 | | |
| INF | Level | -3.2879 | -3.5683 | Stationary at 1 st Difference and Integrated of order one 1(1). |
| | 1 st Diff. | -4.7325 | | |
| LEXTD | Level | -2.2798 | -3.5683 | Stationary at 1 st Difference and Integrated of order one 1(1). |
| | 1 st Diff. | -3.8534 | | |
| GDPGR | Level | -4.4349 | -3.5683 | Stationary at 1 st Difference and Integrated of order one 1(1). |
| | 1 st Diff. | -6.0261 | | |
| RINT | Level | -6.0261 | -3.5683 | Stationary at Levels and Integrated of order zero 1(0). |
| | 1 st Diff. | | | |

Critical values at 5 percent significant level

Source: Author’s Computation 2018 from E-view 9.0 Version

The null hypothesis for the ADF test states that the variable being tested is not stationary. If the calculated ADF statistic is less than the critical value, reject the null hypothesis. Table 2 shows that with exception of real interest rate which is stationary at level and integrated of order zero 1(0); all the other variables were stationary at first differences and integrated of order one 1(1).

Normality Test

Normality test is done to check if the residuals of the error term have a normal distribution. Normality test is conducted using Jacques-Bera (JB) test. In testing for normality, the approach used by Paavola (2006) for testing normality using Jacques-Bera test was adopted. Figure 1 presents normality test for each of the distribution.

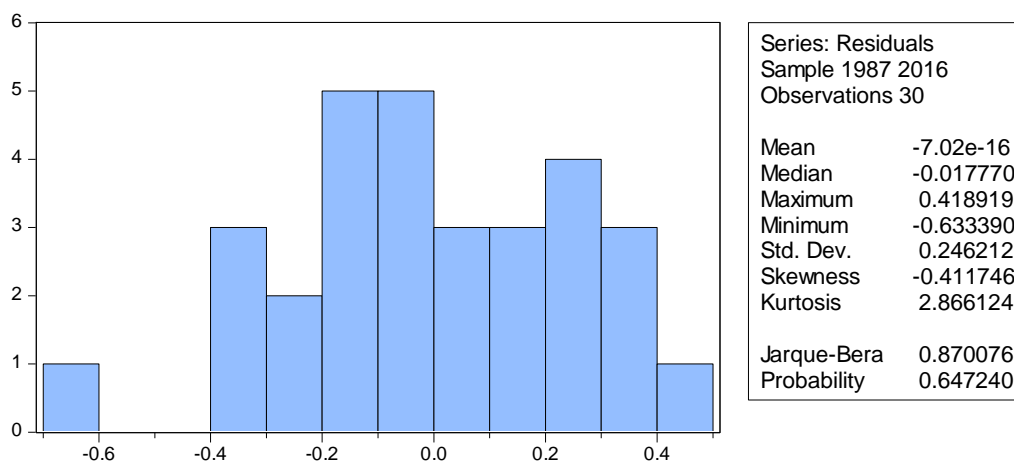


Figure 1: Normality Test (Jacques-Bera Test)

Source: Author’s Computation 2018 from E-view 9.0 Version

Jarque-Bera (JB) test for normality assumes that the series are stationary. JB statistics (0.8701) and corresponding p-values of 0.6472 show that the null hypothesis of normality could not be rejected for six variables namely changes in exchange rate, trade openness, inflation rate, external debt, economic growth rate, real interest rate and log of external reserves.

Cointegration Test

Given that the data include variables that are integrated of order one I(1) and 1(0), Cointegration test was conducted using Pesaran and Shins’ bounds testing approach and the results presented in Table 3.

| Table 3: ARDL Bounds Test | | | |
|--|----------|----------|--|
| Null Hypothesis: No long-run relationships exist | | | |
| Test Statistic | Value | K | |
| F-statistic | 3.739231 | 7 | |
| Critical Value Bounds | | | |
| Significance | I0 Bound | I1 Bound | |
| 10% | 2.03 | 3.13 | |
| 5% | 2.32 | 3.5 | |
| 2.5% | 2.6 | 3.84 | |
| 1% | 2.96 | 4.26 | |

Source: Author’s Computation 2018 from E-view 9.0 Version

The null hypothesis for the ARDL Bounds Test (table 3) holds that there is no cointegration (or no long run relationship) among variables. The F - statistics of 8.8368 is greater than the critical value of 5.61 at 1%

significance level. Therefore, the null hypothesis is rejected. This shows that there exists a long run relationship among log of external reserves as the dependent variable and exchange rate, trade openness, inflation rate, external debt, economic growth rate and real interest rate. Given the findings from the ARDL bounds test, both short run and long run ARDL model can be used for the analysis.

Serial Correlation Test

Serial correlation was tested using Breusch-Godfrey test as shown in Table 4.

Table 4: Serial Correlation Test (Breusch-Godfrey)

| Breusch-Godfrey Serial Correlation LM Test: | | | |
|---|----------|---------------------|--------|
| F-statistic | 0.869295 | Prob. F(1,15) | 0.3659 |
| Obs*R-squared | 1.643352 | Prob. Chi-Square(1) | 0.1999 |

Source: Author’s Computation 2018 from E-view 9.0 Version

The null hypothesis states that there is no first order serial correlation. The F statistics of 0.8693 has a corresponding probability value of 0.3659. This means that the null hypothesis could not be rejected at 5 percent significance level. Therefore, the results show that there is no first order correlation. The Serial Correlation Test confirms that the residuals are not serially correlated.

Multicollinearity Test

Table 5: Multicollinearity Test (Variance Inflation Factor)

| Variable | Coefficient Variance | Uncentered VIF |
|----------|-------------------------|-------------------|
| LINTOP | 0.003628 | 35.06973 |
| TOP | 2.59E-05 | 13.44439 |
| INFR | 2.52E-05 | 3.242583 |
| LEXTD | 0.007792 | 60.15162 |
| GDPGR | 0.000158 | 1.913656 |
| RINT | 3.06E-05 | 1.532014 |

Source: Author’s Computation 2018 from E-view 9.0 Version

Variance Inflation Factor (VIF) was used to check for the presence of multicollinearity among the regressors. Table 5 showed that there is absence of multicollinearity among the regressors. It should be noted that low uncentered VIF indicate absence of multicollinearity among regressors.

Test of Research Hypotheses

Test of hypotheses involved the use of statistics to determine the probability that a given statement is true or not. Therefore, in determining the macroeconomic implications of external reserves management in Nigeria, the study tested each of the research hypotheses using the long run coefficients, t-statistics and the arising p-values as reported in table 6 (Long Run Coefficients).

Table 6: ARDL Cointegration Long Run Form (Long Run Coefficients)

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|----------|-------------|------------|-------------|--------|
| LEXCHR | 2.512073 | 0.518793 | 4.842148 | 0.0002 |
| LINTOP | -0.300673 | 0.310882 | -0.967161 | 0.3479 |
| TOP | -0.007602 | 0.006291 | -1.208490 | 0.2444 |
| INFR | -0.016567 | 0.005347 | -3.098211 | 0.0069 |
| LEXTD | -0.719000 | 0.185115 | -3.884075 | 0.0013 |

| | | | | |
|-------|-----------|----------|----------|--------|
| GDPGR | 0.035844 | 0.018649 | 1.922105 | 0.0726 |
| RINT | 0.007792 | 0.004213 | 1.849576 | 0.0829 |
| C | 11.022631 | 1.628201 | 6.769820 | 0.0000 |

Source: Author's Computation 2016 from E-view 9.0 Version

1. Based on hypothesis one, the study found that exchange rate (EXCHR) with coefficient value of 2.5120, t-value of 4.8421 and p-value of 0.0002 has significant and positive impact on external reserves in Nigeria. This implies that a 10% increase in exchange rate will lead to 25.1% increase in external reserves in Nigeria.
2. Hypothesis two indicated that trade openness (TOP) with coefficient value (-0.3006), t-value (-0.9671) and p-value (0.3479) has insignificant and negative impact on external reserves in Nigeria.
3. Result obtained for Hypothesis three showed that inflation rate (INFR) with coefficient value (-0.0165), t-value (-3.0982) and p-value (0.0069) has significant and negative impact on external reserves in Nigeria.
4. Test result for hypothesis four indicated that external debt (EXTD) with coefficient value of -0.7190, t-value of -3.8841 and p-value of 0.0013 has significant and negative impact on external reserves in Nigeria.
5. The study found from hypothesis five that economic growth rate (GDPGR) with coefficient estimate (0.03584), t-value (1.9221) and p-value (0.0726) has insignificant and positive impact on external reserves in Nigeria.
6. Finally, the study found from hypothesis six that real interest rate (RINT) with the coefficient estimate of 0.0077, t-value of 1.8496 and the p-value of 0.0829 has insignificant and positive impact on external reserves in Nigeria.

V. CONCLUSION

The study concluded that in the long run, the coefficients of exchange rate, inflation rate and external debt are significant. This implies that in the long run, exchange rate, inflation rate and external debt affect the current position of external reserves in Nigeria.

The study concluded that in the short run, the coefficients of the inflation rate and the lagged values of exchange rate external debt are significant. This implies that in the short run, past values of the three dynamic variables (exchange rate, inflation rate and external debt) affect the current position of external reserves in Nigeria.

The study equally concluded that volatility in inflation rate; exchange rate and external debt are significant in determining the external reserves position in Nigeria.

RECOMMENDATIONS

Based on the research findings and the conclusions drawn thereof, the following recommendations were made:

1. That the monetary authorities should pursue and sustain monetary policies that will continue to strengthen the exchange rate of Naira against other currencies in the foreign exchange market. Government should stabilize the exchange rate by discouraging importation of luxury goods while encouraging export activities through export incentives.
2. That the government should develop more friendly economic and trade policies that will encourage ease of doing business, attract foreign direct investment and stimulate domestic investment which will translate to increased domestic and international trade thereby leading to robust economic growth and external reserves accumulation.
3. That government should continue to pursue dynamic monetary and fiscal policies that will ensure that the instability in the macroeconomic variables and volatility in inflation rate is reduced to the level that will enhance economic growth and boost external reserves in Nigeria.
4. That the rising external debt profile of government should be effectively managed by the government and its agencies through efficient fiscal responsibility measures.
5. That government should enhance economic growth in Nigeria by ensuring that it provides conducive environment that can guaranty safety of lives and property; evolve economic and financial inclusion measures that will engender economic growth.
6. That government should pursue policies that will ensure price stability and stability in exchange rate. In this way the volatility in real interest rate, inflation rate and exchange rate will be addressed.

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APPENDIX 1

| YEARS | EXTERNAL RESERVES #'M | EXCH. RATE % | INFLATION RATE (%) | TRADE OPENNESS | EXTER. DEBT #'B | GDP GR. RATE % | REAL INT. RATE % |
|--------------|------------------------------|---------------------|---------------------------|-----------------------|------------------------|-----------------------|-------------------------|
| 1986 | 3587.4 | 2.02 | 5.4 | 24 | 41.45 | -8.8 | -1.5 |
| 1987 | 4643.3 | 4.02 | 10.2 | 42 | 100.79 | -10.8 | -31.9 |
| 1988 | 3272.7 | 4.54 | 56 | 35 | 133.96 | 7.5 | -5.1 |
| 1989 | 13457.1 | 7.39 | 50.5 | 60 | 240.39 | 6.5 | -17 |
| 1990 | 34953.1 | 8.04 | 7.5 | 53 | 298.61 | 12.8 | 14.6 |
| 1991 | 44249.6 | 9.91 | 12.7 | 65 | 328.45 | -0.6 | 2.1 |
| 1992 | 13992.5 | 17.3 | 44.8 | 61 | 544.26 | 0.4 | -25.8 |
| 1993 | 67245.6 | 22.05 | 57.2 | 58 | 633.14 | 2.1 | 4.4 |
| 1994 | 30455.6 | 21.89 | 57 | 42 | 648.81 | 0.9 | -8 |
| 1995 | 40333.2 | 21.89 | 72.8 | 60 | 716.87 | -0.3 | -43.6 |
| 1996 | 174309.9 | 21.89 | 29.3 | 58 | 617.32 | 5 | -9.7 |
| 1997 | 262198.5 | 21.89 | 10.7 | 77 | 595.93 | 2.8 | 16.6 |
| 1998 | 226702.4 | 21.89 | 7.9 | 66 | 633.02 | 2.7 | 25.3 |
| 1999 | 546873.1 | 92.3 | 6.6 | 56 | 2577.37 | 0.5 | 2.8 |
| 2000 | 1090148 | 102.11 | 6.9 | 71 | 3097.38 | 5.3 | -10.3 |
| 2001 | 1181652 | 111.94 | 18.9 | 82 | 3176.29 | 4.4 | 23.8 |
| 2002 | 1013514 | 121 | 12.9 | 63 | 3932.88 | 3.8 | -10.8 |
| 2003 | 1065093 | 129.36 | 14 | 75 | 4478.33 | 10.4 | 8.6 |
| 2004 | 2252644 | 133.5 | 15 | 48 | 4890.27 | 33.7 | 19.4 |

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| | | | | | | | |
|------|-----------|-----|------|----|---------|-----|-------|
| 2005 | 3835433 | 131 | 17.8 | 51 | 2695.07 | 3.4 | -3.3 |
| 2006 | 5425579 | 129 | 8.2 | 65 | 451.46 | 8.2 | -0.4 |
| 2007 | 6055669 | 126 | 5.4 | 64 | 438.89 | 6.8 | 11.6 |
| 2008 | 7025860 | 119 | 11.6 | 65 | 523.25 | 6.3 | 4.2 |
| 2009 | 6339615 | 149 | 12.4 | 62 | 590.44 | 6.9 | 23.7 |
| 2010 | 4872231 | 150 | 13.7 | 43 | 689.84 | 7.8 | -42.3 |
| 2011 | 5059169 | 155 | 14 | 53 | 896.85 | 6.8 | 5.9 |
| 2012 | 5043625 | 157 | 7.8 | 44 | 1026.9 | 6.5 | 6.9 |
| 2013 | 6724472.8 | 157 | 8.2 | 31 | 1373.58 | 5.4 | 10.2 |
| 2014 | 5444398.5 | 159 | 15.4 | 31 | 1631.52 | 6.3 | 11.4 |
| 2015 | 5430681.6 | 192 | 15.9 | 34 | 2111.53 | 2.7 | -3.3 |
| 2016 | 8232133 | 305 | 17.1 | 27 | 3478.92 | 1.6 | 2.6 |

SOURCES: CBN, 2016; World Bank, 2016.