

# Determinants of International Reserves in Nigeria

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**Abstract:** Over the past decades, nations have accumulated international reserves to leverage foreign counterparts or protect themselves against external shocks resulting from integration. The factors identified by researchers as contributing to international reserve accumulation, however, have primarily been market factors. This study sets out to identify some distinct factors of the Nigerian economy. This is accomplished using annual data from 1970 to 2016. Several econometric methods, including the unit root test and Granger causality, were applied to test two hypotheses. The results showed substantial long-run correlations between the variables examined. Thus, the Error Correction Methodology (ECM) was used to investigate short-term and long-term relationships. Findings reveal that the accumulation of foreign reserves was significantly influenced in the long run only by aggregate exports EXPT and trade openness OPN since both variables were statistically significant at 5 percent. At the specified beak-point, there was an important structural change. Finally, Nigeria's level of international reserves was significantly impacted by the quality of its institutions. Thus, the study recommends that policymakers maintain the current exchange rate regime in order to ensure world competitiveness. The research also suggested that the government take steps to improve and build strong institutions in order to promote transparency and accountability.

**Keywords:** Error Correction, Institutional Quality, International Reserves, Opportunity Cost

## I. INTRODUCTION

Over the years, the global accumulation of foreign reserves has increased significantly, especially in the aftermath of the Asian financial crises of 1997/1998 and 2003/2004. Developing Asian countries in particular grew their external reserves by more than double the amount of all developed countries combined. According to statistics, developing Asian countries accounted for a larger share of the growth in global reserves between 1999 and 2002 (International Monetary Fund, 2003) due to a 37% increase in reserves held by emerging and developing economies. Similarly, statistics reveal that rising Asian countries contributed up \$582 billion of the \$1.2 trillion increase in world reserves between 1999 and 2003 (Gosselin & Parent, 2005).

Nigeria, Libya, Angola, Egypt, and Algeria were oil exporting countries with foreign reserves that contributed to the accumulation of foreign reserves in Africa (Ndikumana & Elhiraika, 2007). Nigeria's significant increase in international reserves was due to the oil boom in the early 1970s. However, in the late 1970s and early 1980s, a drop in export revenues

due to a drop in crude oil prices resulted in a drop in Nigeria's foreign reserves. However, from the year 1999, when democracy was established, until 2008, the economy saw judicious spending, consumption, and savings, as well as a quick rise in crude oil prices, as seen by the exceptional increase in reserve accumulation (Abdullateef & Waheed, 2010).

External reserves of Nigeria expanded dramatically from \$1,397.22 million in 1970 to \$43,488.40 million in 1976, according to statistics from the Central Bank of Nigeria (CBN). Oil boomed at this time, both in terms of production and exports, and the government received a large windfall of foreign currency, the majority of which was held in reserves. By 1981, the international reserves had risen to \$56,194.80 million from \$21,542.90 million in 1978. Oil prices plummeted early in the 1980s, resulting in a decline in foreign reserves. From \$56,194.80 million in 1981 to \$5,479.70 million in 1984 (CBN, 2011). After the adoption of stabilization programs such as the SAP (Structural Adjustment Programme) and SFEM (Second Tier Foreign Exchange Management) by 1986 and 1987 respectively, the external reserves increased dramatically from \$11,781.70 million in 1985 to \$72,266.80 million in 1988. Nonetheless, from 1989 to 2003, the reserves ranged from \$25,895.60 million to \$123,329.80 million (CBN, 2012). During the period of 2004 to 2008, the windfall in oil revenues caused the external reserves to rise from \$144.753 million to \$701,674.6 million.

External reserves, on the other hand, decreased steadily from \$536,428.2 million in 2009 to \$390,963.4 million in 2010, before fluctuating. According to Tule, Egbuna, Sagbama, Abdusalam, Ogundele, Oduyemi, and Oladunni (2015), between \$357,665.8 million and \$547,355.4 million were spent between 2012 and 2015. The increase in international reserves accumulated by developing and emerging markets during the 1990s sparked renewed interest in factors affecting international reserve accumulation. Research papers by Choi and Baek (2004), Gosselin and Parent (2005), Elhiraika and Ndikumana (2007), Abdullateef and Waheed (2010), Irefin and Yaaba (2012), Shuaibu and Mohammed (2014), and Egbe (2015) have elaborated on five categories of traditional determinants of international reserves. They are: Economic Size (population, per capita Gross Domestic Product (GDP), GDP per capita, and GDP per capita per capita).

Researchers found that macroeconomic factors were the major predictors of Nigeria's international reserve building, according to a review of research conducted in Nigeria. Taking this approach ignores the unique characteristics of the Nigerian economy, which is dominated by institutions. It is impossible to fully implement Nigeria's economic programs due to issues with its administration, as well as the country's political, social, and institutional conditions. Furthermore, the Nigerian economy suffers from insecurity, poverty, corruption, defiance of the rule of law, and bureaucratic chaos in all its guises. Investment decisions made by potential investors and trading partners are influenced by the institutional quality of the economy.

Given the fluctuations in international reserves and varying results from previous studies, are exports (both oil and non-oil) and quality of institutions, as well as other factors such as economic size (GDP), exchange rate, trade openness, exchange rate flexibility, opportunity cost of holding reserves, and financial openness, factors determining reserve holding? There appears to be no study that considers institutional quality as a factor in the accumulation of international reserves in Nigeria. This study differs from earlier studies in that it fills a gap in the literature. In addition, evaluating aggregate exports and institutional quality with the traditional determinants of international reserves opened a novel perspective in the research of international reserve determinants. The study attempted to address the following questions based on this:

- I. What factors influenced Nigeria's building up of international reserves?
- II. What was the causal relationship between international reserves and size of economy, trade openness, exchange rate flexibility, opportunity cost, aggregate exports, and political environment in Nigeria?

This study used proper empirical methodologies to investigate the potential impact of a number of factors on Nigeria's accumulation of international reserves. For this reason, and to conduct a thorough examination, 2016 data was analyzed. Because the data required for the analysis of the factors collected in the study was available for the time period under examination, as well as the policy shift to a flexible or managed peg exchange rate strategy in 2016, this time frame was chosen. The study's findings will benefit the Nigerian government, the Central Bank of Nigeria (CBN), international economists, monetary economists, public sector economists, and Nigeria's planning agencies. The findings and recommendations of this study will be useful to these institutions when creating strategies for the management of Nigeria's external reserves. It is also anticipated that the results of this endeavor will contribute significantly to existing literature on the factors influencing reserve accumulation in Nigeria and elsewhere. Nigeria's political environment as well as the role of exports in accumulating international reserves will be examined in this research.

## II. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

### 2.1 Conceptual Issues

The monetary authorities of a nation accumulate foreign payments, monies and bonds as international reserves, or external reserves. In specific terms, they refer to financial assets such as gold, silver, other equivalent instruments, and Special Drawing Rights (SDRs). These assets include the reserves held by the central bank of a country in several common currencies, such as the USD, the EUR, the JPY, etc., which help to sustain liabilities (such as the currency issue) and the reserves of several banks held either by the Central Bank or the government (CBN, 2010). Besides influencing an economy's exchange rate policy, these assets also affect global financial market stability and the integration of economies.

There seems to be consensus in the literature on the definition of international reserves. Definitions and uses, however, seem to differ. International reserves are defined by Orok-Duke, Omor-Egbeji and Ekott (2010) as liquid financial assets that countries maintain to meet their obligations resulting from balance of payments transactions and intervening in their foreign exchange markets. As such, international reserves are a collection of savings resulting from the exchange of currencies between the domestic economy and the global market during a specific period of time (Obaseki, 2007).

Global financial institutions, like the International Monetary Fund (2000), define external reserves as the financial assets that are readily available and controlled by the monetary authorities of a nation in order to mitigate foreign exchange imbalances and manipulate exchange rates through their interventions in the exchange markets, among other purposes. In the definition above, external reserves are the assets held by monetary authorities in currencies other than the dollar, yen, and pound sterling (IMF, 2009). Aizenman (2005) describes reserves as liquid foreign assets that are held by an economy's central bank. According to Rasheed (1995), external reserves are financial assets that can be used by a government to earn revenue from external transactions, influence the exchange market, and settle debts incurred through international trade, international diplomacy, and financing agreements.

There are, however, two primary reasons why countries accumulate international reserves, namely mercantilist motives and precautionary motives, that have been identified in the existing theoretical literature. A precautionary motive for accumulating international reserves mirrors a self-insurance mechanism or a defense against unexpected disturbances in the external sector in the future. "The purpose of crisis management is both to prevent and to manage a crisis," as described by Aizenman and Marion (2003) (Mendoza, 2004; Aizenman and Lee, 2005; Kim et al., 2005).

Alternatively, mercantilist motives emphasize hoarding reserves in order to make exports more competitive. Based on this view, central banks accumulate reserves to manage their

real exchange rates and boost export competitiveness. As a result of holding reserves, one can stabilize the exchange rate which can be beneficial to export growth in a country (Rajan, 2002; Calvo and Reinhart, 2002; Dooley et al, 2003; Aizenman and Lee, 2005; Sehgal and Sharma, 2008). The role of international reserves in the economy extends beyond the reasons enumerated above. It may be used for transactional purposes, to facilitate monetary and exchange rate policy, to support countries with foreign debt to meet a portion of their obligations, and thus to preserve creditworthiness.

### 2.2 Empirical Literature

International reserves are determined by a variety of factors across countries and regions. Among the factors that can be divided into five groups are economy size, current account vulnerability, exchange rate flexibility, opportunity cost, and capital account vulnerability.

Ra (2008) suggests that developing countries' accumulation of international reserves may lead to the endogenous decrease in the magnitude of the opportunity cost effect. Long-term debt and the opportunity cost of holding reserves were found to negatively affect reserve demand. Exchange rate policy and financial development had an impact on reserve levels (reserves/GDP). Study concluded that a country's level of international reserves is determined by factors such as its per capita GDP, trade openness, exchange rate regime, financial depth, and political stability. In a study, it was found that countries with stronger economies had greater reserves due to their greater prudential behaviour.

The level of GDP and trade openness are correlated with the level of foreign reserves, as demonstrated by Olokoyo, Osabuohien and Salami (2009). Foreign reserve accumulation is thus consistent with the self-insurance motive. In the study, 17 developing countries were analysed from 1994 to 2002. Study found a downward bias in the chancelry cost effects.

In an investigation of the factors affecting Nigeria's holding of external reserves, Charles-Anyagou and Irefin (2012) analyzed 1980-2009 data. A long-term relationship was found between reserves and their determinants in the study. Among the major factors determining resource management is income. The sustainability of Nigeria's accumulation of international reserves was empirically examined by Shuaibu and Mohammed (2014). In order to integrate econometric techniques, such as error correction mechanisms and bounds testing, an autoregressive distributed lag framework was used.

According to Osigwe and Uzonwanne (2015), exchange rates are positively related to foreign reserves and international direct investment in Nigeria. Based on the study's results, there was cointegration among the studied variables. To promote foreign reserves and foreign direct investment, policy makers are advised to determine the optimal exchange rate level.

In an analysis of the determinants of international reserves in Macedonia, Kamnar, Nikolov, and Sulejmani (2016) show

that reserves are adversely affected by exchange rates and interest rates. A positive relationship between export prices and nominal gross domestic product and international reserves was evident during the evaluation period.

### 2.3 Theoretical Framework

In general, countries keep reserves for two reasons: precautionary and mercantilist. The purpose of reserve accumulation is to protect against future financial crises and sudden interruptions of capital flows. Reserve holdings are used to prevent and manage crises (Aizenman & Lee, 2005). A mercantilist motive, on the other hand, emphasizes the accumulation of reserves to manipulate the exchange rate for export promotion. It is believed that international reserve accumulation contributes to export promotion by maintaining a favourable exchange rate, thereby promoting economic growth (Calvo & Reinhart, 2002). Based on the literature on the motivations for accumulating international reserves, theories have emerged regarding international reserves. In this study, three major theories of international reserve holdings provide the theoretical framework. They are the buffer stock theory, the precautionary theory, and the mercantilist theory.

Frenkel and Jovanovic (1981) developed the buffer stock theory. Essentially, it is assumed that the average reserve holding is negatively influenced by the adjustment costs and the opportunity costs of reserves, but positively impacted by the gross domestic product and volatility of reserves, which is influenced by the underlying volatility of international trade (Flood & Marion, 2002).

In its stochastic form, Frenkel and Jovanovic (1981) formulated the buffer stock model in the form:

$$dR_t = -\mu dt + \sigma dW_t \quad 2.1$$

Where;

$R_t$  = level of international reserves accumulated at t time;

$W_t$  = Wiener process with mean zero and variance t;

$\mu$  = drift parameter

$\sigma$  = the standard deviation of the Wiener increment in accumulation of reserve.

This means that at any particular time the distribution of the reserve holdings can be expressed in the following form:

$$R_t = R_0 - \mu t + \sigma W_t \quad 2.2$$

By minimizing opportunity costs and adjustment costs,  $R_0$  is the optimal stock of reserves at the beginning. When excessive reserves are held above the optimal level, adjustment costs are incurred. If reserves were directed at alternative investments, they would have earned returns similar to those earned from reserves accumulation (Cifarelli & Paladino, 2006). Minimizing the two types of costs yields the following relation for determining the optimal amount of international reserves:

$$R_0 = \sqrt{[2C\sigma^2 / (2r\sigma^2)0.5]} \quad 2.3$$

Frenkel and Jovanovic (1981) derived the equation below by applying some algebraic manipulation to 2.2:

$$\text{Log}(R_0) = C + 0.5\text{Log}(\sigma) - 0.25\text{log}(r) \quad 2.4$$

Where;

$R_0$  = the optimal restocking level for international reserves after the restocking process;

$C$  = a country specific nominal constant (the fixed cost of accumulating reserves);

$\sigma$  = the standard deviation of the Wiener increment in the reserves (time series) process operating between stock adjustments, and

$r$  = the opportunity cost of holding reserves.

Empirical studies have used the buffer stock model in equation 2.4 to model how much reserves should be accumulated at an optimal level. The adaptability of the buffer stock to both fixed and floating exchange regimes gives it an edge over other theories of optimal reserve demand. International reserves are held by a country as a self-insurance mechanism against financial crises, according to the precautionary theory of international reserves. In particular, the precautionary theory of international reserve accumulation views the accumulation of international reserves as an insurance against future sudden stops and reversals of capital flows (Aizenman & Marion, 2003; Aizenman & Lee, 2005; Kim, Li, Rajan, Sula & Willett, 2005). International reserves, for instance, have been considered precautionary savings by Aizenman and Marion (2003) for countries with tax collection issues and who find it very difficult to secure funds from the global capital market. Precautionary reserves would allow a country to weather the storm and take advantage of its position during such a time. Among the main reasons for precautionary reserve demand identified by Kim et al. (2005) are the ability to provide liquidity during a currency crisis, the capacity to cover basic payment imbalances, and the ability to prevent or reduce the risk of a currency crisis.

Aizenman and Lee (2006) developed a theory of mercantilist accumulation of international reserves. Mercantilism views the accumulation of international reserves not only as a tool for effectively managing exchange rates, but also as a way of maintaining low exchange rates in order to promote foreign trade and competitiveness (Aizenman & Lee, 2005; Dooley et al, 2003; Rajan, 2002; Calvo & Reinhart, 2002). Changing exchange rates at a competitive pace will result in accumulating international reserves through monetary mercantilism.

### III. METHODOLOGY

#### 3.1 Research Design

The dynamic determinants of international reserves in Nigeria were investigated with an ex-post facto research design in this

study. To produce a solid analysis and estimation of the stated equations, descriptive and analytical techniques were employed. Graphs, simple tables, means, standard deviations, skewness, kurtosis, Durbin Watson (DW), Jargue-Berra, and Q-statistics were used to perform trend analysis and test for autocorrelation and normality. In addition, error correction modeling (ECM) based on the ordinary least squares (OLS) estimation method was used. The unit root test and cointegration test were used as pre-estimation tests to establish the stationarity of the variables and the relationship between the variables in the study. PP and ADF tests were used to establish unit root. The trace and maximum eigen value tests were also utilized to test for co-integration using the Johansen-Jesulius (1990) multivariate cointegration approach.

#### 3.2 Model Specification

This study's empirical model was based on an eclectic theoretical approach.

The buffer stock theory, the precautionary theory, and the mercantilist theory were all used in this study's model to explain the accumulation of foreign reserves. The level of international reserve accumulation is influenced by five factors, according to studies such as Choi and Baek (2004), Gosslin and Parent (2005), Elhiraika and Ndikumana (2007), Abdullateef and Waheed (2010), Irefin and Yaaba (2012), Shuaibu and Mohammed (2014), and Egbe (2015). Such factors include; "scale factors (i.e. economy size), current account vulnerability, capital account vulnerability, exchange rate flexibility, and opportunity cost," as a result of theoretical postulations.

The scale variable captured the buffer stock hypothesis indicator of economic size as measured by gross domestic product. Trade openness, derived from the precautionary principle, was used to determine current account vulnerability. Capital flows, as represented by financial openness, were used to capture capital account vulnerability, as derived from the precautionary theory.

In this study, the Standard Deviation of the exchange rate, derived from both the buffer stock and mercantilist theories, was used to reflect exchange rate flexibility, while the difference between Nigerian and US interest rates was used to reflect opportunity costs (the Nigerian lending rate minus the US lending rate). The buffer stock idea was used to calculate opportunity cost. Aside from the standard variables listed above, the study considered two additional variables that were thought to have an impact on Nigeria's degree of international reserve accumulation. Exports and the quality of institutions were two of the variables. Nigeria gets the majority of its revenue from the export of both oil and non-oil commodities, hence aggregate export was included. As a result, a portion of export revenues is usually held on a foreign account as a reserve. Institutions were also included in the analysis as a factor of international reserves. This variable measures the



quality of Nigeria's institutions. The particular nature of the Nigerian economy is reflected in this variable.

Having strong institutions ensures that a country's financial management is sound, and that reserves are built as a result. Based on the aforementioned theoretical hypotheses, the empirical model for the investigation was expressed in functional form:

### 3.2.1. Determinants of international reserves in Nigeria

$$RES = f(GDP, OPN, FPN, EXR, OPC, EXPT, INST)$$

3.1

Where:

RES = Level of International Reserves in Nigeria (in millions of dollars);

GDP = Gross Domestic Product in Nigeria (in millions of naira);

OPN = Openness to Trade, which is the sum of imports and exports divided by GDP (in percent);

FPN = Financial Openness, used as a measure of capital account vulnerability in Nigeria.

EXR = Exchange Rate Flexibility, represented by the standard deviation of the annual exchange rate in Nigeria.

OPC = Opportunity Cost of reserve accumulation measured as the percentage difference between domestic (Nigeria) lending rate and the foreign (US) lending rate

EXPT = total exports in Nigeria (in millions of naira)

INST = institutional quality, represented by contract intensive money (This is defined as broad money supply minus currency outside banks divided by broad money supply) in percent.

Thus, the model in equation (3.1) can be expressed in its econometric linear form as:

$$RES = \alpha_0 + \alpha_1 GDP + \alpha_2 OPN + \alpha_3 FPN + \alpha_4 EXR + \alpha_5 OPC + \alpha_6 EXPT + \alpha_7 INST + U \quad 3.2$$

Equation 3.1 in its logarithmic form can be expressed as:

$$LOG(RES) = \alpha_0 + \alpha_1 LOG(GDP) + \alpha_2 LOG(OPN) + \alpha_3 LOG(FPN) + \alpha_4 LOG(EXR) + \alpha_5 LOG(OPC) + \alpha_6 LOG(EXPT) + \alpha_7 LOG(INST) + U \quad 3.3$$

Where:  $\alpha_0$  to  $\alpha_7$  are the parameters the study is seeking to provide numerical values to and  $U_i$  is the stochastic random error term.

### 3.3 Apriori Expectation

GDP (Gross Domestic Product): The more developed the economy of a country is, the more foreign exchange reserves it has. As a result, countries with a large population amass more reserves. As a result, the GDP coefficient should be positive (i.e.  $\alpha_1 > 1$ ).

Trade Openness: Since reserve accumulation is intended to buffer the effects of current account imbalances in an economy, the accumulation of international reserves must grow with volatility in receipts and payments, as measured in this study as current account vulnerability. As a result, trade openness should be positive ( $\alpha_2 > 1$ ).

Financial Openness: To ensure the stability of the financial sector, monetary authorities maintain sufficient reserves to ensure a large level of financial openness, a measure of capital account vulnerability. Therefore, financial openness should increase international reserve accumulation (e.g.,  $\alpha_3 > 1$ ).

Exchange Rate Flexibility: A flexible exchange rate should limit international reserve accumulation since the central bank does not need a significant reserve base to operate a fixed exchange rate. As a result, exchange rate flexibility is expected to affect international reserve accumulation in a negative way (i.e.  $\alpha_4 < 1$ ).

Opportunity Cost of Reserve Holding: The Buffer Stock theory suggests that opportunity cost has an inverse marginal effect on the accumulation of foreign reserves. Reserve buildup should have a negative opportunity cost (i.e.  $\alpha_5 < 1$ ).

Exports: It is possible to create enough reserves (a windfall in revenue) due to an increase in exports. In general, the higher the export earnings, the larger the accumulation of international reserves. Hence, the export coefficient should be positive (i.e.  $\alpha_6 > 1$ ).

Institutional Quality: The quality of institutions, as represented by contract intensive money (CIM) in this study, should have a positive impact on an economy's buildup of international reserves. A country with weak institutions makes foreign trade expensive and so diminishes reserves accumulation; a country with strong institutions has a positive investment climate and integrity; poor or weak institutions make foreign trade expensive and so diminish reserves accumulation. Thus, institutional quality should be high ( $\alpha_7 > 1$ ).

### 3.5 Sources of Data

Study data has been obtained from the World Bank, the Central Bank of Nigeria (CBN) annual statements and reports from 1970 to 2016, the CBN Statistical Bulletins, relevant published research from credible journals, and the authors' own calculation. The study covered the period 1970-2016. International reserves, exchange rates, foreign portfolio investment, oil exports, and GDP were collected via CBN statistics bulletins. CBN's annual reports and financial statements were used to supplement this. In order to calibrate variables such as trade openness in percent, the statistician will add total exports and imports, divide the result by gross domestic product, and multiply the result by 100. Using the Nigerian interest rate differential and the US loan rate differential, the author calculated the opportunity cost. To assess institutional quality, contract intensive money was used.

### 3.6 Estimation Procedures

This study used multiple estimation approaches to arrive at the final estimation stage. In order to determine whether there is a unit root, the ADF and PP tests were performed, as were co-integration tests and Error Correction Model (ECM) tests. According to (Koutsoyiannis, 2001), economic apriori criteria relate to the signs and magnitude of the parameter estimations used. Therefore, the coefficients' signs must match the apriori expectations, or else they will be rejected. This is true unless the variable cannot be included in the specified economy model for some reason.

### 3.7 Limitations of the Study

In addition to being constrained by a number of factors, this study also has several limitations. Some variables, for example, contain no pre-computed data and must be constructed by the author. Variables such as the opportunity cost of accumulating reserves and the quality of institutions do not appear to have widely accepted data sets. There are many ways to calculate the opportunity cost. Similarly, because CIM only measures economic institutions, using it as a proxy for institutions may not yield the desired results. The preferred proxy would have been one that measures both economic and political or social institutions, or a measure that is computed. Further, since the study was conducted exclusively in Nigeria, its scope was limited. This study could have been expanded to include other countries, laying the groundwork for a comparative look.

## IV. RESULTS AND DISCUSSION

### 4.1 Results of Econometric Estimation

#### 4.1.1 Determinants of International Reserves

Table 4.1: Parsimonious Result

Dependent Variable: D(LRES)				
Variables	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.169875	0.078401	-2.166735	0.0366
D(OPN)	0.003169	0.001042	3.040408	0.0043
D(LEXR(-1))	0.401499	0.251893	1.593927	0.1192
D(OPC(-1))	-0.071165	0.017095	-4.162999	0.0002
D(LEXPT)	0.886738	0.175342	5.057194	0.0000
D(INST(-1))	12.02127	2.961610	4.059033	0.0002
ECM(-1)	-0.711487	0.128417	-5.540456	0.0000
R-Squared	0.727459	Mean Dependent Var.		0.1014 12
Adjusted R-Squared	0.684426	S.D. Dependent Var.		0.7430 98
S.E of Regression	0.417443	Akaike Info. Criterion		1.2326 95
Sum of Squared Residual	6.621814	Schwarz Criterion		1.5137 31
Log Likelihood	-20.73564	Hannan-Quinn Criterion.		1.3374 63
F-Statistic	16.90474	Durbin-Watson Stat.		1.9221 90
Prob.(F-Statistic)	0.000000			

Source: Researcher's computation, 2018.

The model's results are presented in table 4.1. Several diagnostic checks showed that the equation calculated was fairly adequate, as shown in the table. Specifically, the estimated equation's R-squared and adjusted R-squared values of 0.727 and 0.684, respectively, demonstrated its high explainability. Based on our findings, explanatory variables accounted for almost 68 percent of variance in reserve accumulation. At the 5% level of significance, the high F-statistic value of 16.904 with a zero (0.0000) probability value confirmed the statistical significance of the whole model. Considering the significance of the equation, the factors responsible for the accumulation of Nigeria's foreign reserve have a combined effect. Furthermore, a D-W statistic of 1.922 demonstrated the absence of serial and autocorrelation in the estimated equation, as well as the equation's adequacy and stable behavior.

Based on the model's short run estimates, trade openness encouraged Nigeria to accumulate international reserves. This is in line with theoretical expectations. Ceteris paribus, an increase in free trade led to an additional 0.003 percent accumulation of reserves. Contrary to expectations, the one-year lag of exchange rate flexibility LEXR (-1) demonstrated a positive coefficient. Current international reserves increased by 0.40 percent after exchange rate flexibility was increased by 1 percent. Exchange rate flexibility did significantly impact reserve accumulation due to its high likelihood value of 0.1192. The CBN may have manipulated the exchange rate during the investigation period (Irefin and Yaaba, 2012). Exchange rate regimes such as this could also be referred to as managed-float regimes.

It is predicted that the one-year lag in the opportunity cost of reserves (-1) had a detrimental effect on demand for international reserves. Based on this assumption, if all other variables remained unchanged, a 1% rise in the opportunity cost of reserve accumulation in the previous period was associated with a 0.07 percent decrease in reserve accumulation in the current period. With a computed t-statistic probability value of 0.0002, less than 0.05 calculated for the one-year lag of opportunity cost of holding reserves, the variable was equally significant in influencing foreign reserve holding.

According to the data, exports contributed to the growth of Nigeria's international reserves. It is consistent with the priori expectation that an increase in overall exports will result in an increase of 0.89 percent in international reserves. The building of international reserves was substantially influenced by exports at the 5% level of importance. Given that the t-statistic probability value for zero was less than 0.05, this is true.

The one-year lag of Institutions INST (-1) is also statistically significant in affecting the buildup of foreign reserves, since the computed t-statistic likelihood of 0.0002 is less than 0.05. Moreover, delamination of INST by institutions (-1) impacted foreign reserves, with a computed t-statistic likelihood of 0.0002 being less than 0.05. This is consistent with our a

priori expectations. In other words, a one percent rise in the quality of institutions in the previous period resulted in a 12.02 percent increase in reserve levels.

ECM's negative coefficient is consistent with theoretical predictions. Based on the t-probability statistic's value of zero (0.0000), the variable was considered statistically significant. Around 71% of the cases demonstrated a coefficient value of

#### 4.1.2 Granger Causality Test

0.711 demonstrating equilibrium was restored to the reserve accumulation process. The system's distortion is therefore corrected by changes in reserves every year to about 71 percent. As a result, equilibrium will take (one year, four months, and nine days) if the system is distorted. As a result, short-run instability is corrected to long-run stability at a high rate.

Table 4.7: Granger Causality Test

Null Hypothesis:	Observations	F-Statistic	Prob.
GDP does not Granger Cause RES	45	0.46882	0.6291
RES does not Granger Cause GDP		1.29008	0.2865
OPN does not Granger Cause RES	45	0.38832	0.6807
RES does not Granger Cause OPN		0.18432	0.8324
FPN does not Granger Cause RES	45	0.63961	0.5328
RES does not Granger Cause FPN		0.83894	0.4396
EXR does not Granger Cause RES	45	6.94113	0.0026
RES does not Granger Cause EXR		1.73616	0.1892
OPC does not Granger Cause RES	45	3.88000	0.0288
RES does not Granger Cause OPC		0.63619	0.5346
EXPT does not Granger Cause RES	45	6.39719	0.0039
RES does not Granger Cause EXPT		1.97814	0.1516
INST does not Granger Cause RES	45	1.22044	0.3059
RES does not Granger Cause INST		3.48498	0.0403

Source: Researcher's computation, 2018.

The results of the Granger causality test are shown in Table 4.11. From exchange rate flexibility and foreign reserves, there appears to be a unidirectional causal linkage. As foreign reserves increased during the analysis period, they were driven by the opportunity cost of reserve accumulation, exchange rate flexibility, and total exports.

A causal relationship existed between international reserves and institutional quality in Nigeria using the causality test. In other words, foreign reserves caused institutional quality, not the other way around. In addition, neither trade openness nor financial openness was linked to international reserves buildup.

#### 4.2 Discussion of findings

##### 4.2.1 Nigeria's International Reserves Determinants

Both macroeconomic and institutional factors influenced Nigeria's accumulation of international reserves, as demonstrated in the previous section. According to the study, macroeconomic variables such as exports, exchange rate flexibility, and trade openness were all critical in the building of international reserves. It was also found that when it comes to accumulating foreign reserves, the quality of institutions matters. Openness to trade in Nigeria plays a major role in building foreign reserves. As a result, the more exposed a country is to external shocks as a result of global commerce, the more likely it is that monetary authorities will hold a significant stockpile of international reserves as self-insurance and precaution. Choi and Beak (2004) found similar results. Studying 137 countries, the authors examined factors influencing international reserves. Similarly, Romero (2005)

analyzed the factors influencing China's and India's international reserves. The factors impacting the accumulation of international reserves in Nigeria were analyzed by researchers Olokoyo et al. (2009) and Charles-Anyaogu (2012). Overall, Studies have shown that Nigeria's development of international reserves is significantly influenced by trade openness.

Nigeria built up overseas reserves due to flexible currency rates, according to the study. Due to the fact that high exchange rate flexibility goes hand-in-hand with the managed floating exchange rate system, which entails higher central bank intervention, the outcome is unexpected. The findings of Irefin and Yaaba (2012) are consistent with those of the present study, which shows that the exchange rate has a substantial impact on Nigeria's accumulation of international reserves. This result differs from that of Abdullateef and Waheed (2010) or Mishra and Sharma (2010). The studies found that exchange rates negatively affected international reserves. In addition, the results of this study contradicted Je Jo (2007) and Charles-Anyaogu (2007). (2012). According to their findings, exchange rate flexibility has no meaningful association with the building of overseas reserves.

In contrast to other research, our analysis of the data revealed that external reserves were negatively associated with the opportunity cost of accumulating them. Using this result, we can demonstrate that when the opportunity cost of accumulating external reserves is high, the central bank will find accumulating reserves less appealing. It is due to the possibility of higher returns from other investments. The finding that opportunity cost of building reserves negatively

correlated with external reserve accumulation is consistent with the findings of Elhiraika & Ndikumana (2007) and Abdullateef & Waheed (2009) that opportunity cost of building reserves negatively correlates with the amount of external reserves accumulated. This suggests that during the period of analysis, external reserves were much more expensive than other investments in Nigeria. Consequently, the central bank lacked the desire to accumulate additional external reserves.

In addition, total exports were positive, which had a significant impact on reserves accumulation. Increased exports resulted in a higher inflow of foreign income into the country, which was then saved as reserves. In line with Elhiraika and Ndikumana's (2007) finding that foreign reserve demand in Africa is mainly driven by exports, this indicates the importance of exports in the accumulation of reserves in African countries.

Finally, Nigeria's level of international reserves was significantly impacted by the quality of its institutions. Financial discipline and accountability are more likely to be present in countries with strong institutions. The increase in Nigeria's international reserves is due to the better utilization of foreign exchange revenues from financial transactions.

#### 4.2.2 Causal Relationship between International Reserves and the Determinants

One-way causality existed between the opportunity cost of retaining reserves, total exports, exchange rate flexibility, and the accumulation of international reserves. The change in reserve accumulation levels can be explained by each of the variables. One-way causality was found between international reserves and institutional quality. As a result, strong institutions could be attributed to foreign reserves. This stands in contrast to expectations that institutional quality would improve bilateral relations, investor investment decisions, and trading partner confidence, thus promoting foreign trade and increasing international reserves.

## V. SUMMARY, CONCLUSION AND RECOMMENDATIONS.

### 5.1 Summary/Conclusion

This study aimed to determine what factors affect Nigeria's accumulation of international reserves. The study also attempted to determine whether there was a causal relationship between international reserve buildup and the exploratory variables. The first chapter explained the study's background. There, the history of reserve accumulation was explored, as well as the likely drivers of such accumulation in Nigeria over the last four decades. Two specific objectives derived from the issue of foreign reserve accumulation in Nigeria are to examine the drivers of foreign reserve accumulation. A causal relationship between foreign reserves and the determinants is also to be assessed. According to the results of the study, the following conclusions can be drawn:

The accumulation of Nigeria's international reserves has been found to be influenced by economic openness (trade openness), total exports, the opportunity cost of holding international reserves, the quality of institutions, and the flexibility of currency rates. Nigeria's accumulation of international reserves is driven by indicators such as capital account vulnerability; current account vulnerability; and a mercantilist motive, as measured by exchange rate flexibility and total exports. An analysis of Granger causality showed that the opportunity cost of holding reserves and total exports were unidirectionally related. A causal relationship between the international reserve and the institutions is also demonstrated. The correlation between international reserves, trade openness, and financial openness was not causal.

In the study, it was concluded that non-macroeconomic factors as well as macroeconomic variables play a role in the accumulation of international reserves. Therefore, Nigeria's international reserve accumulation is influenced by the quality of its institutions.

### 5.2 Policy Recommendations

Based on the study's findings, the following recommendations were made:

- i. An increased exposure to external shocks, which is a result of increased trade openness, leads to a higher accumulation of international reserves. This is confirmed by the positive effect of increased trade openness on the accumulation of international reserves. The government must therefore take action to mitigate the impact of external shocks on the economy. It is crucial that the Nigerian government diversifies the economy away from oil dependence and into fields such as agriculture and mining. In addition, the government should lower trade barriers to make foreign trade more appealing, thereby increasing reserves.
- ii. Nigeria's managed floating exchange rate system, which frequently necessitates central bank intervention, contributes to the beneficial impact of exchange rate flexibility on reserve building. A managed-floating exchange rate regime should be controlled and maintained by the government, through its central bank, in order to improve the country's international competitiveness.
- iii. The central bank's cost of holding international reserves is higher due to the inverse relationship between the opportunity cost of holding reserves and international reserve buildup. It is necessary for the central bank of Nigeria (CBN) to incur opportunity losses in order to accumulate larger reserves for this purpose.
- iv. Exports are positively correlated with international reserves. The government therefore needs to put in place policies to boost exports in Nigeria. These policies include lowering export restrictions, removing trade barriers, providing tax and financial incentives for entrepreneurs, etc.



v. Institutional quality has a positive impact on international reserves, so the government should strengthen its institutions to ensure transparency and accountability, In other words, trade openness will lead to an increase in reserves because it will boost international trade. Stronger institutions are known for establishing financial discipline policies, which results in significant reserve building. Weak institutions hinder economic growth and development.

vi. A unidirectional causality was found between the opportunity cost of retaining reserves, exchange rate flexibility, and exports and international reserves. Policymakers can use reserves to create supplementary institutions or strengthen existing ones. Therefore, the study suggests that government and monetary authorities should use excess reserves to create institutions instead of letting them sit idle.

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## APPENDIX

## DATA PRESENTATION

YEAR	GDP	OPC	RES	OPN
1970	5,281.10	-0.91	156.58	31.54
1971	6,650.90	1.27667	281.38	36.1
1972	7,187.50	1.75167	243.58	33.63
1973	8,630.50	-1.0217	377.98	318.56
1974	18,823.10	-3.7983	3,452.30	41.16
1975	21,475.24	-1.8625	3,583.70	41.26
1976	26,655.78	-0.84	3,286.30	44.69
1977	31,520.34	-0.8242	2,814.50	46.71
1978	34,540.10	-2.0567	1,298.90	41.33
1979	41,974.70	-5.1658	3,059.80	43.65
1980	49,632.32	-7.7658	5,462.00	46.91
1981	47,619.66	-11.12	2,441.60	47.29
1982	49,069.28	-4.6108	1,043.30	36.74
1983	53,107.38	-0.7942	224.40	29.13
1984	59,622.53	0.4575	710.10	26.04
1985	67,908.55	-0.6833	1,657.90	26.59
1986	69,146.99	2.1675	2,836.60	20.74
1987	105,222.84	9.29667	7,504.59	44.57
1988	139,085.30	7.185	5,229.10	36.91
1989	216,797.54	15.9267	3,047.62	40.34
1990	267,549.99	15.4908	4,541.45	57.23
1991	312,139.74	11.5467	4,149.30	69.09
1992	532,613.83	23.5483	1,554.61	106.23
1993	683,869.79	12.32	1,429.59	61.84
1994	899,863.22	13.8617	9,009.11	40.8
1995	1,933,211.55	11.3508	1,611.11	88.16
1996	2,702,719.13	11.4642	3,403.91	69.24
1997	2,801,972.58	5.10083	7,222.22	74.5
1998	2,708,430.86	9.93833	7,107.50	58.4
1999	3,194,014.97	13.3258	5,424.60	61.91
2000	4,582,127.29	8.74667	9,386.10	61.99
2001	4,725,086.00	11.3708	10,267.10	60.03
2002	6,912,381.25	20.175	7,681.10	54.87
2003	8,487,031.57	16.5875	7,467.78	88.99
2004	11,411,066.91	14.84	16,955.02	59.71
2005	14,572,239.12	11.7608	28,279.06	56.41
2006	18,564,594.73	9.3025	42,298.11	44.61
2007	20,657,317.66	8.8875	51,333.15	57.63
2008	24,296,329.29	10.0479	53,000.36	65.83
2009	24,794,238.66	15.7408	42,382.49	56.06
2010	29,205,782.96	14.3356	32,339.25	65.2
2011	37,543,654.70	12.7713	32,639.78	65.6
2012	40,544,099.94	13.5403	43,830.42	59.47
2013	42,396,765.71	13.4725	42,847.31	58.74
2014	89,043,615.26	13.2983	34,241.54	27.74
2015	94,144,960.45	13.5888	28,284.82	24.96
2016	101,489,492.20	13.3554	26,990.58	19.63

SOURCE: CBN statistical bulletin (2011 & 2016) & World Bank Indicators, 2016

YEAR	EXPT	FPN	INST	EXCH
1970	885.67	14.9506416	0.621	0.714
1971	1,293.40	14.61343578	0.629	0.696
1972	1,434.20	14.68962319	0.661	0.658
1973	2,278.40	14.66881023	0.694	0.658
1974	5,794.80	9.316832332	0.731	0.630
1975	4,925.50	14.11548059	0.728	0.616
1976	6,751.10	16.92147069	0.739	0.627
1977	7,630.70	19.50169319	0.726	0.647
1978	6,064.40	21.40340744	0.727	0.606
1979	10,836.80	21.88413497	0.736	0.596
1980	14,186.70	23.88886919	0.762	0.546
1981	11,023.30	30.3890592	0.731	0.610
1982	8,206.40	32.17235237	0.739	0.673
1983	7,502.50	33.30596426	0.747	0.724
1984	9,088.00	33.72205384	0.771	0.765
1985	11,720.80	32.83716361	0.795	0.894
1986	8,920.60	34.42868591	0.792	2.021
1987	30,360.60	26.20494118	0.796	4.018
1988	31,192.80	27.57789644	0.775	4.537
1989	57,971.20	21.17315692	0.772	7.392
1990	109,886.10	19.75594355	0.764	8.038
1991	121,535.40	24.15622407	0.665	9.909
1992	205,611.70	20.86170281	0.692	17.298
1993	218,770.10	24.17693418	0.685	22.051
1994	206,059.20	25.59195556	0.640	21.886
1995	950,661.40	14.95392826	0.643	21.886
1996	1,309,543.40	12.79651885	0.660	21.886
1997	1,241,662.70	14.7496136	0.663	21.886
1998	751,856.70	18.0231954	0.672	21.886
1999	1,188,969.80	19.69158462	0.702	92.693
2000	1,945,723.30	19.17138521	0.700	102.105
2001	1,867,953.85	26.86346052	0.693	111.943
2002	1,744,177.68	21.78646469	0.710	120.970
2003	3,087,886.39	23.01065076	0.747	129.357
2004	4,602,781.54	18.68203034	0.759	133.500
2005	7,246,534.80	18.1023157	0.772	132.147
2006	7,324,680.63	20.45780708	0.807	128.652
2007	8,309,758.32	24.8212318	0.835	125.833
2008	10,161,490.12	32.96055077	0.862	118.567
2009	8,356,385.57	37.9568511	0.890	148.902
2010	11,532,022.68	32.47026854	0.880	150.298
2011	14,231,453.36	32.42223055	0.882	153.862
2012	15,139,326.13	19.37613536	0.897	157.499
2013	15,262,013.61	18.9284613	0.908	157.311
2014	12,960,493.23	19.85463696	0.924	158.550
2015	8,845,158.81	20.07680806	0.927	193.279
2016	8,835,611.91	21.29056044	0.922	253.492

SOURCE: CBN statistical bulletin (2011 & 2016) & World Bank Indicators, 2016