Impact of Exchange Rate Volatility on Nigerian Macroeconomic Performance

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***Abstract*—** This study examines the relationship between exchange rate volatility and macroeconomic performance in Nigerian from the period of 1986-2019. Using Bounds Co-Integration Test and auto-redistribution lag model (ARDL). The result shows that the short run result showed that the exchange rate has a positive association with GDP in the current period, but that the relationship is negative in the lagged periods. The link is negative in the long run, which is consistent with a priori expectations. In the long run, interest rates have a positive relationship with gross domestic product (GDP). The study recommends among other things that the Nigerian government must ensure that the exchange rate does not continue to depreciate, as this will stifle economic growth. When the supply of foreign currencies in the economy is low, the central bank should pump in more foreign currency to keep the exchange rate market stable within the economy.

***Keywords*—** Exchange Rate, Economic Growth, Reserves and ARDL.

1. INTRODUCTION

The impact of changes in exchange rates on inflation and economic activity has been one of the most significant problems to economic policy management around the world, particularly in emerging and developing nations. Exchange rate changes are thought to cause domestic economic distortions and reduce a country's economic competitiveness. The negative impacts of exchange rate misalignment have been widely established in the literature, and policymakers are typically hesitant to adjust exchange rates due to a perceived detrimental impact on the economy.

The relevance of the exchange rate as a tool for attaining overall economic improvement has also been emphasized in the literature. This is based on the relationship between the exchange rate and other economic variables, as well as the critical role of the exchange rate in the formulation of monetary policy, as it serves as an important part of the signaling channel for the transmission of policy decisions to achieve the desired macroeconomic goals.

The exchange rate is a major factor of global trade, and it has gotten a lot of attention in the context of global imbalances. Because every economy strives for a stable rate of exchange with its trading partners, the subject of exchange rate fluctuation has become a hot topic in Nigeria and other oil-exporting African countries. The exchange rate is the price of one country's currency in terms of another country's currency, or the number of units of one currency necessary to purchase a number of units of another currency. This debate has centered on the Bretton Woods adjustment peg, which was established in 1970 and advocates for a flexible currency rate influenced by emerging countries. It was also a problem for those countries undergoing structural reforms in the 1980s, as well as those countries experiencing currency crises in the 1990s.

Exchange rate fluctuation is a major stumbling block to an economy's development, making planning more difficult and investment more risky. For example, fluctuations in the exchange rate may deter potential investors in Nigeria by raising uncertainty about the returns on a given investment. Only if the predicted rewards are large enough to offset the currency risk will potential investors consider investing in a foreign area (Hahn et al; 2005). Changes in world pricing or fluctuations in the currency rate are the two main sources of risk in international commodities commerce. As a result, knowing the behavior of the exchange rate is critical for a variety of reasons. First, from both a descriptive and policy prescription standpoint, the relationship between a country's exchange rate and economic growth via trade is critical.

Economic and non-economic factors such as interest rates in the economy, capital inflows, inflation rate, current account balances, volume of foreign exchange reserves, GDP growth rate, fiscal deficit, export to GDP ratios, import to GDP ratios, political stability, development indices, and corruption can all influence exchange rate fluctuations (Raju & Gokhale, 2013). Central banks that rigorously limit foreign exchange interventions are generally aware of the volatility of the foreign exchange markets and may use interventionist

policies to address potentially disruptive short-term swings (Soro & Aras, 2021).

This has caused variations in Nigeria's external reserves, which has had an impact on the naira's exchange rate value. Following the adoption of the Structural Adjustment Program (SAP) and the consequent liberalization of the foreign exchange market, which led to the creation of the Secondtier Foreign Exchange Market in 1986, exchange rate instability became prevalent in the mid-1980s, particularly in 1986. (SFEM). Because exchange rate floatation usually affects the economy by hindering the attainment of price stability, central banks frequently intervene in the foreign currency markets to enforce price stability. Depending on the state of the economy, the process is normally to buy and sell to maintain the value of the home currency.

The impacts of exchange rate volatility on macroeconomic variables are asymmetric. According to (Adeniran et al; 2014), an increase in imports leads to a decrease in exports, whereas a decrease in exports leads to an increase in exports and a decrease in imports. A shift from foreign to domestic goods is also common when the currency rate depreciates. As a result of the shift in trade terms, income is diverted from importing countries to exporting countries. This has an effect on the economic growth of both exporting and importing countries. Depreciation of the currency has a detrimental impact on developing countries (Razafimahefa, 2012).

The impact of exchange rate variations on real activity has been a hot topic of discussion. The results of the experiments suggest that exchange rate changes have asymmetric impacts. It means that exchange rate depreciation effects on macroeconomic variables like GDP are distinct from exchange rate appreciation effects.

The stability of a macroeconomic climate is vital for business and, as a result, is important for a country's overall competitiveness. While it is true that macroeconomic stability by itself cannot boost a country's productivity, it is equally true that macroeconomic instability affects the economy.

2. LITERATURE REVIEW

The price of one currency in terms of another is known as the foreign exchange rate. In other terms, it is the rate at which currencies are converted, such as the number of Naira or Cedis required to purchase a dollar unit, or vice versa. Exchange rates are divided into two categories. The spot exchange rate, which is the most common, is the rate for instantaneous exchange of bank deposits or currencies. The second is referred to as the forward exchange rate, which is the rate for exchanging bank deposits at a future date. A currency is considered to be depreciating when its value falls in respect to another. Appreciation, on the other hand, occurs when the value of a currency rises in reference to other currencies. Economists and market participants utilize a variety of alternative currency exchange rate metrics (Ismaila, 2016) A number of factors complicate the task of determining and evaluating the equilibrium real exchange rate. The most basic is that economists disagree on how to define the real exchange rate. A variety of analytical RER definitions are employed by economists since they use different types of macroeconomic models for different objectives.

Two main definitions of the RER are distinguished in theory. Within a particular country, the first is the domestic price ratio of tradable to non-tradable goods. The second is the NER, which is adjusted for changes in pricing levels between countries. The internal RER, defined as the internal relative price incentive for producing or consuming tradable products as opposed to non-tradable commodities, is a measure of domestic resource allocation incentives in the home country.

(Ismaila, 2016) gives a full study of the computation by starting with the NER, the home country price of foreign exchange, dividing by a home country price index for the class of items in question, and lastly multiplying by the equivalent foreign price index.

Exchange rate regimes in Nigeria

Nigeria adopted a fixed exchange rate policy from 1960 to 1986, when the country gained independence. That is, the government decided the value of our local currency in foreign currencies through administrative means. The system utilized to determine it was one of preserving parity with the pound sterling by considering the Nigerian Pound's gold content. The gold content of the Nigerian Pound was 2.48824 grams at the time, but after the conversion to Naira, it was decreased to 1.24414 grams of fine gold (Hashim and Zarma, 1996).

The gold content method in Nigeria was converted to a dollar peg as a result of the international financial system problems that led to the devaluation of the dollar and the suspension of convertibility of the dollar in gold from 1971 to 1974. The US dollar to naira exchange rate was set at US dollar 1.52 to Nigerian Naira 1.00 using this method (Olukole, 1992). (Hashim and Zarma, 1996). Following that, the currency was tied to a basket of currencies (Dutch Mark, Swiss Francs, French

Francs, Dutch Guilder, Japanese Yen and Canadian Dollar). In 1978, the import weighted basket method was used. The weights were determined by the relative shares of the countries whose currencies were included in the basket as a percentage of total imports in 1976. The US dollar, the pound sterling, and the currencies in the basket of currencies approach are among these currencies (Hashim and Zarma, 1996). Following a protest from the International Monetary Fund (IMF) that there were frequent instances of the Nigerian naira exchange rate exceeding the two percent restriction, the currency intervention system was implemented in 1985. Following the implementation of this system, the naira exchange rate was quoted against a single intervention currency (the US dollar), minimizing the degree of divergence and leaving the naira with no arbitrage position between the US dollar and the pound sterling (Hashim and Zarma, 1996).

The Flexible Exchange Rate: In September 1986, the Nigerian economy was permitted to float as a result of economic crises marked by diminishing foreign exchange profits and a major imbalance in the nation's balance of payments, as well as an observed overvaluation of the naira. This was done in order to address the economy's issues.

For the economy, which was characterized by deregulation of the economy, including the foreign exchange market, the Structural Adjustment Programme (SAP) was advocated. The second-tier foreign exchange market, also known as the floating exchange rate market, works under a dual exchange rate regime, which includes both the first and second-tier exchange markets. The first-tier foreign exchange market covered debt service payments, embassy expenses, international organization subscriptions, and the settlement of transitional or pre-SFEM transactions, while the second-tier foreign exchange market covered all transactions not covered by the first–tier foreign exchange market (Hashim and Zarma, 1996).

In ERPT, exchange rate regimes have a significant impact. Economic agents adjust prices quickly in a fixed exchange rate regime because they believe any change in the exchange rate is permanent. Economic agents, on the other hand, do not alter their pricing quickly in a flexible exchange rate regime because they believe changes are only temporary. Economic agents in a high-income country do not alter prices quickly in reaction to exchange rate changes because higher incomes allow for a greater degree of competition in the domestic market, limiting enterprises' pricing power. In low-income countries, on the other hand, the situation is reversed (Razafimahefa, 2012).

Macroeconomic Performance in Nigeria

Nigeria's macroeconomic performance began to improve in the 1970s, as the time coincided with the end of the civil war, which demanded enormous reconstruction efforts. The overall GDP increased at a rate of 6.2 percent on average during this time. Between 1970 and 1971, the total GDP rose at a rate of 21.4 percent, masking the trend in sectorial performance. The petroleum industry grew at a pace of 32.4 percent on average throughout this period, while the manufacturing sector grew at a rate of 4.8 percent and the agricultural sector actually declined at a rate of two percent on average. Due to the reconstruction project and the Adedo commission's proposal, demand for products and services increased during this time period. This resulted in severe shortages of products and services, price increases, and an average inflation rate of 15.0 percent over this period.

Economic growth (as measured by gross domestic product) and external reserves are the two macroeconomic performance metrics examined in this study. As a result, the study's goal is to discuss them briefly.

GDP (gross domestic product)

Economic growth is defined as a steady increase in an economy's per capita output or income, as well as an increase in the labor force, consumption, capital, and trade volume. Economic development is defined as a rise in output and production efficiency that is accompanied by improvements in the institutional and technical structures by which it is produced. Growth may be insufficient for development due to unemployment and inequality caused by a lack of technological and structural advancement, but it is impossible to conceive development without growth. Economic growth is measured by output and output per capita, whereas economic development is measured by gross national product (GNP) (Waliu, 2017).

Economic growth refers to an economy's ability to create more commodities and services over time. It's usually expressed as a percentage increase in real gross domestic output, or real GDP. In order to account for the effect of inflation on the price of the goods and services produced, growth is usually calculated in real terms, that is, inflation adjusted terms.

Economic growth is a multifaceted process influenced by a variety of elements including economic, cultural,

and institutional influences. As a result, the causal chains connecting growth and diverse economic factors are typically bi-directional. In addition, the different elements that have been postulated to explain growth are interconnected. All research aiming to scientifically examine whether and to what extent a given factor or collection of factors affects growth face these causality issues (Eko, S. (2017).

External reserves are defined by the International Monetary Fund (IMF) as "official public sector foreign assets that are readily available to, and controlled by, monetary authorities for direct financing of payment imbalances, and directly regulating the magnitude of such imbalances, through intervention in the foreign exchange markets to affect the currency exchange rate and/or the currency exchange rate and/or the currency exchange rate and/or the currency exchange rate and/or the currency exchange rate and/or the currency exchange rate and/or the currency exchange rate and/or the External reserves are the stocks of foreign exchange or savings held and managed by monetary authorities for international transactions between inhabitants of an economy and the rest of the world over a given length of time (Obaseki, 2007).

These reserve currencies are used to back the liabilities of the central bank, such as the local currency issued, the reserves deposits of various deposit money banks (DMBs), the government, and other financial organizations. Individuals' foreign exchange holdings, banks' foreign exchange holdings, government agencies' foreign exchange holdings, and corporate organisations' foreign exchange holdings do not contribute to the nation's external reserves.

The goal of managing external reserves varies from country to country based on the objectives at hand, but in general, a country's external reserves must be managed for reasons such as maintaining foreign exchange stability. Reserves are typically used to affect the exchange rate, pay for imports of goods and services, service the nation's external debt, and provide funding for domestic fiscal expenditures, as well as to protect against currency crises by allowing relevant authorities to sustain their own currency. External reserves also function as a "shock absorber" for changes in foreign transactions, such as changes in imports as a consequence of trade shocks or changes in the capital account as a result of financial shocks. It also provides as a buffer to absorb unforeseen shocks or a significant deterioration in their terms of trade, as well as to meet unanticipated capital outflows (Akinwunmi et al, 2018).

Orji (2015) used the Ballassa-Samuelson hypothesis to study the drivers of the real exchange rate in Nigeria. The data analysis was carried out using the Error Correction Model (ECM) technique, and time series data from 1981 to 2012 were used. The data found that the interest rate differential and oil income were important determinants of the actual exchange rate in Nigeria, whereas the productivity differential had no bearing on the rate. The study concluded that policymakers should consider effective interest rate management and control in order to achieve and maintain a stable real exchange rate, as well as diversifying the economy away from the oil sector to reduce the impact of any oil-related shock.

The impact of the exchange rate on the Nigerian economy was researched by Ayodele (2014). He used the Ordinary Least Squares technique of analysis, and the results revealed that currency rate depreciation and economic growth in Nigeria had a negative association. He suggested that the government create a friendly climate to boost local production, which would result in less imports and, as a result, less need for foreign currency.

When looking at the impact of exchange rate fluctuation on economic development and investment in the United States, From 1986 to 2014, Nigeria was a member of the Commonwealth of Nations.

The ADF test for stationarity and the error correction technique were used by (Adelowokan et al; 2015). GDP, investment, exchange rate, interest rate, and inflation are among the variables used. The findings revealed a negative relationship between exchange rate volatility and investment and economic growth, as well as a positive relationship between inflation, interest rates, and exchange rate. They advised that Nigeria implement a sound exchange rate management system to help the country thrive economically.

Ali et al. (2015) also looked at the influence of the naira's actual exchange rate mismatch on Nigeria's economic growth. They used data from quarterly surveys from 2000 to 2014. The departure of the real exchange rate from a sustainable equilibrium path, estimated using the behavioral equilibrium exchange rate technique, was used to calculate the estimate of the real exchange rate misalignment. The analysis found that the actual exchange rate misalignment has a detrimental influence on Nigeria's economic growth. They advised that a market-based exchange rate arrangement be used indefinitely to ensure that the Naira's exchange rate follows a path of long-term stability.

Enilolobo et al; 2015) also looked into the relationship between Nigerian economic growth and currency rate fluctuations. In order to investigate this nexus, researchers used the Johansen test for co-integration and the error correction model technique. In both the short and long run, the results revealed a positive but insignificant relationship between exchange rate fluctuations and economic growth in Nigeria.

For the period 1985 to 2016, (Olamide, 2018) investigated the efficacy of the Nigerian foreign exchange market. He used secondary time series data and analyzed it with two equations, while estimating it with the fully modified OLS technique. His research found that GDP, oil prices, interest rates, and inflation rates all have a strong and positive association with the Nigerian exchange rate, whereas broad money supply has a negative link with the Nigerian exchange rate. He came to the conclusion that Nigeria's foreign exchange rate market was inefficient, and that the country's monetary authorities should increase transparency in calculating currency rates in order to lessen the risks associated with exchange rate fluctuations.

From 1981 to 2008, Ajao (2015) investigated the drivers of real exchange rate volatility in Nigeria. The GARCH (1, 1) technique was used to calculate exchange rate volatility, and the ECM was used to investigate the various determinants of exchange rate volatility in Nigeria. The co-integration analysis reveals the presence of a long-term equilibrium relationship between REXRVOL and its various determinants. Openness of the economy, government spending, interest rate changes, and the lagged exchange rate were among the primary significant variables that impacted REXRVOL during the period, according to the empirical research. As a result, the study recommends that the central monetary authority implement policies to reduce the degree of exchange rate volatility, while the federal government maintains control over important macroeconomic variables that can have a direct impact on exchange rate swings.

For the period 1980 to 2013, Alayande (2014) used the unit root test and granger causality test to investigate the link between exchange rate and possible determinants. The study's findings revealed that the exchange rate is the most important factor, followed by changes in oil prices, money supply growth, foreign exchange reserves, interest rate, inflation rate, and stock market changes. The study concluded that policy researchers should consider other variables before making any future predictions on exchange rates, and to keep a close eye on any minor changes in other variables to assist policymakers.

III. METHODOLOGY

This study employed time series data for the period 1986 to 2019. It utilizes secondary data obtained from the World Bank Development Indicators, the National Bureau of Statistics and the Central Bank of Nigeria's statistical bulletins.

Model Specification

$GDP = F(EXR, CPI, INT)$ - - - (1)

Where;

GDP=Gross Domestic Product

EXR=Exchange Rate

CPI=Consumer Price Index

INT=Interest Rate

The model can be expressed as:

$GDP = \alpha_0 + \alpha_1 EXR + \alpha_2 CPI + \alpha_3 INT + \mu$ - (2)

IV. RESULTS AND DISCUSSION

This test is carried out using a 5% level of significance. When the p-value of the ADF test statistics is less than 0.05 and the test statistics are greater than the MacKinnon crucial values at the 5% significance level, the variables are thus stationary. The results of the ADF unit root test are presented in the tables below.

Table 1: Stationarity test

Variables	ADF Test Statistic	Probability Value	Order of Integration
Exchange Rate	-4.846848	0.0003	I(0)
Gross Domestic Product	-3.146838	0.0024	I(1)
Consumer Price Index	-4.212895	0.0032	I(0)
Interest Rate	-4.329888	0.0021	I(1)

Source: Computation from E-views (2021)

Since the variables have a mixed order of integration, the Auto Regressive Distributed Lag Model is the most appropriate approach of estimation.

Bounds Co-Integration Test

The boundaries co-integration test was used to see if the variables are co-integrated. At the 5% level of significance, the value of the F statistics was compared to the upper and lower boundaries critical value. This comparison was then assist determine whether or not the variables are co-integrated.

Table 2: Bounds co-integration test result

	ARDL Bounds Test	
Test Statistic	Value	k
F-statistic	7.502196	3
	Critical Value Bounds	
Significance	I0 Bound	I1 Bound
10%	2.72	3.77
5%	4.23	4.35
2.5%	3.69	4.89
1%	4.29	5.61

Source: computation from E-views (2021)

The limits co-integration test, as shown in the table above, reveals that there is co-integration between the variables in the model. This is due to the fact that the F statistic's value exceeds the upper bound at the 5% level of significance. As a result, it is inferred that the variables have a long-term relationship, and the long-term model will be estimated.

Table: 3 ARDL Long Run and Short Run Results

The results of the ARDL long and short runs are shown in the table above. The best latency for the dependent variable as well as the independent variables was determined to be four. The outcome of the ARDL model

ARDL Cointegrating And Long Run Form				
Dependent Variable: LNGDP				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(LNEXR)	0.021582	0.095180	0.226745	0.8235
D (LNEXR (-1))	-0.150795	0.108158	-1.394214	0.1823
D(LNEXR(-2))	-0.281764	0.095061	-2.964025	0.0091
D(LNCPI)	0.509218	0.346927	1.467794	0.1615
D(INT)	-0.051847	0.011926	-4.347595	0.0005
D(INT(-1))	0.026204	0.013602	1.926424	0.0720
CointEq(-1)	-0.388611	0.077949	-4.985464	0.0001
Cointeq = LNGDP - (1.4677 *L 25.4671)	NEXR -0.8475*LNCPI -0.2420 *D		INT +	
	Long Run Coefficients			
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
LNEXR	1.467653	0.329349	4.456223	0.0004

LNCPI	-0.847493	0.393404	-2.154255	0.0468
INT	-0.242018	0.060485	-4.001296	0.0010
C	25.467071	0.953792	26.700853	0.0000

R squared: 0.893136 / F-statistic: 231.4878 Durbin Watson stat 1.792664 Adjusted R squared: 0.788845 Prob (F-statistic): 0.000000

Source: Computation from E-views (2021)

The R squared value is 0.893136, implying that changes in the independent variables of exchange rate, consumer price index, and interest rate account for nearly 89 percent of variations in GDP. The value of the Durbin Watson statistic is bigger than the R squared value, indicating that there is no false regression. Furthermore, the F statistic's probability value of 0.000000 implies that the exchange rate, consumer price index, and interest rate all influence GDP in Nigeria. Because the error correction coefficient is negative, less than 1, and statistically significant at the 5% level of significance, it conforms to theoretical predictions.

In Nigeria's first and second period lags, the exchange rate has a negative association with GDP in the short run. Also the exchange rate has a positive relationship with GDP, the effect in these lagged periods is bigger than the effect in the current era. In the short run, the association between exchange rate and GDP is only statistically significant at the second lagged period, according to the short run finding.

This means that as the exchange rate rises (i.e. depreciates), GDP will decrease. GDP will rise if the exchange rate falls, or if it appreciates. The link between the consumer price index and GDP deviates from expectations. In the long run, the consumer price index has a positive connection with GDP, which means that when the consumer price index grows, so does GDP. In the current period, the interest rate has a negative and significant association with GDP. However, the link is positive but insignificant over a one-year period.

V. CONCLUSION/RECOMMENDATION

When GDP was utilized as the macroeconomic performance indicator, the short run result showed that the exchange rate has a positive association with GDP in the current period, but that the relationship is negative in the lagged periods.

The link is negative in the long run, which is consistent with a priori expectations. From the first through the tenth period, the impulse response function reveals that consumer prices have been growing, demonstrating that consumer prices rise in response to a one standard deviation exchange rate shock.

Apart from the fact that Nigeria is an oil-exporting country that rely substantially on imports, the impacts of exchange rates on consumer prices follow a nearly identical pattern, which is the reality of most economies that rely primarily on oil for revenue.

As a result, it is critical for Nigeria to maintain exchange rate stability in order to avoid price inflation caused by exchange rate depreciation. Since Nigeria is heavily reliant on imports, she must diversify her economies to boost exports, which would improve the supply of foreign currency in the country. This will help to keep the exchange rate and consumer prices stable.

The Nigerian government must ensure that the exchange rate does not continue to depreciate, as this will stifle economic growth.

When the supply of foreign currencies in the economy is low, the central bank can pump in more foreign money to keep the exchange rate market stable.

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