



Determinants of External Reserves: A Post Structural Adjustment Programmes Study from Nigeria

Dr. Ebi R. Odi & d Dr. Greatness U. Oji

**Department of Finance and Banking,
University of Port Harcourt, Port Harcourt, Nigeria**

ABSTRACT

This study examined factors that determine Nigeria external reserve. Time series data were sourced from Central Bank of Nigeria Statistical Bulletin from 1981-2020. External reserves was modeled as the function of Real interest rate, Fiscal policy as annual budget to gross domestic product, Economic growth as growth of gross domestic product, Exchange rate per US dollar, Financial sector Openness as foreign capital inflow to gross domestic product, Economic openness as import-export to gross domestic product and Oil price. The study employed multiple regression models to estimate the effect of the variables on external reserves. Ordinary Least Square of Augmented Dickey Fuller Test, Johansen Co-integration test, error correction model and pair-wise causality tests were used to conduct the investigations and analysis. The results found that 91.5 percent variation in Nigeria external reserves was traced to the factors examined in this study; the regression model was statistically significant from the F-statistic while the Durbin Watson proved that there is no autocorrelation among the variables. the study conclude that exchange rate has negative and no significant effect, Economic openness has positive and significant effect, Economic growth has negative and no significant effect, Financial deepening has negative and no significant effect, Financial sector openness has negative and significant effect, Fiscal policy has positive and no significant effect, Oil price has positive and no significant effect while real interest rate has negative and no significant effect on external reserves. From the findings, the study recommends well formulated macroeconomic and monetary policy enhances and stabilizes Nigeria external reserves.

Keywords: External Reserves, A Post Structural Adjustment Programmes, Exchange rate, Financial Openness, Economic Openness

INTRODUCTION

External reserves are the crucial assets that can easily manipulate the pace of a country's exchange rate through effective interventions in financial markets or proven to be an imperative tool for monetary authorities to crop external payment imbalances. Normally, a country embosses its reserves in the form of gold, foreign currencies, and special drawing rights. The Central Bank of Nigeria holds reserves to deal with exchange rate volatility, as a shockwave stabilizer in times of financial tremors, settlement of international trade and means of holding Sovereign Wealth Fund (Olokoyo *et al*, 2009). External reserves have necessitated external sector developments such as international trade transactions, exchange rate, external debt and other related external obligations. It forms the means for holding Sovereign Wealth Fund.

Reserve holdings are means to measure a country's credit ratings and credit worthiness as a form of shock absorber in periods of financial shocks (Umeora, 2013; Osuji & Ebiringa, 2012). For instance, the Nigerian Central Bank holds external reserves for the purpose of exchange rate stability, exchange rate targeting, creditworthy consciousness, provision of emergency fund, and as a buffer to meet unexpected capital outflows (Archer & Halliday, 1998). Nzotta (2004) opined that foreign reserves come about when foreign exchange receipts exceed foreign exchange disbursement. It represents the balance of foreign exchange surpluses of a nation's accumulated reserves over a period of time.

Conceptually, external reserves consist of official public sector foreign assets that are readily available to, and controlled by the monetary authorities, for direct financing of payment imbalances

and directly regulating the magnitude of such imbalances, through intervention in the exchange markets to affect the currency exchange rate and/or for other purposes (IMF, 2003). These are assets of the central bank held in different reserve currencies, mostly the US dollar and to a lesser extent the Euro, the UK pound, and the Japanese yen, and used to back its liabilities such as the local currency issued, and the various bank reserves deposited with the central bank, by the government or financial institutions (CBN, 2010). With increased financial integration, countries are more vulnerable to contagion from within and outside their regions. Central Banks of Nigeria over the years have accumulated reserves to cushion extreme events, the bunching of external debt maturities or other shocks that could affect the foreign exchange market and the domestic economy.

The Structural Adjustment Program was introduced in mid-1986 as a short-term reform program that was expected to terminate by mid-1988, but it continued thereafter until it was abandoned in 1994. It was the most revolutionary approach to solving Nigeria's long-standing economic problems and the most controversial program of stabilization and development ever instituted in the country. However, the negative effects of Structural Adjustment Program included rapid depreciation of the local currency, depletion of external reserves, high and volatile interest rates, near paralysis of the real sector, galloping inflation, heavy debt overhang, increasing unemployment, and deterioration in living standards of the average Nigerian, among others. Factors that determine external reserve is a matter of concern to monetary authorities as depletion in external reserve symbolize macroeconomic instability. The study of external reserves is well documented in literature, however most of the studies focused on external reserves and economic growth. This study focused on factors that determine external reserves in Nigeria.

LITERATURE REVIEW

External Reserves in Nigeria

Prior to the inception of the Central Bank of Nigeria in 1959, the country formed part of the defunct West African Currency Board (WACB). In that period, management of external reserves posed little or no problems to the country because the manner in which the Board operated prevented such problems from arising. Optimal deployment of reserves then was really not an issue since Nigeria's non-sterling earnings were deposited in London in exchange for credit entries in the sterling accounts maintained there (Aizenman 2005).

Subsequently, the 1959 Act which established the Central Bank of Nigeria (CBN) required the Bank to hold external reserves solely in Gold and Sterling. With the amendment in 1962 of this Act, the Bank acquired the mandate to maintain the country's foreign exchange reserves not only in sterling balance but also in non-sterling assets such as gold coin or bullion, bank balances, bills of exchange, government and government guaranteed securities of countries other than Britain and treasury bills in other countries. The monetary options available to the country widened upon joining the International Monetary Fund (IMF) in 1961 to include many more assets (Yuguda 2003).

Odozi (2000) noted that in addition to the problem of depleting reserves; Nigeria faced a new scenario with reserve management. Following the admission into the organization of Petroleum Exporting Countries (OPEC) in 1973 and the oil boom of the era, the problem of reserve management switched from that of 'inadequate' to that of 'excess reserves'. This remained so until 1981 when the country was hit by the global economic recession that led to a consistent decline in her external reserves. In the light of this development, economic stabilization measures revolving stringent exchange control, which ran from April 1982 to June, 1986 (when accretion to external reserves was low), were introduced. By the end of 1985, it was evident that the use of stringent economic controls was ineffective in restraining external reserves depletion. To this end, exchange and trade controls were discontinued in 1986, following the adoption of market based policy measures, the Structural Adjustment Programme (SAP) in July 1986. However, after more than seven years of liberation, government felt that the overall performance of the economy was unsatisfactory. Hence, in January 1994, some measures of control were re-introduced which saw the CBN as the sole custodian of foreign exchange and together with its designated agents, the avenues for foreign exchange important. Again the trade and exchange policies in 1994 failed to substantially achieve the desired objectives. The guided deregulation introduced in 1995, among other things, abolished the 1962 Exchange Control Act, in a bid to enhance the flow of capital and the reserves position of the country. Other measures aimed at boosting the external reserves included the introduction of an Autonomous Foreign

Exchange Market (AFEM) for the purpose of trading in foreign currencies at market determined rates and further liberation of the foreign exchange system in 1997 and the trade and exchange regime in 1998.

Composition of External Reserves

The currency diversification of external reserves involves the shift on the part of Central Banks from holding their external reserves in the traditional gold reserve assets to a basket of foreign currencies and securities. In considering the basket of foreign currencies to hold, the monetary authorities of most countries are influenced by historical, economic and political fundamentals. Although a general economic objective of currency composition of reserves is investment in foreign currencies and securities by central banks to maximize returns on financial resources, the monetary authorities, more often than not, play down on the profitability aspects and concentrate on their liquidity needs especially if they are experiencing balance of payments disequilibrium.

Legislation at the inception of the Central Bank of Nigeria (CBN) made it relatively impossible to diversify the reserve assets away from gold (10%) and the pounds sterling (90%). The dollar assets did not even qualify as part of the official reserve holdings till the amendment of the CBN Act in 1962. Consequently, in the 1960's the external reserves of the country were held predominantly in pound sterling assets thereby conforming to the arrangement of the Sterling Exchange System.

The pound sterling accounted on the average for 78.4% of the external reserves from 1959 through 1970 while the US dollar assets accounted for 12.5% in the period. The composition of external reserves in Nigeria as indicated under the Banks and Other Financial Institutions Act (BOFIA) 1999 and the CBN Act 2007(section 24) include:

- i. Gold coin or bullion
- ii. Balance at any bank outside Nigeria where the currency is freely convertible, currency and in such currency, notes, money at call and any bill of exchange bearing at least two valid and authorized signatures and having a maturity not exceeding ninety days exclusive of the days of grace.
- iii. Treasury bills having maturity not exceeding one year issued by the government of any country outside Nigeria whose currency is freely convertible.
- iv. Securities of, or guarantees by, a government of any country outside Nigeria, whose currency is freely convertible, provided such securities shall mature in a period not exceeding 10 years from the date of acquisition and are of such investment grade as may be determined by the Board of Directors of the bank from time to time.
- v. Securities of, or guarantees by, international financial institutions if such securities are expressed in freely convertible currencies, in the form of investment grade assets as may be determined by Bank's Board and maturity of the securities shall not exceed five years.
- vi. Nigeria's gold tranche at the International monetary Fund
- vii. Allocation of the Special Drawing Right (SDR) made to Nigeria by the International Monetary Fund.
- viii. Investments by way of loans or debenture in an investment bank or development financial institution within or outside Nigeria for a maximum period of 5 years in as far as:
 - ix. The amount is not more than 5 per cent of the total foreign reserves;
 - x. The reserve level at the time of investment is more than such amount as will sustain 24 months of imports;
 - xi. The loan or debenture is denominated in foreign currency provided the investment bank or development financial institution referred to in (h) above, carries such a rating by rating agencies as may be prescribed from time to time by the Bank; and
 - xii. Such other securities and investments as may be approved from time to time by the Board, provided they are liquid foreign currency assets that are of investment grade and in the form of freely convertible currencies (CBN, 2009).

The central bank holds the country's foreign reserves in major currencies such as: the U.S dollar, the euro, the Japanese yen, the British pound, the Swiss franc and those of other trading partners. However, over 90% of Nigeria's foreign reserves is denominated in the U.S dollar, mainly due to the fact that its crude oil exports are invoiced in the U.S dollar while most of its obligations such as external debt service, foreign exchange intervention, as well as other service obligations are also denominated in the U.S dollar (Nda,2006).

Bretton Woods System and Export Promotion

Dooley, Folkerts-Landau, and Garber (2003) posited that the economic emergence of a fixed exchange rate periphery in Asia has re-established the United States as the centre country in the revived Bretton Woods international monetary system. In terms of the Asian countries, the periphery, development strategy is export-led growth supported by undervalued exchange rates. However, a single-minded emphasis on export growth has been supported by a virtually unlimited demand for U.S. financial assets in the form of official reserves.

Dooley, Folkerts-Landau, and Garber (2004) extended the argument and state that the U.S. deficit, supplies international collateral to the periphery and international collateral in turn supports two-way trade in financial assets that liberates capital formation in poor countries from inefficient domestic financial markets. Pertinent to note here is that a rate of exchange that does nothing more than equalize price levels will not necessarily prove to be equilibrium in foreign exchange rate. Foreign trade usually includes capital and unilateral transfer movements, and this theory does not pretend to even-out with them. Adding together, nations produce many commodities that do not enter into international trade, and the prices of those domestic goods obviously cannot be equalized internationally.

Precautionary Motives

Aizenman and Marion (2004) argued that apart from any need to hold reserves for exchange-rate management, countries that face conditional access to global capital markets and costly tax collection will hold precautionary reserves to smooth consumption and distortions intertemporally. This helps to explain, to a large extent, the recent accumulation of reserves in Asian countries in the aftermath of financial crises. Aizenman and Marion (2004) stated that political instability or corruption could explain why countries decide to reduce the demand for precautionary reserves. Caballero and Krishnamurthy (2003) added that countries with underdeveloped local securities markets need higher levels of reserves. This is essentially in line with the assumption of conditional access to global capital markets in Aizenman and Marion's (2004) argument. Aizenman and Lee (2007) stated that precautionary motives may lead countries to hoard international reserves in order to mitigate the possible transmission of banking crisis to currency crisis.

Under uncovered interest parity, the differential in interest rates would equal not only the forward discount, but also the expected rate of future change in the exchange rate. It is hard to measure whether this condition in fact holds, because it is hard to measure investors' private expectations. One reason uncovered interest parity could easily fail is the existence of a foreign exchange-risk premium. If uncovered-interest parity holds, then countries can finance unlimited deficits by borrowing abroad, so long as they are willing and able to pay the going world rate of return. But if uncovered interest parity does not hold, then countries will find that the more they borrow, the higher the rate of interest they must pay.

Monetarist or Classical Views

Edwards (1983) stated that on the one hand, reserves movement respond to discrepancies between desired and actual reserves and on the other, according to monetary approach to balance of payments, changes in international reserves is related to excess demands or excess supplies of money. Yin-Wong and Hiro (2006) posited that Johnson and the global monetarists argue that excess demand for money (that involves balance of payments surplus) needs to be complimented by an increase in international reserves whereas excess supply of money (balance of payments deficit) leads to a fall in reserve holding. This view is based on the international financial framework under the Bretton Woods system. De Beaufort and Kapteyn (2001) referred to research on the Early Warning System, including Calvo (1996) and argued that the reserves-to-M2 ratio is a reasonable measure of reserve adequacy.

Caballero and Panageas (2004) argued that reserve accumulation is not the best insurance against sudden stops. Lane and Burke (2001) posited that there is no significant association between exchange rate regime and international reserves. Yearger (1984) stated that a restored gold standard would not work well and would hardly endure if it were not accompanied by drastic restraints on government interferences in economic life. Aizenman and Lee (2007) stated that an unintended consequence of competitive hoarding is excessive reserves, where the competitive gains are dissipated. The inefficiency associated with competitive hoarding may provide the impetus for the formation of institutions that would allow coordination. For example an Asian International Reserve Fund may provide an umbrella institution that would commit the countries to refrain from competitive hoarding.

Keynesian View on International Reserves

To Keynes, the early twentieth century had proven the extent to which nations would resort to currency devaluation as a lever to improve their balance of trade, seldom improving in the process either their own terms of trade or the opportunities inherent in a flourishing and expanding trade network. As balance of payments accounting had become more common, many Western nations had come to believe that unilateral currency devaluation would, in the absence of reciprocal action, improve the terms of trade. It would make a nation's own exports cheaper in terms of foreign currency and would, of course, make imports equally more expensive. It was not uncommon to find, however, the price of imports rising under such an initiative to the point where the aggregate value of imported goods continued to outpace the value of the higher, newly attained level of exports.

Keynes's theoretical insight here was to recognize that in modern industrial economies, monetary policy would simply have little effect in restoring balance through price deflation. It would regulate external balance, instead, by causing unemployment, lower incomes, and decreased imports. He then seized upon the notion that exchange rate mechanism mattered far less than international liquidity. Though gold, the pound sterling, and the U.S. dollar had all proved somewhat useful in attempts at securing substantial international reserves with which to conduct increasing levels of trade, even the highly regarded British and American currencies remained vulnerable to the deflationist tendencies Keynes so abhorred. However, Robert and Vijay (2010) argued that the fact that the reserves were held mainly in dollars allowed the US to avoid deflation, and instead run a "Keynesian" domestic policy which set the stage for an unsustainable asset and consumption boom. In short, there was a nexus connecting reserve accumulation by China and expansionary monetary and fiscal policy in the US.

Empirical Review

Williams, Adegbola and Afolabi (2018) examined determinants of foreign exchange rate was carried out using time series data from 1986 to 2016. This analysis attempted to find out the casual relationship between external reserves and foreign exchange rate in the Nigerian context by looking at the impact of foreign exchange rate on external reserves from 1986 to 2016 and after the financial crisis. The Nigeria economy is a mono economy where the import is stronger than export making the Nigeria naira irrelevant in the global market. This prompted the researchers to undertake this study so as to establish a linear relationship between external reserves and other variables likely to affect foreign exchange rate. The theoretical framework of production and risk aversion and model specification variables applied in this study may have been overlooked by previous studies. The study found out that the Nigerian external reserves ($RS = 0.000139$) positively affect foreign exchange rate in a normal economic situation and negatively affect foreign exchange rate in a period of global financial crisis. In the period of global financial crisis, the study recommends that the Nigeria government can increase her export to strengthen her currency so as to make her currency globally competitive. Furthermore, the external reserve is just a backup plan to cushion the effect of financial crisis and international liability in terms of balance of payment problem not as a core determinant of foreign exchange rate in Nigeria.

Miszta (2021) analyzed the size of China's Central Bank's foreign exchange reserves and the main determinants of changes in China's foreign reserves. The publication attempts to prove two theses. According to the first thesis, the current foreign exchange reserves level in China has been higher than the optimal level suggested by the foreign exchange reserves adequacy ratios. However, in line with the second thesis, the most important factors determining China's foreign exchange reserves were changes in the value of imports and changes in the level of China's short-term foreign debt. The study uses a research method based on literature studies in the field of banking and international finance and econometric methods (the classic least squares method). The selection of these research methods and their use are elements of the author's approach to the problem of the optimal level of foreign exchange reserves in China. Research revealed that for almost the entire period 1990-2019, the value of China's foreign exchange reserves was higher than the optimal values, as suggested by the adequacy ratios of currency reserves. The exceptions were the ratio of the optimal level of foreign exchange reserves, calculated as 20% of the M2 money supply, and the ratio calculated by the IMF methodology for countries with constant exchange rates. China's relatively high foreign exchange reserves were adequately hedged against the possible effects of economic crises, while the relatively high level of these reserves led to their low profitability. The analysis results indicated that changes in the value of

China's foreign exchange reserves were, to the greatest extent, determined by the inflow of foreign direct investment and changes in import expenditure.

Azeem and Khurshid (2019) investigated the impact of macroeconomic indicators on foreign reserves in the context of Pakistan. The Vector Autoregressive (VAR) model has been used to estimate Pakistan's foreign exchange reserves demand. It uses current account vulnerability, capital account vulnerability, exchange rate flexibility, and the opportunity cost of holding reserves as independent variables. The results indicate that macroeconomic variables such as remittances, exchange rate, the ratio of current account deficit to GDP, and interest rate differential (measure as opportunity cost) determine the country's long-run reserves demand function. Whereas, observed results show that demand for foreign reserves is highly sensitive to capital account vulnerability and less responsive to its opportunity cost. The Granger causality analysis probed that the various macroeconomic variables fail to cause reverse causality. It implies that in Pakistan, the demand for reserves is driven by macroeconomic stability. The study is helpful for the country's institutions to boost foreign reserves by controlling macroeconomics indicators.

Umeora (2013) examined the relationship between Exchange Rate and Foreign Exchange Reserves in Nigeria: 1986 - 2011. The results of the ADF test, Johansen test and ECM showed positive and significant relationship between Exchange Rate and Foreign Exchange Reserves. Ahmad and Pentecost (2009) examined the long-run relationship between Exchange Rate and International Reserves of African countries: 1980Q1 - 2004Q4, using the threshold co-integration technique. The result showed long-run relationship between exchange rate and international reserves. Nwachukwu, Ali, Abdullahi, Shettima, Zirra, Falade, and Alenyi (2016) modelled the long-run connection between the Bureau de Change Exchange Rate and external reserves in Nigeria, using the threshold VECM on daily data from January 1st, 2014 to July 31st, 2015. The results indicate a non-linear long-run relationship between Bureau de Change Exchange rate and external reserves.

Ajibola, Udoette, Omotosho and Muhammad (2015) examined the longrun correlation between exchange rate and external reserves: 1990Q1 - 2012Q4 in Nigeria using the 2-regime threshold VECM. Their results affirmed co-integration between the two variables. Abdullateef and Waheed (2010) found that Exchange Rates had no effect on Foreign Exchange reserves in Nigeria: 1986 - 2006 using OLS and VECM. Osigwe, Okechukwu and Onoja (2015) modelled the determinants of foreign reserves in Nigeria adopting the Johansen co-integration approach. Exchange rate was found to be significant but with negative determinant on Foreign Exchange Reserves.

Ibrahim (2011) used OLS and VECM; and observed that the fluctuations in external reserve were not significantly influenced by Exchange Rate instability between 1986 and 2006 in Nigeria. Audu and Okumoko (2013) econometric results showed that real Exchange Rate had positive significant effect on Real Foreign Reserve in Nigeria: 1970 - 2012. Osuji and Ebiringa (2012) investigated the long run relationship between exchange rate and external reserve management in Nigeria: 1981 to 2010. Their results from econometric analysis showed significance between Exchange Rate and External Reserves.

Elhiraika and Ndikumana (2007) used panel data for 21 African countries: 1979 – 2005. They examined the sources, motivation and economic implications of reserve accumulation considering its relationship with Exchange Rate. Nominal Exchange Rate strongly responded to changes in International Reserves both in the short-run and the long-run. Aizenman and Marion (2004) results of the effective Exchange Rate volatility for a panel data analysis of 64 countries: 1980-1996 showed that Exchange Rate volatility was significant and accounted for about 70% of the variation in the observed reserve holdings.

Kiru (2016) looked at the effect of exchange rate volatility on the Zambian Stock Market from 2000 to 2015 and found out that there is a negative relationship between the exchange rate and the stock. The work of Kiru (2016) does not corroborate with the definition of reserves used for hedging as stated by the International Monetary Fund. The fall of the Bretton Woods system and the importance of external reserves, the Central Bank of Nigeria Act of 1991 empowered the Central Bank of Nigeria (CBN) to safeguard her currency from any negative impact of foreign exchange as well as to provide confidence in her local currency. CBN (2017) stated that the Nigerian external reserves has been fluctuating in its movement but in the first half of 2017, there is 16% increase in foreign reserves which stands at \$30.271 billion as at June 29, 2017.

Tariq et al (2014) stated that most developing nations often feel the negative effect of real exchange rate volatility and thus reduce the development of their economic growth. Dooley et al (2004) stated that when nations hold reserves, it stands a form of mechanism to facilitate growth and maintain undervalued real exchange rate. Dooley et al (2004) stated this in the context of China.

Romero (2005) investigated a study that deals with a comparative analysis of the factors of international reserves demands in China and India. The study applied a fixed exchange rate model based on sample period for the former and a floating exchange rate based sample period for the latter country by using an annual data for the period 1980 to 2003. The study concluded that there was no relationship of fixed and floating exchange rate with reserves. However, it was noted that the data, such as current account balance, average propensity to import, and real exchange rate has equilibrium relationship.

Eliza et al (2008) used Malaysian data from 1970 to 2004 to study if there is a short or long-run demand for international reserves. He uses an advanced econometrics method called the autoregressive distributed lag (ARDL) bounds testing approach. His results showed that the current account balance and short-term external debt significantly affect the demand for international reserves both in the long run and short run. Ahmad and Kyereboah-Coleman and Agyire-Tettey (2008) used data from selected African countries for 34 years to examine the relationship between exchange rate and foreign reserves and relate it to the Ghana economy. They applied the co-integration method and found out that a long-run dynamics exist.

Ajibola et al (2015) investigated the impact of exchange rate and external reserves in Nigeria using time series data from 1990 to 2012 on a Threshold Vector Error Correction Model (TVECM) methodology. Their study found that there is a co-integration of variables if the equilibrium error is more than an estimated threshold parameter of 0.52. Gokhale & Raju (2013) studied the causality between the exchange rate and foreign exchange reserves using Indian data and found that there is no short and long-term association between exchange rate and foreign exchange reserve in the Indian context. Romdhane (2015) studied the impact of exchange rate fluctuation on economic growth and found that there may either be positive or negative impact based on the volume of foreign direct investment. Having noted all these as well as the empirical review, the idea behind this study is to look at the variable not included in the work of Gokhale & Raju (2013) and to apply another form of research method on the Nigerian data and context.

Xu Guangqing (2003) in a paper submitted to the Third Annual International Conference on Business in Hawaii, estimated the desired stock of reserves for China and showed that deviations of the actual stock from the desired level do trigger a process of adjustment and found that the speed of adjustment was quite high in China. The study also examined the determinants of the speed of adjustment and examined the empirical content of the hypothesis that (i) trade-off large equilibrium stocks of reserve for low speeds of adjustment; (ii) the speed of adjustment depends upon the (absolute) size of the discrepancy between desired and actual stocks; and (iii) the speed of adjustment depends upon whether the discrepancy between actual and desired stocks is positive or negative. Following previous work on the demand for foreign reserves and considering China's special economic characteristics, especially the capital flight which happened seriously in China, the study assumed that the desired level of reserves is related to (i) a measure of scale - reflecting the value of foreign reserve transactions or of wealth; (ii) the average propensity to import - reflecting the degree of openness of the economy; (iii) the volatility of exchange rate; (iv) debt burden and (v) capital flight pressure. The study revealed that all the variables except the debt rate had significant values and also showed some special characteristics involved in China's reserve adjustment picture: China adjusts more rapidly to reserve deficiencies than to surpluses; the speed of adjustment is negatively related to the divergence between the actual level of reserve and the target level; and when China holds abnormally large quantities of reserve it does adjust more rapidly.

Aizenman and Riera-Crichton (2006) evaluated the impact of international reserves, terms of trade shocks and capital flows on the real exchange rate (REER). The study revealed that international reserves cushions the impact of terms of trade shocks on the REER, and that this effect is important for developing but not for industrial countries. The buffer effect is especially significant for Asian countries, and for countries exporting natural resources. Financial depth reduces the buffer role of international reserves in developing countries. Developing countries REER seem to be more sensitive to changes in reserve assets; whereas industrial countries display a significant relationship between

hot money and REER. Choi and Baek (2004) used a new classification of exchange rate arrangements developed by Reinhart and Rogoff (2004) to test whether reserve holdings decrease with increasing exchange rate flexibility. Using pooled data for 137 countries over the period 1980-2000, the study regresses international reserves variable on other variables such as per capita GDP, trade openness (measured as the ratio of exports plus imports to GDP), financial openness (defined as the ratio of gross private capital flows to GDP), interest rate, export volatility and a dummy for exchange rate regime. The study finds that the degree of exchange rate flexibility has an inverted-U relationship with the country's reserve holdings. Exchange rate regimes with intermediate flexibility need more reserves than polar regimes (hard pegs and freely floating). Further, reserve holdings are smaller under hard pegs than under freely floating, implying that current large stockpiles of reserves in East Asian countries can be significantly reduced if they adopt a single currency. Regarding the other determinants of the demand for reserves, country size, real openness and financial openness all raise reserve holdings while the opportunity cost and export volatility are not significant variables. Finally, per capita GDP and reserve holdings also have an inverted-U relationship, thereby, showing that their correlation is negative for industrial countries, but positive for developing countries.

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

Choi and Baek (2004) and Lai (2004) used OLS but did not test for the stationarity of the series they used. However, it has been shown that running regression on non-stationary data using OLS estimation method produces spurious regression results. As a result of this, this study will use the cointegration approach and also tests for the stationarity of the series in order to avoid any spurious regression results. Khan and Ahmed (2005) analyzed the main determinants of reserves holding in Pakistan and also attempted to find the implications of structural shifts such as September 11, military take-over and the autonomy of State Bank of Pakistan for the traditional reserves demand theory and the implications of monetary approach to balance of payments for reserves holding behaviour in Pakistan. The study estimates the long run cointegration relationship between reserves variable and other determinants such as balance of payments variability, money market rate, the average propensity to import, the level of imports and workers' remittances using quarterly data over the period 1982:1-2003:2. The study found that there exist stable long run reserve demand functions in case of Pakistan. The estimated cointegration relationship shows that all variables except remittances are significant. The variations in balance of payments and imports have positive relationship while money market rate has a negative impact on international reserves.

Yin-Wong and Hiro (2006) conducted a comprehensive cross-country empirical analysis of the determinants of international reserves. For the sample period of 1975 to 2004, they used data from more than 100 economies, including both developed and developing economies, to examine the effects on international reserves holding of three groups of determinants, namely, traditional macro variables, financial variables, and institutional variables. They focused on the interplay of these variables and their changing roles in determining international reserves. Therefore, with a large sample of economies, they compared the behaviour of crisis-inflicted and non-crisis-inflicted economies and examined whether international reserves of these economies behave differently before and after crises. Moreover, they used the estimation results to compare and contrast the patterns of demand for international reserves of the developed and developing economies. The estimation results showed that the explanatory power of the determinants changes across different time periods and also vary between developed and developing economies. The compositions of the significant determinants within each one of the three groups of explanatory variables also displayed substantial variations across subsample periods and country groups. The behaviour of crisis-inflicted economies can be identified only in some cases but not uniformly. The results also suggest that, compared with a

developing economy, a developed economy tends to hold a lower level of international reserves, *ceteris paribus*.

Jo (2007) used a cointegration and a vector error correction approach to estimate the magnitude and sources of international reserve accumulation in Korea. The study presents further evidence to support the hypothesis that the large buildup of international reserves in Korea might be the by-product of mercantilist objectives to smooth exchange rate movements beyond responses to perceptions of the need for greater reserve hoardings, generated by the 1997-98 Asian crises. The study finds that Korea's recent hoarding of international reserves substantially exceeds any benchmark levels. One explanation is that the large reserve buildup is the by-product of Korea's exchange rate policy to maintain export competitiveness. The study presents evidence that, under managed float FX regime since the crisis in Korea, exports have been cheap and the terms of trade have substantially declined, maintaining high export growth. Also, the main source of Korea's reserve hoarding after the crisis has been trade surplus rather than capital inflows. In the cointegration and error correction estimation, both long-term and short-term relationship between the terms of trade and international reserve is found to be negative, which is further evidence that Korea has stockpiled reserves with heightened concern about export competitiveness. However, the results do not ignore some scope of the precautionary demand that Asian countries have built the buffers against rapid financial outflows. More so, GDP has a significantly positive relationship with foreign reserve stock implying that, from long-term point of view, as international transactions increase with economic size, reserve levels have increased with GDP levels. The variability measures of the balance of payments have positive long term relationship with reserves, confirming that reserve holding increase with the volatility of international transactions. The exchange rate volatility shows positive long-run relationship with reserves while the openness measure shows a long run negative relationship with reserves.

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

Adam and Leonce (2007) investigated the crowding out effect of external reserves on both public and private investment, Real GDP growth, domestic credit to public sector (for public investment) and interest rate and exchange rate expectations (for private investment) served as additional variables to external reserves. The same authors considered monetary variables such as interest rates, inflation rate, as additional variables to external reserve in exchange rate equation and finally, only the lag value of inflation rate was added for inflation equation.

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

Suvojit, Ram, and Benito (2008) analyzed the optimal reserve holding for India during an era of flexible exchange rate and high capital mobility using the buffer stock model of Frenke and Jovanovic (1981). The evidence derived from the ARDL approach of Pesaran, Shin and Smith (1996) support the fact that the scale variable, opportunity cost variable and the volatility variable all have significant effects on the reserve demand. The evidence also shows that exchange rate flexibility does not have any significant impact on the reserve demand. Prabheesh, Malathy, and Madhumathi (2009)

empirically investigated the importance of precautionary and mercantilist approaches to international reserves in the Indian context using monthly data from 1993 to 2007. The ARDL approach to cointegration was used to estimate as in the long-run relationship between reserves and its determinants. The empirical results show that the impact of the volatility of Foreign Institutional Investment which captures the precautionary motive, and that of undervalued real exchange rate which is associated with the mercantilist view on reserves are statistically significant in the long run. Hence, they concluded that both the precautionary and mercantilist motives explain reserve accumulation in India over the study period.

Usman and Ibrahim (2010) investigated the impact of change in external reserve positions of Nigeria on domestic investment, inflation rate and exchange rate. Using a combination of ordinary least square (OLS) and vector error correction (VEC) methods, it was observed that change in external reserves in the country only influences foreign direct investment (FDI) and exchange rates and no influence of it was found on domestic investment and inflation rates. The study suggested that there is need for broader reserve management strategies that will aim at maximizing the gains from oil export revenue by utilizing more of these resources to boost domestic investment. It is pertinent to note here that the literature reviewed, has revealed various variables that may affect reserve holdings of any nation.

METHODOLOGY

The ex post facto research design was adopted using the simple time series econometric techniques. The model was estimated employing the descriptive statistics, Augmented Dickey Fuller (ADF) unit root test, Johansen co-integration test, Error Correction Mechanism (ECM) and Ordinary Least-Squares (OLS). The Descriptive statistics is a test for normality of the data, Augmented Dickey-Fuller (ADF) unit root test for stationarity of the variables. The Johansen co-integration test for long-run equilibrium relationship while the error correction mechanism examines the short run relationship, the data were annual records for 40 years: 1981 – 2020 sourced from the Central Bank of Nigeria Statistical Bulletin and World Bank data base. The study formulates the following models:

$$EXTR = f (RIR, FP, FD, ECG, EXR, FOP, EOP, OILP) \quad 1$$

Transforming equation 1 to econometrics model:

$$EXTR = \beta_0 + \beta_1 RIR + \beta_2 FP + \beta_3 FD + \beta_4 ECG + \beta_5 EXR + \beta_6 FOP + \beta_7 EOP + \beta_8 OILP + \mu$$

(2)

Where

EXTR = External Reserves as percentage of GDP

RIR = Real interest rate

FP = Fiscal policy as annual budget to GDP

ECG = Economic growth as growth of GDP

EXR = Exchange rate per US dollar

FOP = Financial sector Openness as foreign capital inflow to GDP

EOP = Economic openness as import-export to GDP

OILP = Oil price

μ = Error Term

$\beta_1 - \beta_8$

β_0 = Coefficient of Independent Variables to the Dependent Variables

= Regression Intercept

Data Analysis Procedure

The main tool of analysis is the Ordinary Least Squares (OLS) using the multiple regression method for a period of 40 years, annual data covering 1981– 2020. Statistical evaluation of the global utility of the analytical model, so as to determine the reliability of the results obtained were carried out using the coefficient of correlation (r) of the regression, the coefficient of determination (r²), the student T-test and F-test.

- (i) **Coefficient of Determination (r²) Test:** This measure the explanatory power of the independent variables on the dependent variables. R² gives the proportion or percentage of the total variation in the dependent variable Y that is accounted for by the single explanatory variable X. The higher the R² value the better. For example, to determine the proportion of financial deepening toeconomic development in our model, we used the coefficient of determination. The coefficient of determination varies between 0.0 and 1.0. A coefficient of determination says 0.20 means that 20% of changes in the dependent variable is explained by the independent variable(s). Therefore, we shall use the R² to determine the extent to which variation in financial deepening variables are explained by variations in economic development variables over the periods covered in this study.
- (ii) **F-Test:** This measures the overall significance. The extent to which the statistic of the coefficient of determination is statistically significant is measured by the F-test. The F-test can be done using the F-statistic or by the probability estimate. We use the F-statistic estimate for this analysis.
- (iii) **Student T-test:** measures the individual statistical significance of the estimated independent variables. This is a test of significance used to test the significance of regression coefficients (Gujurati, 2003). Generally speaking, the test of significance approach is one of the methods used to test statistical hypothesis. A test of significance is a procedure by sample results are used to verify the truth or falsity of a null hypothesis (Ho) at 5% level of significance.
- (iv) **Durbin Watson Statistics:** This measures the collinearity and autocorrelation between the variables in the time series. It is expected that a ratio of close to 2.00 is not auto correlated while ratio above 2.00 assumed the presence of autocorrelation.
- (v) **Regression coefficient:** This measures the extent in which the independent variables affect the dependent variables in the study.
- (vi) **Probability ratio:** It measures also the extent in which the independent variables can explain change to the dependent variables given a percentage level of significant.

Stationarity (Unit Root) Tests

The study investigates the stationarity properties of the time series data using the Augmented Dickey Fuller (ADF) test. The study was subjected all the variables to unit root test using the augmented Dickey Fuller (ADF) test specified in Gujarati (2004) as follows.

$$\Delta y_t = \beta_1 + \beta_2 + \delta y_{t-1} + \alpha \sum_{i=1}^m \Delta y_{t-i} + Et \tag{3.9}$$

Where:

Δy_t = change time t

Δy_{t-1} = the lagged value of the dependent variables

Σ_t = White noise error term

If in the above $\delta = 0$, then we conclude that there is a unit root. Otherwise there is no unit root, meaning that it is stationary. The choice of lag will be determined by Akaike information criteria.

Co-integration Test (The Johansen' Test)

It has already been warned that the regression of a non-stationary time series on another non stationary time series may lead to a spurious regression. Thus, a test for co-integration enables us to avoid spurious regression situation. This study employed Johansen Multivariate Co-Integration Test to ascertain if there is the existence of a long run equilibrium relationship among time series variables. If the residual is found to be stationary at level, we conclude that the variables are co-integrated and as such has long-run relationship exists among them.

Granger Causality Test

Causality means the impact of one variable on another, in other-words; causality is when an independent variable causes changes in a dependent variable. The rationale for conducting this test is that it enables the researcher to know whether the independent variables can actually cause the variations in the dependent variable. Thus, Granger causality test helps in adequate specification of model. The pair-wise granger causality test is mathematically expressed as:

$$Y_t \pi_o + \sum_{i=1}^n x_1^y Y_{t-1} \sum_{i=1}^n \pi_1^x x_{t-1} + u_1 \tag{3.19}$$

and

$$x_t dp_o + \sum_{i=1}^n dp_1^y Y_{t-1} \sum_{i=1}^n dp_1^x x_{y-1} + V_1 \tag{3.20}$$

Where x_t and y_t are the variables to be tested while u_t and v_t are the white noise disturbance terms. The null hypothesis $\pi_1^y = dp_1^y = 0$, for all I 's is tested against the alternative hypothesis $\pi_1^x \neq 0$ and $dp_1^y \neq 0$. if the co-efficient of π_1^x are statistically significant but that of dp_1^y are not, then x causes y. If the reverse is true then y causes x. however, where both co-efficient of π_1^x and dp_1^y are significant then causality is bi – directional.

Vector Error Correction (VEC) Technique

The presence of co-integrating relationship forms the basis of the use of Vector Error Correction Model. E-views econometric software used for data analysis, implement vector Auto-regression (VAR)- based co-integration tests using the methodology developed by Johansen (1991,1995). The non-standard critical values are taken from OsterwardLenun (1992).

ANALYSIS OF RESULTS AND DISCUSSION OF FINDINGS

Table 1: Presentation of ADF Unit Root

Variable	ADF Statistic	MacKinnon@ 1%	MacKinnon@ 5%	MacKinnon@ 10%	Order of integration
ADF @ Level					
EXTR	-0.301969	-3.610453	-2.938987	-2.607932	1(0)
EXR	-2.161732	-3.610453	-2.938987	-2.607932	1(0)
EOP	-1.677653	-3.610453	-2.938987	-2.607932	1(0)
ECG	-3.283437	-3.615588	-2.941145	-2.609066	1(0)
FD	-0.714680	-3.610453	-2.938987	-2.607932	1(0)
FOP	-2.038038	-3.610453	-2.938987	-2.607932	1(0)
FP	-1.437870	-3.615588	-2.941145	-2.609066	1(0)
OILP	-1.978996	-3.610453	-2.938987	-2.607932	1(0)
RIR	-1.951991	-3.646342	-2.954021	-2.615817	1(0)
ADF @ Difference					
EXTR*	-6.798201	-3.632900	-2.948404	-2.612874	1(1)
EXR*	-5.907188	-3.632900	-2.948404	-2.612874	1(1)
EOP*	-4.881764	-3.661661	-2.960411	-2.619160	1(1)
ECG*	-4.536881	-3.632900	-2.948404	-2.612874	1(1)
FD*	-9.030785	-3.621023	-2.943427	-2.610263	1(1)
FOP*	-4.862885	-3.661661	-2.960411	-2.619160	1(1)
FP*	-8.207685	-3.626784	-2.945842	-2.611531	1(1)
OILP*	-6.091221	-3.639407	-2.951125	-2.614300	1(1)
RIR*	-6.821784	-3.610453	-2.938987	-2.607932	1(1)

Table 2: Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.837913	289.4702	197.3709	0.0000
At most 1 *	0.777867	220.3246	159.5297	0.0000
At most 2 *	0.755525	163.1544	125.6154	0.0000
At most 3 *	0.658332	109.6260	95.75366	0.0039
At most 4	0.561820	68.81720	69.81889	0.0599
At most 5	0.395096	37.46246	47.85613	0.3260
At most 6	0.253223	18.36039	29.79707	0.5396
At most 7	0.148473	7.264836	15.49471	0.5470
At most 8	0.029997	1.157336	3.841466	0.2820

Table 3: Normalized cointegrating coefficients (standard error in parentheses)

EXTR	EXR	EOP	ECG	FD	FOP	FP	OILP	RIR
1.000000	0.129273	-1314.965	-141.9524	9.344572	519.2280	15.93123	-0.740353	-70.69727
	(0.20628)	(132.909)	(28.5098)	(2.78174)	(46.8906)	(5.51869)	(0.26475)	(27.9078)

Table 4: Presentation of Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.
EXR does not Granger Cause EXTR	38	2.95817	0.0658
EXTR does not Granger Cause EXR		4.74729	0.0154
EOP does not Granger Cause EXTR	38	1.16950	0.3231
EXTR does not Granger Cause EOP		1.54811	0.2277
ECG does not Granger Cause EXTR	38	1.61687	0.2139
EXTR does not Granger Cause ECG		0.82666	0.4464
FD does not Granger Cause EXTR	38	7.50405	0.0021
EXTR does not Granger Cause FD		0.46373	0.6330
FOP does not Granger Cause EXTR	38	0.19192	0.8263
EXTR does not Granger Cause FOP		0.80503	0.4557
FP does not Granger Cause EXTR	38	0.08228	0.9212
EXTR does not Granger Cause FP		1.06067	0.3577
OILP does not Granger Cause EXTR	38	0.07922	0.9240
EXTR does not Granger Cause OILP		0.93239	0.4037
RIR does not Granger Cause EXTR	38	0.14009	0.8698
EXTR does not Granger Cause RIR		2.10296	0.1382

Table 5: Presentation of Error Correction Model Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXR(-1)	-0.849679	0.517487	-1.641934	0.1162
EXR(-2)	0.956680	0.510303	1.874727	0.0755
EOP(-1)	386.5031	133.2384	2.900839	0.0088
EOP(-2)	-145.8550	145.4593	-1.002720	0.3280
ECG(-1)	-71.38272	180.0449	-0.396472	0.6960
ECG(-2)	125.5260	178.5994	0.702836	0.4903
FD(-1)	-3.958436	4.107579	-0.963691	0.3467
FD(-2)	18.75652	4.583398	4.092274	0.0006
FOP(-1)	-140.1897	53.44383	-2.623123	0.0163
FOP(-2)	58.04270	52.79798	1.099336	0.2847
FP(-1)	13.01212	6.636711	1.960627	0.0640
FP(-2)	1.806282	5.789234	0.312007	0.7583
OILP(-1)	0.352075	0.212849	1.654105	0.1137
OILP(-2)	0.626555	0.239217	2.619194	0.0164
RIR(-1)	11.86829	22.45827	0.528460	0.6030
RIR(-2)	-17.64410	21.56489	-0.818186	0.4229
C	-379.8615	156.0121	-2.434820	0.0244
ECM(-1)	0.287657	0.174990	1.643852	0.1158
R-squared	0.953217	Mean dependent var		130.5982
Adjusted R-squared	0.913452	S.D. dependent var		117.5073
S.E. of regression	34.56948	Akaike info criterion		10.22933
Sum squared resid	23900.98	Schwarz criterion		11.00503
Log likelihood	-176.3573	Hannan-Quinn criter.		10.50532
F-statistic	23.97114	Durbin-Watson stat		2.329966
Prob(F-statistic)	0.000000			

Source: Extracts from E-View 9.0

ANALYSIS AND DISCUSSION OF FINDINGS

In an attempt to estimate the determinants of external reserves in Nigeria, the first task is to test for the presence of unit root. This is necessary in order to ensure that the parameters are estimated using stationary time series data. Thus, this study seeks to avert the occurrence of spurious results. To do this, the Augmented Dickey-Fuller (ADF) test was used. The essence of the ADF tests is the null hypothesis of nonstationarity. To reject this, the ADF statistics must be more negative than the critical values and significant.

Table 1 presents the results of ADF test statistics for the levels and first differences of the annual time series data for the period, 1981-2020. The asterisk (*) denotes rejection of the unit root hypothesis at the 1, 5 and 10% level. The ADF statistics were generated with a test for a random walk against stationary AR (1) with drift and trend with maximum lag of 2.

This step seeks to identify the number of cointegrating relationships that exist among these variables. This paper uses the methodology developed by Johansen (1991), popularly known as the Johansen cointegration test. This test identifies the number of stationary long-run relationships that exist among the set of integrated variables. It offers two tests, the trace test and the eigenvalue test, with a view to identifying the number of cointegrating relationships.

The trace test tests the null hypothesis that there are at most r cointegrating relationships. In other words, a rejection of the null hypothesis means that there are more than r cointegrating relationships. In table 2, the trace test rejects the null hypothesis if the trace statistics exceeds the critical value, which is generated automatically by Eviews. This suggests that the null hypothesis of no cointegrating relationships is rejected. This result confirms that there is three cointegrating relationship among the variables employed for the use of this paper. These results confirm the presence of a long-run relationship between the explained variable and one of the explanatory variables.

Table 3 presents the normalized cointegration test, the results shows that in the long run exchange rate, financial sector development, financial sector openness and fiscal policy have positive long run effect on Nigeria external reserves while economic openness, economic growth and oil price have negative long run effect on external reserves. The causality test presented in table 4 found that there is uni-directional causality from external reserves to exchange rate and uni-directional causality from financial sector deepening and external reserves while other variables have no causal relationship.

Table 5 present the results of the Vector Error Correction Model, the results found that 91.5 percent variation in Nigeria external reserves was traced to the factors examined in this study, the regression model was statistically significant from the F-statistic while the Durbin Watson proved that there is no autocorrelation among the variables. The study found that exchange rate has negative and no significant effect on external reserves at lag 1 but positive and no significant effect at lag 2. Economic openness has positive and significant effect on external reserves at lag 1 but positive and no significant effect at lag 2. Economic growth has negative and no significant effect on external reserves at lag 1 but positive and no significant effect at lag 2. Financial deepening has negative and no significant effect on external reserves at lag 1 but positive and significant effect at lag 2. Financial sector openness has negative and significant effect on external reserves at lag 1 but positive and no significant effect at lag 2. Fiscal policy has positive and no significant effect on external reserves at lag 1 and positive and no significant effect at lag 2. Oil price has positive and no significant effect on external reserves at lag 1 but positive and significant effect at lag 2 while real interest rate has negative and no significant effect on external reserves at lag 1 but negative and no significant effect at lag 2. The positive effect of the variables confirms our a-priori expectations and confirms structural and financial sector reforms. empirically, the findings confirm the findings of Williams, Adegbola and Afolabi (2018) that the Nigerian external reserves ($RS= 0.000139$) positively affect foreign exchange rate in a normal economic situation and negatively affect foreign exchange rate in a period of global financial crisis, Miszta (2021) that for almost the entire period 1990-2019, the value of China's foreign exchange reserves was higher than the optimal values, as suggested by the adequacy ratios of currency reserves and that changes in the value of China's foreign exchange reserves were, to the greatest extent, determined by the inflow of foreign direct investment and changes in import expenditure. The findings of Azeem and Khurshid (2019) that macroeconomic variables such as remittances, exchange rate, the ratio of current account deficit to GDP, and interest rate differential (measure as opportunity cost) determine the country's long-run reserves demand function, Umeora (2013), Nwachukwu, Ali, Abdullahi, Shettima, Zirra, Falade, and Alenyi (2016) indicated a non-linear

long-run relationship between Bureau de Change Exchange rate and external reserves, Ajibola, Udoette, Omotosho and Muhammad (2015) Abdullateef and Waheed (2010) and the findings of Ibrahim (2011) Audu and Okumoko (2013), Osuji and Ebringa (2012) significance between exchange rate and external reserves.

CONCLUSION

This paper examined factors that determine Nigeria external reserves. Following a detailed time series analysis, the study conclude that exchange rate has negative and no significant effect on external reserves at lag 1 but positive and no significant effect at lag 2. Economic openness has positive and significant effect on external reserves at lag 1 but positive and no significant effect at lag 2. Economic growth has negative and no significant effect on external reserves at lag 1 but positive and no significant effect at lag 2. Financial deepening has negative and no significant effect on external reserves at lag 1 but positive and significant effect at lag 2. Financial sector openness has negative and significant effect on external reserves at lag 1 but positive and no significant effect at lag 2. Fiscal policy has positive and no significant effect on external reserves at lag 1 and positive and no significant effect at lag 2. Oil price has positive and no significant effect on external reserves at lag 1 but positive and significant effect at lag 2 while real interest rate has negative and no significant effect on external reserves at lag 1 but negative and no significant effect at lag 2.

RECOMMENDATIONS

- i. Managers of Nigeria's foreign reserves should encourage the monitoring of the use of scarce foreign exchange resources to ensure that foreign exchange disbursements and utilization are in line with economic priorities and within the annual foreign exchange budget.
- ii. Nigerian government need to reconsider her reserve management strategies as the result shows that reserves holding by this country cannot be justified by trade openness.
- iii. Nigeria should liberalize its trade though with some restrictions such as imposition of tax on imported luxury goods in order to help in more reserve accumulation.
- iv. Broader economic development policy framework should be aimed at in order to maximize the gains from oil export revenues as it is the major foreign exchange earner of Nigeria.
- v. Nigeria reserve managers should invest heavily in infrastructural development in order to create the enabling environment for a non-oil economy.
- vi. The operation of the financial sector should be deepened to attract foreign and domestic investors.

REFERENCES

- Abdullateef, U., & Waheed, I. (2010). External reserve holdings in Nigeria: Implications for investment, inflation and exchange rate. *Journal of Economics and International Finance*, 2(9), 183–189.
- Ahmad, A. H., & Pentecost, E. J. (2009). Exchange rates and international reserves: a threshold cointegration analysis. Paper Presented at 14th Annual Conference on Econometric Modelling for Africa - Abuja, Nigeria. *Amity Journal of Finance ADMAA AJF* 3(1),90-100.
- Aizenman, J., Yeonho, L., & Youngseop, R. (2007). International reserves management and capital mobility in a volatile world: Policy considerations and a case study of Korea, *Journal of Japanese and International Economies*, 21(3),1-15.
- Aizenman, J., & Marion, N. (2004). International reserve holdings with sovereign risk and costly tax collection. *The Economic Journal*, 114(497), 569–591.
- Aizenman, J., & Nancy, M. (2003). The high demand for international reserves in the Far East: What is going on? *Japanese and International Economies*, 17 (6), 370–400.
- Aizenman, J., & Nancy, M. (2004). International reserve holdings with sovereign risk and costly tax collection. *Economic Journal*, 114 (5), 569–591.
- Ajibola, I. O., Udoette, U. S., Omotosho, B. S., & Muhammad, R. A. (2015). Nonlinear adjustments between exchange rates and external reserves in Nigeria: A threshold cointegration analysis. *CBN Journal of Applied Statistics*, 6(1), 111–132.
- Akanni, A., & Bukola, R. (2016). External reserves management and its effect on economic growth of Nigeria. *IJBFRM*, 4(2016), 36–46.

- Ana, M. R. (2005). Comparative study: Factors that affect foreign currency reserves in China and India. Honors research, economics department spring 2005, Illinois Wesleyan University. *Central Bank of Nigeria. July 2017 Website. www.cbn.gov.ng*
- Audu, N., & Okumoko, T. (2013). The dynamic of Nigeria's foreign reserve: A time series approach. *Indian Journal of Economics & Business*, 12(2-4), 201-222.
- Caballero, R. J., & Stavros, P. (2004). Insurance and reserves management in a model of sudden stops manuscript, MIT.
- Calvo, G. (1996). Capital flows and macroeconomic management: Tequila lessons. *International Journal of Finance & Economics* 1, 207-223.
- Calvo, G., & Reinhart, C. (2002). Fear of floating. *Quarterly Journal of Economics*, 107(2), 379-408.
- Calvo, G. A., & Carmen, M. R. (2002). Fear of floating. *Quarterly Journal of Economics*, 117 (5), 379-408. 55
- CBN (2007) Reserves Consumptions and Future Savings: what Options. <http://www.cenbank.org/intops/reservemgt>.
- CBN (2010). International operations, reserve management, reserves consumptions & future savings: What options. <http://www.cenbank.org/intertemporallyintops/reservemgt>.
- Choi, C., & Baek, S. (2004). Exchange rate regimes and international reserves. http://www.eusan.org/pdf/conf04/choi_baek.pdf
- Choi, W. G., & David, C. (2004). Liability dollarization and the bank balance sheet channel. *Journal of International Economics*, 64 (6), 247-275.
- Choi, W. G., Sunil, S., & Maria, S. (2007). Capital flows, financial integration, and international reserve holdings: The Recent Experience of Emerging Markets and Advanced Economies, *IMF Working Paper, WP/07/151*, (Washington: International Monetary Fund).
- Cushman, D.O. (1988). Exchange rate uncertainty and foreign direct investment in the United States, *Weltwirtschaftliches Archiv*, 124(2), 322-334.
- Daud, S. N. M., & Ahmed, A.H. (2013). The cost of international reserves: An empirical from Malaysia. *Journal of Economic Cooperation and Development*, 34(4), 23-46.
- Disyatat, H. (2001). Currency crises and foreign reserves: A Simple Model, *IMF Working Paper 01/18* (Washington: International Monetary Fund).
- Dooley, F., & Garber, U. (2003). An essay on the revived Bretton woods system. *NBER Working Papers, No. 9971*.
- Dooley, M. P., Folkerts-Landau, D., & Garber, P. (2004). The revived Bretton Woods system. *Int. J. Fin. Econ.*, 9(1), 307-313.
- Dooley, M., Folkerts-Landau, D., & Garber, M. (2004). The revived bretton woods system: the effects of periphery intervention and reserve management on interest rates and exchange rates in centre countries, *NBER Working Paper 10332*, (Cambridge: National Bureau of Economic Research).
- Eichengreen, B., & Adalet, J. (2005). Current account reversals: Always a problem? *NBER Working Paper No. 11634*, (Cambridge: National Bureau of Economic Research).
- Ekesiobi, C. S., Maduka, A. C., Onwuteaka, I. C., & Akamobi, O. G. (2015). Modelling non-oil exports and foreign reserves in Nigeria. *Developing Country Studies*, 6(6), 126-132.
- Eliza, N., Azali, M., Siong-Hook, L., & Chin, L. (2008). *Demand for international reserves in asean-5 economies*. Universiti Putra Malaysia.
- Emmanuel, U. (2013). Foreign exchange reserves (fer) accumulation and macro-economic stability: the Nigerian experience. *International Journal of Business and Management Invention ISSN*, 2(9), 150-157.
- Esther, O. A., & Folorunso. S. A. (2011). The role of foreign direct investment in economic development: *World Journal of Entrepreneurship, Management and Sustainable Development*, 6(1/2), 133-147
- Flood, R., & Marion, N. (2002). Holding international reserves in an era of high capital mobility. *IMF Working Paper 02/62* (Washington: International Monetary Fund).
- Frankel, J. A. (2005). Mundell-Fleming lecture: Contractionary currency crashes in developing countries. *IMF Staff Papers*, 52 (2), 149-192.
- Frankel, J., & Rudiger, D. (1995). *The flexible exchange rate system: experience and alternatives, on exchange rates*, ed. by Frankel, Jeffrey A. (Cambridge, Massachusetts: MIT Press), 6-39.

- Georgoulas, K., Papakostas, N., Chryssolouris, G., Stanev, S., Krappe, H. and Ovtcharova, J. (2009). Evaluation of flexibility for the effective change management of manufacturing organizations. *Robotics and Computer Integrated Manufacturing*, 25(6), 888-893.
- Gokhale, M.S. and R. Raju (2013). Causality between exchange rate and foreign exchange. *Global Journal of Management and Business Research*, 13(7), 1-12.
- Guglielmo, M. C., Faek, M. A., Fabio, S., & Nicola, S. (2013). International portfolio flows and exchange rate volatility for emerging markets. *German Institute for Economic Research*. 3, 567-588.
- Halliday, J., & Archer, D. (1998). The rationale for holding foreign currency reserves. *Reserve Bank of New Zealand Bulletin*, 61(4), 346–354.
- Hamen, H. T.W. & Abiodun, O. (2014). The impact of global financial crisis on economy growth on a developing economy. (An instrumental variable regression approach). *Global Advance Journal of Business and Management*, 3(1),178-198.
- Heller, R., & Mohsin, B. (1978). The demand for international reserves under fixed and floating exchange rates. *IMF Staff Papers*, 25 (7), 623–49.
- Hur, Y., & Kondo, Y. (2011). *A theory of sudden stops, foreign reserves, and rollover risk in emerging economies*. Federal Reserve Bank of Minneapolis.
- Ibrahim, W. (2011). External reserve holdings in Nigeria: Implications for investment, inflation and exchange rate. *Journal of Public Administration and Policy Research*, 3(4), 106–112.
- Imarhiagbe, S. (2015). Examining the impact of crude oil price on external reserves: Evidence from Nigeria. *International Journal of Economics and Finance*, 7(5), 13-29.
- Inyiama, O., & Ikechukwu, O. (2015). Crude oil production, prices, export and foreign exchange rate, do they interact? Evidence from Nigeria (2006-2014). *International Journal of Developing and Emerging Economies*, 3(2), 24–37.
- Irefin, D., & Yaaba, B. (2011). Determinants of foreign reserves in Nigeria: An autoregressive distributed lag approach. *CBN Journal of Applied Statistics*, 2(2), 63–82.
- Kemal, I. (2002). Optimal level of reserves in developing economies, with special reference to Pakistan. *Pakistan Institute of Development Economics, Islamabad, (Public Policy Papers No.1)*
- Khan and Ahmed (2005). The demand for international reserves: A case study of Pakistan. *The Pakistan Development Review*, 44:4Part II 939-957
- Kiru, S. (2016). Effects of exchange rate volatility on the stock market: The Zambian Experience. *Journal of Economics and Sustainable Development*, 7(4), 114-119.
- Kyereboah-Coleman, A., & Agyire-Tettey, K.F. (2008). Effect of exchange-rate volatility on foreign direct investment in Sub-Saharan Africa: The Case of Ghana (Case study). *Journal of Risk Finance*, 9(1), 52 –70.
- Lai, M. (2004). *International reserve holdings are financial centres different?* Hong Kong Monetary Authority Quarterly Bulletin.
- Lane, P., & Gian, M. M. (2006). The external wealth of nations mark ii: revised and extended estimates of foreign assets and liabilities, 1970–2004. *IMF Working Paper 06/69 (Washington: International Monetary Fund)*.
- Lazarus, A. (2017). Impact of foreign direct investment on power sector of Nigeria. *Journal of Management Research*, 5 (3), 63-80.
- Magnus,J. (2007). Foreign exchange reserves accumulation: Implications for the Nigerian economy. *Central of Bank of Nigeria working*, 31-43.
- Misztal, P., (2021). The size and the main determinants of china’s official currency reserves in the period 1990-2019. *European Research Studies Journal XXIV,(1)*, 568-582.
- Muhammad, A., & Muzammil, K. (2019). Impact of macroeconomic variables on foreign exchange reserves: A case from Pakistan. *Economic Journal of Emerging Markets*, 11(2) 2019, 173-182
- Nwachukwu, N. E., Ali, A. I., Abdullahi, I. S., Shettima, M. A., Zirra, S. S., Falade, B. S., & Alenyi, M. J. (2016). Exchange rate and external reserves in Nigeria: A threshold cointegration analysis. *CBN Journal of Applied Statistics*, 7(1), 233–254.
- Nwaobi, H. (2003). Monetary approach to balance of payments: An econometric case study of Nigeria. *International Finance*, 0307001, *Economics Working Paper Archive at WUSTL*.

- Obansa, S., Okoroafor, O., Aluko, O., & Eze, M. (2013). Perceived relationship between exchange rate, interest rate and economic growth in Nigeria: 1970-2010. *American Journal of Humanities and Social Sciences*, 1(3), 116–124.
- Odili Okochukwu (2015). Exchange rate volatility, stock market performance and foreign direct investment in Nigeria. *International Journal of Academic Research in Accounting, Finance and Management Sciences*, 5(2), 34- 49.
- Ogundipe, O., Ojeaga, P., & Ogundipe, A. (2013). Oil price and exchange rate volatility in Nigeria. *Journal of Economics and Finance (IOSR)*, 5(4), 1–9.
- Olukoya (2010). Nigerian foreign reserves tumble 7.6 percent in one month to \$33.9 Billion October 26, 1:14 PM GMT Tue Oct 26 13:14:30 GMT 2010. Retrieved from <http://www.bloomberg.net>.
- Osinubi, T.S., & Amaghionyeodiwe, L.A. (2009). Foreign direct investment and exchange rate volatility in Nigeria. *International Journal of Applied Econometrics and Quantitative Studies*, 6 (2), 84-115.
- Osuji, E. (2015). International oil prices and exchange rate in Nigeria: A causality analysis. *International Journal of Academic Research in Economics and Management Sciences*, 4(3), 11–22.
- Owolabi, F. O. (2017). Exchange rate volatility, inflation uncertainty and foreign direct investment in Nigeria. *Botswana Journal of Economics*, 5(7), 14-31.
- Prabheesh, M., & Madhumathi (2009). Precautionary and mercantilist approaches to demand for international reserves: *An empirical investigation in the Indian context Macroeconomics and Finance in Emerging Market Economies*, 2(2), 279– 291.
- Prasad, E. S., Rogoff, S., & Ayhan, S. (2003). Effects of financial globalization on developing countries: some empirical evidence. *IMF Occasional Paper No 220 (Washington: International Monetary Fund)*.
- Salgado, R. M. (2017). Regional economic outlook, April 2017, Asia and Pacific: Preparing for Choppy Seas. Washington, D.C.: International Monetary Fund.
- Schumpeter, J.A. (1911). *The theory of economic development*. Harvard University Press, Cambridge.
- Stober, E. O. (2016). Crude oil price shocks and macroeconomic behavior in Nigeria. *Journal of Social and Economic Statistics*, 5(1), 56–66.
- Suvojit L., Ram L., & Benito R. (2008). *The optimal level of international reserves*. The case of India.
- Tariq, M., Z. Haq, S. Jan, M. Jehangir, & M. Aamir. (2014). Real exchange rate and foreign exchange reserves: A Mercantilist View. *Life Science Journal*, 11(3s), 121-134
- Uguru, L. (2015). Forecasting the causal relationship between oil prices and exchange rate in Nigeria: 1970- 2014. *IOSR Journal of Economics and Finance*, 6(1), 121–126.
- Usman and Ibrahim (2010). External reserve holdings in Nigeria: Implications for investment, Inflation and exchange rate. *Journal of Economics and International Finance*, 2(9), 183-189.
- Usman, O. A., & Adejare, A. T. (2012). The effects of foreign exchange regimes on industrial growth in Nigeria. *Global Advanced Research Journal of Economics, Accounting and Finance*, 1(1), 1–8
- Williams, H. T., Adegbola D. D. & Afolabi, T. S. (2018). An empirical investigation of the determinants of foreign exchange in Nigeria. *Archives of Business Research*, 6(6), 54-65
- Xu, G. (2003). The scale, demand and dynamic adjustment for china’s foreign exchange reserves paper submitted to the third annual international conference: *Hawaii International Conference on Business, Honolulu, Hawaii, USA. June 18-21*.
- Yan, Z. (2007). International reserves and fiscal policy in developing countries SCCIE working paper #06-18 Santa Cruz Center for International Economics <http://sccie.ucsc.edu/>
- Yin-Wong & Hiro (2006). A cross-country empirical analysis of international reserves. *Economic Journal*, 99, 307-314
- Yousaf, S., Shahzadi, I., Kanwal, B. & Hassan, M. (2013). Impact of exchange rate volatility on FDI in Pakistan. *IOSR J. Bus. Management*, 12(1), 79-86.