

Analysis of the Relationship between Interest Rate, Exchange Rate and Economic Growth in Nigeria

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Abstract

This study analyses the relationship between interest rate, exchange rate and economic growth in Nigeria spanning from 1980-2022. Data for the study were obtained from World Development Indicators. The study undertook unit root test using the Augmented Dickey Fuller (ADF) method. Consequently, based on the outcome of the ADF result, the research used Auto-regressive Distributive Lag (ARDL) model to determine the existence of a long-run interactive relationship between interest rate, exchange rate, and economic growth in Nigeria. The Auto-regressive distributive Lag (ARDL) bound test result of the long-run interactive relationship between the variables reported the existence of long-run relationship. The study further revealed that the interaction between real interest rate and exchange rate on growth of gross domestic product is negative, but statistically significant both in the long-run and previous period of the short-run. Similarly, the interaction between lending interest rate and exchange rate is negatively related with growth of gross domestic in the long-run. However, deposit interest rate and exchange rate recounted a positive but insignificant interactive relationship. It has been suggested, among other recommendations, that the Central Bank of Nigeria (CBN), should raise deposit interest rate in order to incentivize individuals to save a greater portion of their income. This will enable financial institutions to enhance their capacity to allocate more cash towards investment, thereby fostering economic growth.

Keywords: Interest Rate, Exchange Rate, Inflation Rate, Economic Growth

Introduction

The growth of a country is a fundamental barometer to both developed, developing as well as less developing countries. Therefore, economic growth refers to increase in the amount of goods and services produced per head of the population over a period of time. Utile *et al.* (2018) provided a definition of economic growth as the augmentation of an individual's per-capita income inside the economy. According to Akintoye and Olowulajo (2008), economic growth in a nation is achieved when the ratio of the nation's capital to its entire population grows. Economic growth is a paramount objective for all nations, especially those in the developing category,

such as Nigeria. For example, when a nation's gross domestic product consistently exhibits growth, it is seen as an indication of higher economic growth in that country. Moreover, when there is a sustained rise in the per capita production of goods and services within an economy over a significant duration, such as a period of five years or more, it indicates the presence of factors contributing to economic growth. According to Anyawoncha (1993), it is said that the economic growth of a country may be assessed by considering its per capita income and the aggregate output of goods and services produced within a certain timeframe. It is crucial to acknowledge that in order for a nation to attain economic progress, it must undergo a consistent augmentation in the production of products and services, resulting in job creation and an enhancement in the quality of life for its populace. Economic growth may have either a positive or negative trajectory. The term "negative growth" is often used to characterize an economic scenario in which the overall size of the economy is contracting. Negative growth is often linked to periods of economic recession and economic depression. The pursuit of economic expansion has encountered obstacles in the form of exchange rate fluctuations and interest rate fluctuations (Anyawoncha, 1993).

The term "exchange rate" pertains to the rate at which one currency may be exchanged for another currency. This rate has a significant impact on international commerce and the flow of capital across national borders. Azid *et al* (2005) defined exchange rate as the value of one currency relative to another. It denotes the exchange rate of the domestic currency relative to foreign currencies. The exchange rate plays a crucial role in fostering economic growth, since the sustained and long-term growth of an economy necessitates a stable trade and exchange rate. This suggests that the rate of exchange has a determining role in the rate of economic growth inside a nation. Nevertheless, the fluctuation of the currency rate in Nigeria has led to a significant increase in the prevailing interest rate. This assumption aligns with the perspective put forward by Mordi (2006), who argues that the exchange rate of the Nigerian currency, the naira, has seen fluctuations ever since the implementation of the Structural Adjustment Programme (SAP) in 1986. The Nigerian economic situation since the implementation of the Structural Adjustment Program (SAP) has mostly been marked by a notable rise in demand that has surpassed the available supply, hence leading to a persistent devaluation of the national currency, the naira. The aforementioned circumstance has resulted in an increase in the interest rate, thus impacting the pricing of commodities and services. Take for instance, in the past four years the countries exchange rate to the dollar has been on upward movement. The value of the Naira to exchange rate was

US\$306.92 in 2019, but increased to US\$358.86 in 2020. Painfully, the exchange rate escalated to US\$401.15 in 2021 and further up to US\$425.98 in 2022. Correspondingly, interest rate is negatively affected due to the inability of the Naira to withstand the pressure from the dollar leading to increase in the prices of goods and services in Nigeria. Additionally, this ugly scenario has resulted to increase in prices of goods and services (inflation). Moreso, in 2019 the inflation rate was about 11.4%, but increased to 13.2% in 2020. Consequently, inflation rate rise to about 17% in 2021 and 18.8% in 2022 (WDI, 2022).

Interest rates are a fundamental metric in financial markets, exerting a significant impact on the whole economy. Hence, the term "interest rate" denotes the expense associated with obtaining a loan, stated as a proportion of the borrowed sum, often represented as a percentage. This implies that investors may redirect their investments from areas with low interest rates to those with higher interest rates, since the latter offers more appeal to foreign investors seeking larger returns. Consequently, a higher interest rate might result in an upsurge in investment. As stated by Sanusi (2002), interest rates represent the expenses incurred by a borrower, while acquiring a loan within an economic context. This suggests that interest rates play a crucial role in determining the cost of credit within an economy. The potential consequence of elevated interest rates within a given society is that it may serve as a deterrent for borrowers who might otherwise be inclined to seek loans. This phenomenon may be attributed to the combination of credit expenses and the credit itself, resulting in a total sum that may exceed the borrower's ability to repay within the designated loan deadline. The effect of this phenomenon on the economy is that the Gross Domestic Product (GDP) would be diminished, since relying only on equity financing is insufficient to sufficiently support productive activities within an economy (Abdul & Marwan, 2013)

This research discourse is therefore motivated by conflicting findings from several empirical investigations. In a study conducted by Ahamed *et al.* (2022), Jelilov (2016), and Abdul and Marwan (2013), the researchers examined the association between interest rates and economic growth. Their findings indicated a negative impact of interest rates on economic growth. However, Mushtaq and Siddiqui (2016) presented an alternative perspective, suggesting that interest rates actually foster economic growth. In a recent study conducted by Matarr and Momodou (2021), has shown that there is no significant impact of interest rates on economic growth. According to recent studies conducted by Ukangwa and Ikechi (2022), Egbujor (2012), and Godwin and Sergius (2021), it has been suggested that the

exchange rate has a detrimental impact on economic growth. Conversely, Sibanda (2012) observed a positive correlation between the exchange rate and economic growth. However, Utile *et al.* (2018) found no substantial evidence to support the notion that the exchange rate has a significant effect on economic growth.

The present research discourse has found that existing empirical literature has primarily focused on investigating the relationship between economic growth and either interest rate or exchange rate. These studies have utilized various indicators such as real interest rate, lending rate, deposit rate, exchange rate, and inflation rate. However, an important aspect that has been overlooked in these studies is the examination of how the interaction between interest rate and exchange rate influences economic growth. This work made a valuable contribution to the existing body of knowledge by conducting an empirical investigation into the link between interest rates, exchange rates, and economic growth in Nigeria. As a result, it expanded the scope of the study beyond previous research conducted on this topic. This research aims to provide an empirical analysis of the interplay between interest rates, exchange rates, and economic growth in Nigeria spanning the period from 1980 to 2022.

The subsequent sections of this article are organized as follows: Section 1 provides an introduction, while Section 2 offers a concise overview of the existing literature on interest rates, exchange rates, and economic growth, including conceptual, theoretical, and empirical perspectives. Section 3 of the study is dedicated to the discussion of the research methodology used, while section 4 provides an overview of the obtained results. Section 5 concludes the study by providing a concise commentary on the policy implications and offering suggestions.

2.0 Literature Review

Theoretical Literature

Capital Accumulation Growth Theory

The theory of capital accumulation growth was proposed by Mbaye (2012). According to the hypothesis, the impact of exchange rates on economic growth is mediated through their influence on savings. According to the idea, it is posited that the undervaluation of the real exchange rate might contribute to economic growth by augmenting the overall capital stock of the economy. This suggests that a devalued real exchange rate has a propensity to elevate the domestic saving rate. The stimulation of economic growth via an increase in the rate of capital

accumulation is facilitated by higher saving rates resulting from depreciation. The concept of capital accumulation posits the existence of two distinct sources through which capital accumulation may arise. The first mechanism entails the exclusive operation of capital accumulation within the tradable goods sector, resulting in a rise in its proportion of the Gross Domestic Product (GDP). Conversely, the second mechanism involves the growth of general savings and investment, leading to an increase in the economy's capital stock.

The correlation between a devalued real exchange rate and the savings rate emerges due to the fact that a devalued real exchange rate has a tendency to redirect aggregate demand from traded products to non-traded commodities. This redirection necessitates an elevation in the real interest rate in order to uphold internal equilibrium (Montiel & Servén, 2008). The rise in interest rates serves as a limiting factor on aggregate demand, mostly by augmenting the rate of domestic saving. Therefore, based on this viewpoint, the relationship of causality may be seen as originating from the real exchange rate and passing via the real interest rate, then affecting the saving rate, ultimately leading to an enhancement in economic growth. The implication of a favorable and flexible domestic exchange rate is that it signals to financial market operators to lower their interest rates. This, in turn, enables investors to obtain adequate loans for productive activities, thereby fostering the growth of the Nigerian economy. However, in the event that the exchange rate is very low, it will have an impact on the interest rate, resulting in a decrease in economic activity.

Empirical Literature

The study conducted by Ahamed *et al.* (2022) investigated the impact of interest rates on the economic growth of Bangladesh. The study's results revealed a significant relationship between interest rates and economic growth. Therefore, it can be inferred that interest rates have an impact on the economic growth of Bangladesh. Elevated rates of interest have a tendency to impede the progress of economic growth. In their study, Matarr and Momodou (2021) investigate the impact of interest rates on the economic development of Gambia from 1993 to 2017. They employed Vector Error Correction Model (VECM) to examine the association between the dependent variable, namely Gross Domestic Product (GDP), and the independent variables, namely the Real Effective Exchange Rate and Real Interest Rate, both in the short-term and long-term. Based on empirical data, it is seen that there is no immediate correlation between the expansion of the Gambian economy and interest rates in the short term. However, a long-term

relationship is identified between the real interest rate, real exchange rate, and GDP.

In their study, Abdul and Marwan (2013) examine the impact of interest rate, inflation rate, and GDP on the actual economic growth in Jordan from 2000 to 2010. The study used a consistent set of four variables to examine the link of Granger Causality. The results of the study revealed that inflation has a causal effect on interest rates. In contrast, all other variables exhibit independence from one another. The result further indicated that the present interest rate has a significant impact on the growth rate. Additionally, The findings indicated that the inflation rate has a significant impact on the growth rate. The findings indicate that both the current GDP and the lagged GDP have a significant effect on the growth rate.

Furthermore, Mori *et al.* (2012) conducted a study to examine the impact of exchange rates on the economic growth of Malaysia. The researchers used time series data from 1971 to 2009 for their analysis. The findings from the ARDL limits test indicate the presence of long-term cointegration between nominal and real exchange rates, as well as economic growth. Notably, the real exchange rate exhibits a statistically significant positive coefficient. Furthermore, the findings of the error correction model-based autoregressive distributed lag (ECM-based ARDL) analysis similarly indicate that exchange rates have a comparable causal impact on economic growth. Given the significance of exchange rate factors, particularly in real terms, these results ultimately indicate the need for the establishment of a well-designed systematic exchange rate via monetary policy in order to enhance the stability and sustainability of economic growth in Malaysia. Sibanda (2012) conducted a study to analyze the influence of real exchange rates on the economic development of South Africa. The research used quarterly time series data spanning from 1994 to 2010. The independent variables considered in this research included real exchange rates, real interest rates, money supply, trade openness, and gross fixed capital creation. The findings of this research indicate that in the context of South Africa, real exchange rates, gross fixed capital formation, and real interest rates exert a positive long-term influence on economic growth. Conversely, money supply and trade openness have a negative long-term effect on economic growth. Based on the findings of the regression analysis, it was seen that the devaluation of the currency has a large negative impact on long-term economic growth, but it has a considerable positive effect on short-term economic growth.

In a recent study conducted by Ukangwa and Ikechi (2022), to examine the impact of Nigeria's exchange rate on the country's economic growth. This study aims to examine the impact of Naira exchange rates on economic growth and inflation in Nigeria during the period of 1987 to 2018. The research used the Ordinary Least Squares approach of analysis in order to develop a regression model for the purpose of testing the given hypotheses. The results of the study indicate that there is no statistically significant relationship between the Naira exchange rate and economic development in Nigeria. However, it was observed that the Naira exchange rate does have a substantial effect on the inflation rate in the country. Consequently, the research suggests that it is imperative to enhance the export sector of Nigeria in order to have a lasting effect, while simultaneously promoting domestic manufacturing.

In their study, Godwin and Sergius (2021) investigate the impact of exchange rate fluctuations on the economic growth of Nigeria. The study carefully examined the impact of exchange rates on key economic indicators, including gross domestic product (GDP), gross national product (GNP), and unemployment. The study used secondary data obtained from the Central Bank of Nigeria Statistical Bulletin spanning from 2009 to 2018. The study revealed that the impact of exchange rate on GDP and GNP was statistically significant, however its influence on unemployment was not statistically significant.

The study conducted by Utile *et al.* (2018) examined the impact of interest rates on the economic growth of Nigeria. The data included in the research was sourced from the statistics bulletin of the Central Bank of Nigeria spanning the years 1980 to 2016. The study used multiple regression model. The study revealed that the variables INF and EXR have a statistically negligible and negative impact on the Gross Domestic Product (GDP). Furthermore, it has been shown that the Domestic Investment Rate (DIR) has a positive and statistically significant correlation with Gross Domestic Product (GDP).

The study conducted by Jelilov (2016) investigated the influence of interest rates on the economic development of Nigeria over the period spanning from 1990 to 2013. The findings indicate that there is a little correlation between the interest rate and economic growth. However, it is observed that reducing the interest rate might potentially enhance growth by stimulating higher levels of investment. The findings of the research indicate that it is advisable for Nigerian authorities to establish interest rate policies that may effectively stimulate economic growth.

The study conducted by Egbujor (2012) investigated the influence of exchange rate fluctuations on the economic growth of Nigeria. The dependent variables in this study are GDP and non-oil export, whereas the independent variables are real exchange rates, interest rates, inflation rate, and degree of trade openness. The examination of the results indicates a discernible correlation between the Gross Domestic Product (GDP), exports (EXPT), and the real exchange rate in Nigeria. The stability of exchange rates has a significant and favorable impact on both export activities and economic development. The enhanced stability of currency rates serves as a driving force for enterprises to engage in investments within export-oriented sectors.

3.0 Methodology

The research design used in this study was an ex-post facto design. The study utilized secondary data obtained from the World Development Indicators (WDI) to examine the relationship between various economic indicators and economic growth in Nigeria. Specifically, data on real interest rate, lending interest rate, deposit lending rate, exchange rate, and inflation rate were collected as proxies for "interest and exchange rates." The period of analysis spanned from 1980 to 2022. To achieve this, the research discourse utilised the Augmented Dickey Fuller (ADF) and the Auto-regressive Distributive Lag (ARDL) model to analyse the various data.

3.1 Model Specification

The foundation for model definition in this context is rooted in the theory of capital accumulation growth, which posits that exchange rates have an influence on economic development through impacting savings. According to the idea, it is posited that the undervaluation of the real exchange rate might contribute to economic growth by augmenting the overall capital stock of the economy. This suggests that a devalued real exchange rate has a propensity to elevate the domestic saving rate. The stimulation of economic development via an increase in the rate of capital accumulation is facilitated by higher saving rates that are brought about by depreciation. Consequently, the present study's model is constructed by adapting the models used in Utile *et al.* (2018) research, which examined the impact of interest rates on economic growth in Nigeria. The model is defined in the following manner:

$$\Delta \text{GDP}_t = \beta_0 + \Delta \text{GDP}_{t-1} + \sum \beta_{1t} \Delta \text{INF}_{t-1} + \sum \beta_{2t} \Delta \text{DIR}_{t-1} + \sum \beta_{3t} \Delta \text{EXR}_{t-1} + U_t$$

Where;

In this context, GDP refers to Gross Domestic Product, DIR stands for Deposit Interest Rate, and EXR represents Exchange Rate.

The model underwent modifications via the inclusion of two additional variables: the real interest rate (RIR) and the lending interest rate (LIR). The model delineates the endogenous variable of Economic Growth as a function of the exogenous variables Real interest rate, lending interest rate, deposit interest rate, inflation rate, and currency rate. The model is defined in the following manner:

Model One: Interest Rate and Gross Domestic Product Growth Model

$$GDPG = f(RIR, LIR, DIR) \quad 1$$

The mathematical model could be symbolically expressed as;

$$GDPG = \beta_0 + \beta_1 RIR + \beta_2 LIR + \beta_3 DIR \quad 2$$

Equation (3.2) above is transformed into an econometric model by incorporating the disturbance term (ϵ) as follows;

$$GDPG = \beta_0 + \beta_1 RIR + \beta_2 LIR + \beta_3 DIR + e \quad 3$$

Model Two: Exchange Rate and Gross Domestic Product Growth Model

$$GDPG = f(EXR, INFR, RIR) \quad 4$$

The mathematical model could be symbolically expressed as;

$$GDPG = \beta_0 + \beta_1 EXR + \beta_2 INFR + \beta_3 RIR \quad 5$$

Equation (3.2) above is transformed into an econometric model by incorporating the disturbance term (ϵ) as follows;

$$GDPG = \beta_0 + \beta_1 LEXR + \beta_2 INFR + \beta_3 RIR + e \quad 6$$

Interactive Model: Interest Rate, Exchange Rate and Gross Domestic Product Growth Model

$$GDPG = f(RIR*LEXR, LIR*LEXR, DIR*EXR) \quad 7$$

Where;

GDPG = Gross Domestic Product Growth RIR = Real Interest Rate, LIR= Lending Interest Rate, DIR= Deposit Interest Rate, *EXR* = *Exchange Rate*, INFR = Inflation Rate f = functional relationship β_0 = Intercept of relationship in the model/constant β_1 - β_3 = Coefficients of each independent or explanatory variable e = Stochastic or Error term

Method of Data Analyses

Unit Root Test

The study employed the Augmented Dickey Fuller (ADF) unit root test to identify the order of integration of the variables under study to select appropriate methodology in order to avoid spurious regression.

The ARDL Method

The study employed the autoregressive distributive lag model (ARDL) proposed by Pesaran, Shin and Smith (2001) to estimate the relationship between the variables. The model is therefore specified in unrestricted error correction form to test for cointegration relationship as follows:

The Autoregressive Distributed Lag (ARDL) Model is specified as follows:

$$\Delta \text{GDPG}_t = \beta_0 + \Delta \text{GDPG}_{t-1} + \sum \beta_{1t} \Delta \text{RIR}_{t-1} + \sum \beta_{2t} \Delta \text{LIR}_{t-1} + \sum \beta_{3t} \Delta \text{DIR}_{t-1} + \Delta \text{GDPG}_{t-1} + \sum \Phi_{1t} \Delta \text{RIR}_{t-1} + \sum \Phi_{2t} \Delta \text{LIR}_{t-1} + \sum \Phi_{3t} \Delta \text{DIR}_{t-1} + U_t \dots \dots \dots 8$$

$$\Delta \text{GDPG}_t = \beta_0 + \Delta \text{GDPG}_{t-1} + \sum \beta_{1t} \Delta \text{LEXR}_{t-1} + \sum \beta_{2t} \Delta \text{INFR}_{t-1} + \sum \beta_{3t} \Delta \text{RIR}_{t-1} + \Delta \text{GDPG}_{t-1} + \sum \Phi_{1t} \Delta \text{LEXR}_{t-1} + \sum \Phi_{2t} \Delta \text{INFR}_{t-1} + \sum \Phi_{3t} \Delta \text{RIR}_{t-1} + U_t \dots \dots \dots 9$$

$$\Delta \text{GDPG}_t = \beta_0 + \Delta \text{GDPG}_{t-1} + \sum \beta_{1t} \Delta \text{RIR} * \text{LEXR}_{t-1} + \sum \beta_{2t} \Delta \text{LIR} * \text{LEXR}_{t-1} + \sum \beta_{3t} \Delta \text{DIR} * \text{LEXR}_{t-1} + \Delta \text{GDPG}_{t-1} + \sum \Phi_{1t} \Delta \text{RIR} * \text{LEXR}_{t-1} + \sum \Phi_{2t} \Delta \text{LIR} * \text{LEXR}_{t-1} + \sum \Phi_{3t} \Delta \text{DIR} * \text{LEXR}_{t-1} + U_t \dots \dots \dots 10$$

The inference here is that, if the computed F-statistics is greater than the upper bound critical value at 5%, there is said to be cointegration. If the computed F-statistics is less than the lower bound critical value at 5% there is no cointegration. However, if the value of the computed F-statistics lies between the upper and the lower critical values, then the inference is said to be inconclusive. Once cointegration relationship exists, the long-run model would be estimated as specified:

$$\Delta \text{GDPG}_{t-1} + \sum \Phi_{1t} \Delta \text{RIR}_{t-1} + \sum \Phi_{2t} \Delta \text{LIR}_{t-1} + \sum \Phi_{3t} \Delta \text{DIR}_{t-1} + U_t \dots \dots \dots 11$$

$$\Delta \text{GDPG}_{t-1} + \sum \Phi_{1t} \Delta \text{LEXR}_{t-1} + \sum \Phi_{2t} \Delta \text{INFR}_{t-1} + \sum \Phi_{3t} \Delta \text{RIR}_{t-1} + U_t \dots \dots \dots 12$$

$$\Delta \text{GDPG}_{t-1} + \sum \Phi_{1t} \Delta \text{RIR} * \text{LEXR}_{t-1} + \sum \Phi_{2t} \Delta \text{LIR} * \text{LEXR}_{t-1} + \sum \Phi_{3t} \Delta \text{DIR} * \text{LEXR}_{t-1} + U_t \dots \dots \dots 13$$

Similarly, the short-run model of the error correction specification would be estimated to ascertain the short-run dynamic behaviour of the variables in the model as;

$$\Delta \text{GDPG}_t = \beta_0 + \Delta \text{GDPG}_{t-1} + \sum \beta_{1t} \Delta \text{RIR}_{t-1} + \sum \beta_{2t} \Delta \text{LIR}_{t-1} + \sum \beta_{3t} \Delta \text{DIR}_{t-1} + \text{ECT}_{t-1} + U_t \dots \dots \dots 14$$

$$\Delta \text{GDPG}_t = \beta_0 + \Delta \text{GDPG}_{t-1} + \sum \beta_{1t} \Delta \text{LEXR}_{t-1} + \sum \beta_{2t} \Delta \text{INFR}_{t-1} + \sum \beta_{3t} \Delta \text{RIR}_{t-1} + \text{ECT}_{t-1} + U_t \dots \dots \dots 15$$

$$\Delta \text{GDPGt} = \beta_0 + \Delta \text{GDPGt-1} + \sum \beta_{1t} \Delta \text{RIR} * \text{LEXRt-1} + \sum \beta_{2t} \text{LIR} * \text{LEXRt-1} + \sum \beta_{3t} \Delta \text{DIR} * \text{LEXRt-1} + \text{ECTt-1} + \text{Ut} \dots\dots\dots 16$$

Where the ECT in the above equation is specified as;

$$\text{ECTt} = \Delta \text{GDPGt} - \beta_0 - \Delta \text{GDPGt-1} - \sum \beta_{1t} \Delta \text{RIRt-1} - \sum \beta_{2t} \Delta \text{LIRt-1} - \sum \beta_{3t} \Delta \text{DIRt-1} \dots\dots\dots 17$$

$$\text{ECTt} = \Delta \text{GDPGt} - \beta_0 - \Delta \text{GDPGt-1} - \sum \beta_{1t} \Delta \text{LEXRt-1} - \sum \beta_{2t} \Delta \text{INFRt-1} - \sum \beta_{3t} \Delta \text{DIRt-1} \dots\dots\dots 18$$

$$\text{ECTt} = \Delta \text{GDPGt} - \beta_0 - \Delta \text{GDPGt-1} - \sum \beta_{1t} \Delta \text{RIR} * \text{LEXRt-1} - \sum \beta_{2t} \Delta \text{LIR} * \text{LEXRt-1} - \sum \beta_{3t} \Delta \text{DIR} * \text{LEXRt-1} \dots\dots\dots 19$$

Finally, the study diagnosed the model by conducting test for serial correlation, Ramsey reset test and heteroskedasticity.

4. Result and Discussion

In the field of time series analysis, it is customary to assess the order of integration for each series as a means of mitigating the issue of spurious regression. Hence, an investigation is undertaken to examine the stationary quality of each variable by the use of the Augmented Dickey-Fuller test (Dickey & Fuller, 1979). The criterion for determining stationarity is based on the comparison between the Augmented Dickey Fuller (ADF) test statistics and the Mackinnon Critical Value at a significance level of 5%. In order for a variable to be considered stationary, the ADF test statistics must exceed the Mackinnon Critical Value in absolute terms, disregarding the negative values of both. Conversely, if the ADF test statistics do not surpass the Mackinnon Critical Value, we accept the null hypothesis (Ho) that the data is non-stationary and reject the alternate hypothesis (H1) that the data is stationary.

Table 1: Unit Root Test Using Augmented Dickey Fuller (ADF)

Variables	Levels		First Difference		Order of Integration	P-value
	ADF Statistics	5% Critical Value	ADF Statistics	5% Critical Value		
GDPG	-2.852962	-2.935001	-12.09635	-2.935001	I(1)	0.0000
RIR	-4.747835	-2.933158			I(0)	0.0004
LIR	-2.308124	-2.933158	-5.510039	-2.936942	I(1)	0.0000
DIR	-1.532725	-2.941145	-3.912682	-2.941145	I(1)	0.0046
LOGEXR	-2.017060	-2.933158	-5.495842	-2.935001	I(1)	0.0000
INFR	-3.133588	-2.933158			I(0)	0.0316

Source: Extracts from E-view 10. * Level of significance at 5%

The variables included in the research underwent Augmented Dickey Fuller (ADF) Tests to determine if they exhibited stationary or non-stationary behavior, as shown by the findings presented in Table 1. The stationarity test result indicates that GDPG, LIR, DIR, and LEXR exhibited stationarity after being differenced once I(1), whereas RIR and INFR were found to be stationary at level I(0). The variables in model one demonstrate a combination of integrated orders, indicating both stationarity at the level and initial differences.

Interactive Model Co-integration Result (Interest Rate, Exchange Rate & Economic Growth)

Table 2: ARDL Bound Test

Test Statistics	Value	K
F-statistics	7.181100	3
Significance	I (0)	I(1)
10%	2.72	3.77
5%	3.23	4.35
2.5%	3.69	4.89
1%	4.29	5.61

Source: Authors computation from E-view 10 Output

The results of the bound test are shown in Table 2, where the F-statistics are compared to the critical bound values. The results indicate that, with a significance level of 0.05, the F-statistic exceeds both the lower and upper critical values of 3.23 and 4.35, respectively. It may be inferred that there exists a certain level of co-integration among the interest rate, exchange rate, and economic growth in Nigeria. Consequently, the anticipated outcomes of the Auto-Regressive Distributive Lag (ARDL) model in both the long-run and short-run periods are analysed.

Table 3: ARDL Long-run Result (Dependent Variable GDPG)

Variable	Coefficient	Std. Error	t-statistics	Prob
RIR*EXR	-0.017956	0.003967	-4.526413	0.0031
LIR*EXR	-0.019436	0.004961	-3.917674	0.0372
DIR*EXR	0.011100	0.007903	1.404529	0.1720
EC = GDPG - (-0.0180*RIR_EXR -0.0194*LIR_EXR + 0.0111*DIR_EXR)				

Source: Authors computation from E-view 10 Output

Submission from the long-run results shown in Table 3 of the Autoregressive Distributive Lag (ARDL) model, indicates that there exists a negative relationship of -0.017956 between the interaction of real interest rate and exchange rate (RIR*LEXR) on the growth of gross domestic product (GDPG). This means that a unit rise in the interaction between real interest rate and exchange rate will amount to about 0.01% fall in growth of gross domestic product (GDPG). The p-value showed that the interactive relationship between RIR*LEXR and GDPG is statistically significant. Similarly, the interactive relationship between lending interest rate and exchange rate (LIR*LEXR) reported a desirable negative (-0.019436) relationship on the growth of gross domestic product (GDPG). this implies that a unit increase in LIR*LEXR will result to 0.02% decline in GDPG. Also, the p value of 0.0372 is less than the threshold value of 0.05 indicates a significant relationship between LIR*LEXR and GDPG.

In conclusion, inference from the relationship between the interaction of deposit interest rate and exchange rate (DIR*LEXR) reveals a positive relationship of +0.011100 with the growth of gross domestic product (GDPG). The findings indicate that a unit increase in the interaction between deposit interest rate and exchange rate (DIR*LEXR) will result to 0.01% increase in GDPG. However, the p-value of 0.1720 indicates that there is statistical significant relationship between DIR*LEXR and GDPG.

Table 4: ARDL Short-run Result (Dependent Variable GDPG)

Variables	Coefficient	Std. Error	t-Statistics	Prob
C	0.220710	0.088663	2.489316	0.0434
D(RIR*EXR)	-0.003706	0.001152	-3.217300	0.0297
D(RIR*EXR(-1)	0.002981	0.001585	1.881125	0.0712
D(RIR*EXR(-2)	0.001998	0.001405	1.421741	0.1670
D(LIR*EXR)	-0.002950	0.002409	-1.224311	0.2318
D(LIR*EXR(-1)	0.003140	0.002494	1.259016	0.2192
D(LIR*EXR(-2)	0.002838	0.003500	0.810927	0.4248
D(DIR*EXR)	0.004007	0.002999	1.336397	0.1930
D(DIR*EXR(-1)	-0.005078	0.003032	-1.674698	0.1060
D(DIR*EXR(-2)	-0.005378	0.003859	-1.393753	0.1752
ECM(-1)	-0.662615	0.153417	-4.319044	0.0002
Adj R ² =0.454371, F-statistics = 4.247716 (0.001077), DW =2.016916				

Source: Authors computation from E-view 10 Output

Based on the findings derived from the Auto-regressive Distributive Lag (ARDL) model shown in Table 4, it is evident that the coefficient associated with the error correction component is both statistically significant and negative. Put otherwise, the negative sign substantiates its importance. It may be inferred that the Error Correction Mechanism (ECM) will exhibit efficacy in rectifying any deviations from the long-run equilibrium. The coefficient of the Error Correction Model (ECM) at -0.662615 suggests that the rate at which the system adjusts towards long-term equilibrium is 66%. This implies that any previous deviations from equilibrium will be rectified at the speed of 66% in the current period. This implies that the current value of GDPG exhibits a gradual response to fluctuations in RIR*EXR, LIR*EXR, and DIR*EXR.

Based on the findings of the ARDL short-run analysis, it is evident that the constant parameter (Bo) has a positive value of +0.220710. This implies that while all the independent variables remain unchanged, the dependent variable GDPG will have an annual growth rate of 0.22 percent. The coefficient for the relationship between real interest rate and exchange rate (RIR*EXR) is -0.003706. This implies that the

relationship between real interest rate (RIR) and exchange rate (EXR) is negatively related to growth rate of gross domestic product (GDPG) in the most current period of the short-run, while the interaction between LIR*LEXR, and LIR*LEXR in relation to GDPG are all insignificantly related.

Additionally, the coefficient of determination (adjusted R^2) reported a value of 0.454371. This shows that about 45% of the variation in the dependent variable can be accounted by the explanatory variables (RIR*LEXR, LIR*LEXR, DIR*LEXR). The significance of the whole model is shown by its corresponding probability value of 1%, suggesting that the model as a whole is extremely important. The Durbin-Watson statistic of 2.016916 indicates that the series under consideration are devoid of autocorrelation issues. The whole of the findings indicated a notable influence of both interest rate and exchange rate on the economic growth in Nigeria.

Diagnostic Test

Table 5: Ramsey Reset Test, Serial Correlation LM Test and Homoscedasticity Test Results

	F-Statistic	Prob.Value
Ramsey Reset Test	0.962371	0.3360
Breusch-Godfrey Serial Correlation LM Test	2.420052	0.1103
Breusch-Pagan-Godfrey Heteroskedasticity Test	0.495365	0.9073

Source: Author's Computation using E-view 10

Based on the findings shown in Table 5, the diagnostic test results indicate that the linearity test of the Ramsey reset test yielded an f-statistic of 0.962371, This p-value above the crucial value of 0.05, suggesting that the model is appropriately described. Consequently, the null hypothesis was rejected in this investigation. The findings of the Breusch-Godfrey Serial Correlation LM Test reveal that the f-statistic is 2.420052, and the Chi-Square probability value is 0.1103, indicates that the model does not exhibit serial correlation, as shown by a probability value of around 11 percent which exceeds the threshold value of 5 percent (0.05). The results of the Breusch-Pagan-Godfrey test indicate that the f-statistic is 0.495365 and the Chi-Square probability value is 0.9073, Based on the obtained probability Chi-square value above 5% ($P > 0.05$), the findings suggest the absence of heteroskedasticity in the model. Consequently, residuals exhibit homoscedasticity since they possess a consistent variance, a desirable characteristic in regression analysis.

5. Conclusion and Recommendations

This research examined the relationship between interest rates, exchange rates, and economic growth in Nigeria from 1980 to 2022. The explanatory factors in this study were proxied by the real interest rate, exchange rate, inflation rate, deposit lending rate, and lending interest rate. The response variable, on the other hand, was captured by the gross domestic product growth rate. Based on the finding, this research discourse infer that continuous increase in interest rate, exchange rate and inflation rate will slow down economic activities and grossly affect the Nigerian economy. This is as a result of the negative interaction between real interest rate and exchange rate as well as lending rate and exchange rate with respect to growth of gross domestic product. the interactive relationship between deposit interest rate and exchange rate was positive but insignificant with growth of gross domestic product.

Based on the findings, the following recommendations were made;

1. The Central Bank of Nigeria (CBN), should raise deposit interest rate in order to incentivize individuals to save a greater portion of their income. This will enable financial institutions to enhance their capacity to allocate more cash towards investment, thereby fostering economic growth.
2. The Central Bank of Nigeria, should consider implementing a floating exchange rate system. This would allow the interplay of demand and supply forces to ascertain the exchange rate, while the government should provide a favorable climate that facilitates the productive operations of the real sector, hence fostering fast economic growth.
3. In the context of a growing economy, it is imperative for the government and its affiliated entities to formulate effective measures aimed at mitigating the escalating interest and exchange rates. This may be achieved via the revitalization and establishment of novel industries, which would not only provide employment opportunities for the populace but also facilitate the production of items that contribute to price stability and enhance food security.

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