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Impact of the Exchange Rate on Economic Growth in Nigeria

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Abstract

This paper examines the impact of the exchange rate on economic growth in Nigeria. In particular, it investigates both the long-run impact, the short-run dynamics, and the long-run relationship of the underlined variables of the impact of the exchange rate on economic growth in Nigeria using the autoregressive distributed lag model (ARDL) and an error correction model (ECM). The results show that there is a positive relationship between the exchange rate and economic growth in the long run and a positive relationship between trade openness and economic growth in the long run. Foreign direct investment net inflows also have a positive relationship with economic growth. More specifically, the results indicate that a 1 percent rise in the exchange rate in the long run leads to a 0.006 percent rise in economic growth rates, and a 1 percent rise in trade openness and foreign direct investment net inflows in the long run increases economic growth by 0.12 and 2.27 percent, respectively. Given the positive impact of exchange rates on RGDP, maintaining a stable exchange rate environment is crucial, and policymakers should aim to implement measures that promote stability while also considering policies that enhance competitiveness. This may involve monitoring and managing currency fluctuations to ensure they remain favorable for both domestic industries and export activities.

Keywords: *Exchange Rate, Economic Growth, ECM and ARDL*

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Background to the Study

In developing nations, fostering economic growth through national development necessitates significant financial resources. These countries strive to close the developmental disparity with more advanced nations (Primi and Toselli, 2020). When faced with limited resources, they often resort to importing goods, leveraging the unique natural wealth and resources available globally. Thus, international trade relies on exchange rates, playing a pivotal role in an economy. These rates directly impact domestic prices, trade profitability, resource allocation, and investment decisions.

The exchange rate, signifying the value between two currencies, dictates their exchange price. It serves as a crucial macroeconomic indicator of a country's currency competitiveness (Rasaq, 2013). Traditionally, it's defined as the price of foreign currency concerning the domestic currency (Mejekomi, 2000). Effective exchange rate management remains integral to economic growth, influencing export stimulation and private investment. A stable exchange rate significantly impacts international trade, affecting a country's foreign reserves, import/export values, and its relationships with trading partners. This subject has garnered attention in Nigeria's academic discourse as every economy aims for a stable exchange rate with its trading counterparts.

Research by Douglas and Jike (2005) highlighted how exchange rate fluctuations impact various economic facets, including real GDP, exports/imports, interest rates, unemployment, and terms of trade. Similarly, Mordi (2006) emphasized that these fluctuations affect inflation, price incentives, fiscal viability, export competitiveness, resource allocation efficiency, international confidence, and balance of payments equilibrium. These findings underscore the exchange rate's critical role in the economic prosperity of nations engaged in global trade of goods and services.

Exchange rates are a fundamental determinant of economic performance in any country, and Nigeria is no exception. The dynamics of exchange rates and their impact on economic growth have been the subject of extensive research in the context of Nigeria's evolving economy. This study aims to shed light on the relationship between exchange rates, real gross domestic product (GDP), trade openness, foreign direct investment (FDI), and interest rates in Nigeria, considering the intricate interplay of these variables. Exchange Rates: Exchange rates in Nigeria have experienced significant fluctuations over the years, influenced by factors such as global oil prices, domestic inflation, and government policies. These fluctuations have had direct and indirect consequences on the country's economic performance. A stable or appreciating exchange rate can boost export competitiveness and attract foreign capital, while a depreciating currency may lead to inflationary pressures and hinder economic growth (Ogunmuyiwa & Ekone, 2019).

Real Gross Domestic Product (GDP): Real GDP is a key indicator of a country's economic performance, reflecting the total value of goods and services produced within its borders. Fluctuations in exchange rates can impact the real GDP by affecting the prices of imports and exports. Exchange rate movements can either enhance or hamper economic growth by

influencing the country's net exports (Onodugo, Adebayo, & Nwani, 2021). Trade openness is the degree to which a country participates in international trade activities, encompassing both imports and exports. It is a fundamental component of a nation's economic structure and an essential variable in the examination of exchange rates and their influence on economic growth. In the case of Nigeria, a country with a diverse and resource-rich economy, trade openness plays a pivotal role. Nigeria's economic growth is inextricably linked to its engagement in international trade. The extent to which the Nigerian economy is integrated into the global market affects various aspects of its economic performance, from its balance of payments to its overall prosperity. A thorough understanding of trade openness in Nigeria is essential when exploring the effects of exchange rate fluctuations on economic growth.

Foreign Direct Investment (FDI): FDI plays a pivotal role in shaping Nigeria's economic landscape. The country's attractiveness to foreign investors is closely linked to exchange rate stability, as a volatile currency can deter FDI inflows. Additionally, FDI can impact economic growth by injecting capital, technology, and expertise into the economy, leading to job creation and increased production (Aremu, Bolarinwa, & Usman, 2017). Interest Rates: The interest rate policy adopted by the Central Bank of Nigeria can significantly affect exchange rates and, consequently, economic growth. A higher interest rate can attract foreign investment, leading to an appreciation of the currency, while lower interest rates may encourage capital outflows and currency depreciation. These rate fluctuations can have implications for borrowing costs, investment decisions, and overall economic growth (Aminu, Owoeye, & Nwokoma, 2019).

The Nigerian economy has faced significant challenges due to the instability in its foreign exchange rate market, characterized by notable volatility (Kelikume and Nwani, 2019; Osabuohien et al., 2018). To address this issue, Nigeria's government initiated the Structural Adjustment Program (SAP) in 1986, receiving support from the International Monetary Fund (IMF) and the World Bank (Mordi 2006). The SAP aimed to achieve several objectives, including restructuring and broadening the economic base to reduce reliance on the oil sector and imports, ensuring fiscal and balance of payments viability in the medium term, and fostering non-inflationary economic growth. Nigeria's exchange rate policy has undergone significant shifts over distinct periods in its history. Initially, post-independence, the nation maintained a fixed parity with the British pound. This persisted through the oil boom of the 1970s until 1986, when the country transitioned to a floating currency after a severe economic downturn between 1982 and 1985. Throughout these phases, the economic and political considerations guiding the exchange rate policy held crucial implications for the economy's structural development, inflation rates, balance of payments, and real income.

However, a substantial policy reversal occurred in September 1986 when Nigeria adopted a flexible exchange rate regime following the implementation of the Structural Adjustment Program (SAP). During SAP, foreign exchange allocation and import licensing procedures were absent, and foreign exchange transactions operated on a market-based system (Oyejide and Ogun, 1995). This reform, an integral part of the Economic Recovery Program (ERP) in 1986, included financial sector reforms, notably shifting away from fixed exchange rates

towards a free-floating regime in the late 1980s. This transition was predicated on the belief that flexible exchange rates would mitigate economic fluctuations and steer the country towards a path of growth.

The year SAP commenced; the exchange rate was ₦2.02 to U. S$1.00. However, by 1987, 1990, and 1991, it had depreciated to average rates of ₦4.02, ₦8.04, and ₦9.91 to US$1.00, respectively (CBN Report, 2022). Further depreciation continued in 1992 and 1993, reaching ₦17.30 and ₦22.05 to US$1.00, respectively. The continuous depreciation compelled a complete policy reversal in 1994, leading to the reintroduction of a fixed exchange rate regime pegged at ₦21.8861 per US$1.00 (CBN Report, 2022). The underperformance of the economy by the end of 1994 prompted the reintroduction of the market-based approach through the Autonomous Foreign Exchange Market (AFEM) from January 1995 to October 1999. Despite this transition, the exchange rate continued to depreciate from ₦21.8881 per US$1.00 in 1994 to ₦32.43, ₦35.43, ₦36.31, and ₦41.26 per US$1.00 between 1995 and 1998, respectively. It further declined to ₦128.75 between 2002 and 2005. However, there were periods of relative stability, notably in 2003 and between 2005 and 2008, during which the Naira appreciated. The exchange rate fluctuated significantly in subsequent years: in 2011, it stood at ₦162.30, declined to ₦156.15 in 2012, and further dropped to ₦155.73 in 2013. The Naira-Dollar exchange rate exhibited high volatility towards the end of 2014 and in 2015, ranging from ₦168 to ₦204 for 1 US$, eventually stabilizing at ₦197 for 1 US$ by August 2015. In 2016, the average exchange rate settled at ₦257.6604, rising to ₦333.7146 in 2017 and ₦361.2924 in 2018. The average rates stood at ₦360.0594 NGN in 2019, ₦380.2556 in 2020, and increased to ₦403.5808 for 1 US$ in 2021. As of December 2022, Nigeria's exchange rate against the US$ averaged ₦445.971 (NGN/US$), compared to ₦441.879 NGN/US$ in the preceding month (CBN Report, 2022). The real exchange rate reflects a country's economic condition. Fluctuations in this rate may discourage potential investors in Nigeria due to increased uncertainty about investment returns. Investors typically consider foreign investments only if the anticipated returns are sufficient to offset currency risks (Chukwu, 2007). Risk in international commodity trade often originates from changes in world prices or fluctuations in the real exchange rate. Hence, comprehending exchange rate behavior holds immense importance.

The following questions were answered in this study:

i. What impact does the exchange rate have on Nigeria's real gross domestic product?
ii. What impact does trade openness have on Nigeria's real gross domestic product?
iii. What impact do foreign direct investment net inflows have on Nigeria's real gross domestic product?

The following hypotheses were tested:

H_0: The exchange rate has no significant impact on Nigeria's real gross domestic product.
H_0: The value of trade openness has no significant impact on Nigeria's real gross domestic product.
H_0: Foreign direct investment net inflows have no significant impact on Nigeria's real gross domestic product.

Theoretical Basis and Empirical Underpinning

Since the switch from the fixed rate system to the floating rate system, theories of how exchange rates are determined have altered. The exchange rate used here is determined by supply and demand in comparison to other currencies. This has led to the development of numerous hypotheses about how to calculate the rate of exchange between various currencies. Below are some of the key theories discussed:

1. **The Theory of Purchasing Power Parity**: Professor Cassel of Sweden coined the phrase PPP in 1918. According to the hypothesis, after the exchange rate is taken into account, commodities from one nation will cost the same amount in another. There are two PPP variations, which are as follows:
   a. Absolute purchasing power parity theory which states that an identical product should have the same price in both countries.
   b. Relative purchasing power parity theory is of the view that inflation differences between two countries will have an equal impact on their exchange rate. For instance, when inflation is higher in country X than in Y, the price of goods in X will increase more than the price of goods in Y. X's currency will depreciate with respect to Y's currency. The rate of depreciation is equal to the inflation.

2. **Interest Rate Parity Theory (IRP)**: According to John M. Keynes, the interest rate parity theory (IRP) describes the link between the current spot exchange rate and the anticipated spot rate or forward exchange rate of two countries. A forward exchange rate is the rate of exchange decided upon now for a foreign exchange market transaction that will take place at a specific date in the future, whereas a spot exchange rate is the current price level in the market to directly exchange one currency for another.

3. **International Fisher Effect (IFE):** In 1930, American economist Irvin Fisher proposed the idea that countries with higher nominal interest rates also experience higher rates of inflation, which will cause their currencies to depreciate relative to those of other nations. The interest rate before accounting for inflation is known as a nominal interest rate (A real interest rate is an interest rate that has been adjusted to remove the effects of inflation to reflect the real cost of funds to the borrower and the real yield to the lender or to an investor. Adjusted for inflation is the process of removing the effect of price inflation from data. Interest rate is the rate often expressed as a percentage per annum charged on money borrowed or lent. In real term, it is the reward for the wealth holder to part with his cash, and in financial terms, it is the cost of funds).

4. **Unbiased Forward Rate (UFR**): According to the Unbiased Forward Rate (UFR), the forward exchange rate is a fair indicator of the upcoming spot exchange rate. Unbiased future rates signify that a commodity's forward rates will match its predicted price on a specific date or expiration date.

Empirical literature

The empirical literature regarding the effect of exchange rate volatility on economic growth has been unsettled. For example, Innocent, Millicent, Abubakar, Benedict, Gabriel, Ekechi (2022) investigated on the impact of exchange rate volatility on exports in Nigeria utilizing data from 2005Q1 to 2020Q4. The variables used include volume of export, real gross domestic product, exchange rate volatility measured as nominal effective exchange rate and industrial production index. The ARCH model and its extensions of GARCH, TARCH and EGARCH models were employed to measure exchange rate volatility. The Autoregressive Distributed Lag (ARDL) Bounds test methodology was used to examine the short-run and long-run effects of exchange rate volatility on exports. The findings revealed that exchange rate volatility had a negative and insignificant impact on exports.

Anifowose (2021) presented an empirical test result on the effect of exchange rate on economic growth in Nigeria with emphasis on asymmetric relationship among the variables (gross domestic product, exchange rate and inflation rate). Applying the Non-Linear Autoregressive Distributed Lag model (NARDL) approach to examine asymmetric relationships among variables. The study found that in the long run economic growth was positively affected by positive shocks to exchange rate.

Ahiabo and Amoah (2019) used Fully Modified Ordinary Least Squares (FMOLS) method and annual time series data from 1980-2015 to examine the effect of real effective exchange rate volatility on economic growth in Ghana. Gross Domestic Product was used as the dependent variable while exchange rate, inflation rate, foreign direct investment and labour force were the explanatory variables. The regression results showed that the actual effective exchange rate volatility has a negative and statistically significant effect on economic growth in Ghana.

Ufoeze, Okuma, Nwakoby and Alajekwu (2018) investigated the effect of exchange rate fluctuation on economic growth in Nigeria using time series data spanning from 1970 to 2012. The study adopted exchange rate, inflation, money supply and oil revenue as the explanatory variables, while gross domestic product (proxy for economic growth) was used as the response variable. They employed multiple regression technique based on OLS for the analysis of data. Their study produced mixed findings, and they concluded that floating exchange rate outperformed fixed exchange rate as a better indicator of a sustainable economic growth.

Akinmulegun and Falana (2018) examined the effect of exchange rate fluctuation on industrial output in Nigeria using data covering between 1986 to 2015. The study adopted gross domestic product representing industrial output growth as the response variable, while the explanatory variables include exchange rate, inflation, interest rate and net exports. Statistical tools used for data analysis include ADF/PP unit root test, Johansen co-integration test, Pairwise Granger causality test and VECM. The results showed a unidirectional causality from exchange rate to industrial output growth, that is, industrial output responded significantly and positively to exchange rate much more than the other variables. The study concluded that exchange rate had potentials of affecting industrial output growth in Nigeria.

Umaru, Aguda, and Davies (2018) also examined the effects of exchange rate volatility on the economic growth of English-speaking countries of West Africa. The study applied three types of panel data namely, Pooled OLS model, Fixed Effect Model, and Random Effect Model used to analyze the data. The results obtained indicated that the independent variable (real exchange rate) is statistically significant and negatively related to the dependent variable (GDP) in West Africa's English-speaking countries, excluding time-invariant variables.

Iyeli and Utting (2017) studied the effect of exchange rate volatility on Economic Growth in Nigeria from 1970 to 2011 employing the Johansen Co-integration estimation technique to test for the short and long runs effect of the variables used. The model formulated used Real GDP as the dependent variable while Exchange Rate (EXR), Balance of Payment (BOP) Oil Revenue (OREV) and inflation rate (INF) became the independent variables. The ADF test revealed that all the variables were stationary. From the parsimonious model, the result showed that OREV and EXR are positively related to GDP, an increase in inflation (INF) will stimulate a reduction in GDP. Further findings revealed that there exist two equations at 5% level in both trace and Max – Eigen statistic. This implies that exchange rate volatility and oil revenue contribute positively to GDP in the long run.

Ndu- Okrereke and Nwachukwu (2017) on the effect of exchange rate fluctuations on the Nigerian economy employed the use of Vector Auto Regression (VARs) models on the time series data, the result revealed that supply of foreign exchange has a positive and significant relationship with output level of Gross Domestic Product while the demand for foreign exchange has a negative relationship with Gross Domestic Product. The hypotheses stated was tested using the two-stage least square (2LS).

Sabina, Manyo, and Ugochukwu (2017) examined the impact of Nigeria's exchange rate volatility and economic development using the Generalized Method of Moments (GMM) to estimate. The finding revealed a negative relationship between exchange rate volatility and Nigeria's economic growth. The also showed that exchange rate volatility and FDI have a negative and significant impact on Nigerian economic growth. Government expenditures and external reserves exhibit positive and significant effect on Nigeria's economic growth for the period studied.

Table 1: Summary of Empirical Literature

Authors	Year of study	Topics	Variables	Methods	Findings
Innocent.U.D,Millicent A.E.,Abubakar S. S., Benedict I. U.,Gabriel .O. E.,Ekechi C.	2022.	The impact of exchange rate volatility on exports in Nigeria utilizing data from 2005Q1 to 2020Q4.	Volume of export, Real Gross Domestic Product, Exchange Rate Volatility measured as Nominal effective exchange rate and Industrial Production Index.	ARCH model and its extensions of GARCH, TARCH and EGARCH models were employed to measure exchange rate volatility. The Autoregressive Distributed Lag Bounds test was used to examine the short-run and long-run effects of exchange rate volatility on exports.	The findings revealed that exchange rate volatility had a negative and insignificant impact on exports.
Anifowose D. A.	2021	The effect of exchange rate on economic growth in Nigeria.	Gross Domestic product, exchange rate and inflation rate.	Non Linear Autoregressive Distributed Lag model(NARDL) approach.	The study found out that in the long run economic growth is positively affected by positive shocks to exchange rate.
Ahiabo and Amoah.	2019	The effect of real effective exchange rate volatility on economic growth in Ghana.	Gross Domestic Product was used as the dependent variable while exchange rate, inflation rate, foreign direct investment and labour force were the explanatory variables.	Fully Modified Ordinary Least Squares (FMOLS) method.	The regression results showed that the actual effective exchange rate volatility has a negative and statistically significant effect on economic growth in Ghana.
Ufoeze, Okuma, Nwakoby and Alajekwu	2018	The effect of exchange rate fluctuation on economic growth in Nigeria using time series data covering 1970 to 2012.	Exchange rate, inflation, money supply and oil revenue as the explanatory variables, while gross domestic product (proxy for economic growth) was used as the response variable.	Multiple regression technique based on OLS for the analysis of data.	Their study produced mixed findings, and they concluded that floating exchange rate outperformed fixed exchange rate as a better indicator of a sustainable economic growth.
Akinmulegun and Falana.	2018	The effect of exchange rate fluctuation on industrial output in Nigeria using data covering 1986 to 2015.	Gross Domestic Product representing industrial output growth as the response variable, while the explanatory variables include exchange rate, inflation, interest rate and net exports.	ADF/PP unit root test, Johansen co-integration test, Pairwise Granger causality test and VECM.	The results showed a unidirectional causality from exchange rate to industrial output growth, that is, industrial output responded significantly positively to exchange rate much more than the other variables. The study concluded that exchange rate had potentials of affecting industrial output growth in Nigeria.

Source: Author's Compilation, 2023.

Umaru, Aguda, and Davies.	2018	The effects of exchange rate volatility on the economic growth of English-speaking countries of West Africa.	Exchange rate and Gross Domestic Product (GDP).	The study applied three types of panel data namely; Pooled OLS model, Fixed Effect Model, and Random Effect Model used to analyze the data	The results obtained indicated that the independent variable (real exchange rate) is statistically significant and negatively related to the dependent variable (GDP) in West Africa's English-speaking countries, excluding time-invariant variables.
Iyeli and Utting.	2017	The effect of exchange rate volatility on Economic Growth in Nigeria from 1970 to 2011.	Real GDP as the dependent variable while Exchange Rate (EXR), Balance of Payment (BOP) Oil Revenue (OREV) and inflation rate (INF) are the independent variables.	Johansen Co-integration estimation technique.	The result showed that OREV and EXR are positively related to GDP.
Ndu- Okrereke and Nwachukwu.	2017	The effect of exchange rate fluctuations on the Nigerian economy.	Exchange rate and Gross Domestic Product.	Vector Auto Regression (VARs) models.	The result revealed that supply of foreign exchange has a positive and significant relationship with output level of Gross Domestic Product while the demand for foreign exchange has a negative relationship with Gross Domestic Product.
Sabina, Manyo, and Ugochukwu.	2017	The impact of Nigeria's exchange rate volatility and economic development.	Exchange rate, foreign direct investment, government expenditure, external reserves and gross domestic product.	Generalized Method of Moments (GMM).	The finding revealed a negative relationship between exchange rate volatility and Nigeria's economic growth. The also showed that exchange rate volatility and FDI have a negative and significant impact on Nigerian economic growth. Government. Expenditures and External Reserves exhibit positive and significant effect on Nigeria's economic growth for the period studied.

Theoretical framework/ Model specification

The theoretical foundation of this research is based on the growth theory of the Cobb-Douglas production function, which has its roots in Solow's growth model. As per this theory, the generation of output Y is determined by the factors of capital (K), technology (A), and labor (L). This relationship can be illustrated as follows:

$$Y = F(AK^{\propto}L^{1-\propto} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

If there is a change in production, it can be attributed to fluctuations in capital, labor, or enhancements in overall factor productivity. As a result, an economy can achieve growth via two primary avenues: one is by accumulating factors, which means increasing labor and capital inputs, and the other is by elevating total factor productivity, signifying enhancements in efficiency or technological progress. In this study, the Cobb-Douglas production function is employed. It involves the use of the variable Y, which in the study signifies real gross domestic product, and these variables are utilized to investigate the relationships and impact of the exchange rate on economic growth in Nigeria.

Model Specifications

The study is based on the Keynesian model of an open economy and the model is built on the work conducted by Innocent, Millicent, Abubakar, Benedict, Gabriel, Ekechi (2022) using an autoregressive distributed lag (ARDL) model:

$$RGDP = f(EXR, TOP, FDI, INT) \ldots\ldots\ldots\ldots\ldots\ldots\ldots .2$$

Where;

RGDP = Real Gross Domestic Product growth rate
EXR = Exchange Rate
TOP= Trade Openness
FDI= Foreign direct investment net inflows
INT= Interest rate

Putting equation (1) in econometric form, the linear regression model specification is in the form below:

$$RGDP_t = \beta_0 + \beta_1 EXR_t + \beta_2 TOP_t + \beta_3 FDI_t + \beta_4 INT_t + \mu_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3$$

Where;

RGDP, EXR, TOP as previously defined
β_0 = Constant term
β_1 and β_4 are the coefficients to be estimated
t = trend variable
μ = error term

Thus, a linear-log transformation mechanism is applied in order to have the same unit measurement and improve linearity between the dependent and independent variables.

$$RGDP_t = \beta_0 + \beta_1 EXR_t + \beta_2 LTOP_t + \beta_3 LFDI_t + \beta_4 INT_t + \mu_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots 4$$

Long- run model specification for RGDP

$$RGDP_t = a_{01} + b_{11}{}^{RGDP_{t-1}} + b_{21}{}^{EXR_{t-1}} + b_{31}{}^{LTOP_{t-1}} + b_{41}{}^{LFDI\ net\ inflow_{t-1}} + b_{51}{}^{INT_{t-1}} + e_{1t}$$
$$\ldots\ldots\ldots\ldots\ldots\ldots\ldots 5$$
$$rgdp\ \ c\ rgdp(-1)\ exr\ (-1)\ ltop\ (-1)\ lfdi\ net\ inflow(-1)\ int(-1) \ldots\ldots\ldots\ldots\ldots\ldots\ldots 6$$

The exclusion of the change parameters represented by 'd' is an indication that the model is a long-run ARDL equation.

The Error Correction Model (ECM) specification:

$$\Delta RGDP_t = \alpha_{01} + \sum_{i=1}^{p} \alpha_{1i}\, \Delta RGDP_{t-1} + \sum_{i=1}^{q} \alpha_{2i}\, \Delta EXR_{t-1} + \sum_{i=1}^{q} \alpha_{3i}\, \Delta LTOP_{t-1} +$$
$$\sum_{i=1}^{q} \alpha_{4i}\, \Delta LFDI\ Net\ Inflow_{t-1} + \sum_{i=1}^{q} \alpha_{5i}\, \Delta INT_{t-1} + \lambda ECT_{t-1} + e_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots 7$$
$$d(rgdp)c\ d\big(rgdp(-1)\big)\ d\big(exr(-1)\big)\ d\big(ltop(-1)\big)\ d\big(lfdi\ net\ inflow(-1)\big)d\big(int(-1)\big)ecm(-1)$$
$$\ldots\ldots\ldots\ldots\ldots\ldots\ldots 8$$

The lag orders for both the dependent and independent variables are denoted by p and q, respectively.
e_t is the random disturbance.
α *and* b are the parameters to be calculated.
Δ denotes the change operator.
$\lambda = (1 - \sum_{i=1}^{p} \delta_i)$ is the error correction term coefficient indicated by a negative symbol.
ECT_{t-1} represents the error correction term lagged by one period.
a_{1i} *to* a_{5i} signifies the short-term evolving coefficients within the model that capture the convergence towards the long-term equilibrium.

Nature and Sources of Data

The data for this study were from secondary sources. Specifically, annual time series data for the variables from 1970 to 2022 were obtained for the purpose of this study. The Annual Statistical Bulletin of the Central Bank of Nigeria (CBN), World Development Indicators (WDI), and the United Nations Conference on Trade and Development (UNCTAD) were my sources of data.

Findings and Discussion

Unit Root Test

In time series analysis, it is a standard practice to conduct a unit root test for macroeconomic variables to help ascertain their stationarity state and thereby prevent spurious results in the analysis.

Table 2: Summary of the Augmented Dickey-Fuller (ADF) Unit Root Test

Variables	ADF Statistics	Test Critical Values (5%)	Order of Integration	Conclusion
RGDP	-5.808358	-2.918778	I(0)	Stationary
EXR	-3.905438	-2.919952	I(1)	Stationary
LTOP	-7.329232	-2.919952	I(1)	Stationary
LFDI Net Inflow	-11.06996	-2.923780	I(1)	Stationary
INT	-7.926563	-2.919952	I(1)	Stationary

Source: Researcher's compilation (Eviews10)

The unit root test presented in Table 1 above shows that only RGDP (real gross domestic product growth rate) was integrated of order zero {I (0)}, i.e., stationary at level and have no unit root, while EXR (exchange rate), LTOP (log of trade openness), LFDI Net Inflow (log of foreign direct investment net inflow) and INT (interest rate) were integrated of order one {I (1)}, i.e., they are stationary at first difference and have no unit roots. From the above findings, none of the variables is of {I (2)} and have clearly shown a case of mixed order of integration, and therefore, it becomes appropriate to apply the bounds test.
Based on the result of the unit root test, the ARDL Bound Test was conducted to capture short-run and long-run causality relationships.

Table 3: Summary of Diagnostic Test Results

Test	Type	Statistic value		Probability value
Goodness of fit	R-Squared Adjusted R-Squared	0.575390 0.494878		
Joint significance	F-statistics	3.420476		0.010536
CUSUM	Recursive estimates	Lies within 5% significance level		
CUSUMSQ	Recursive estimates	Slight deviation from 5% significance level		
Normality	JB test	Jarque-Bera	2.012461	0.365594
Autocorrelation	Breusch-Godfrey LM Test	F-statistic	1.701663	0.1944
Multicollinearity	Variance Inflation Factors	Coefficient variance	Less than 10	No sign of multicollinearity
Durbin-Watson statistic				2.000162

Source: Researcher's Compilation, 2023.

The assessment of goodness of fit reveals that 58% of the variation in the dependent variable is explained by the independent variables, while the adjusted R-squared stands at 50%. The Durbin-Watson statistic, with a value of 2.000162, suggests an absence of autocorrelation in the regression analysis residuals. Furthermore, the Durbin-Watson statistic's value being

greater than R-squared indicates the test result's reliability and non-spurious nature. The Cumulative Sum of Recursive Residuals (CUSUM) analysis demonstrates the stability and accuracy of both long-term and short-term parameter estimates, with the graph showing the blue line staying within the critical boundaries at the 5% significance level. However, the Cumulative Sum of Squares of Recursive Residuals (CUSUMSQ) exhibits a slight deviation from the 5% significance level, possibly due to structural breaks. The diagnostic findings indicate normally distributed residuals, as the Jarque-Bera probability value exceeds the 5% significance level, and there is no serial correlation in the model, as confirmed by the f-statistical probability value of the serial correlation LM test exceeding the 5% significance level. Moreover, the assessment of multicollinearity using the Variance Inflation Factor (VIF) reveals the absence of multicollinearity, as all VIF values are less than 10.

Stability Test. Figure 1: Plot of Cumulative Sum of Recursive Residuals (CUSUM) and Cumulative Sum of squares of Recursive Residuals (CUSUMSQ)

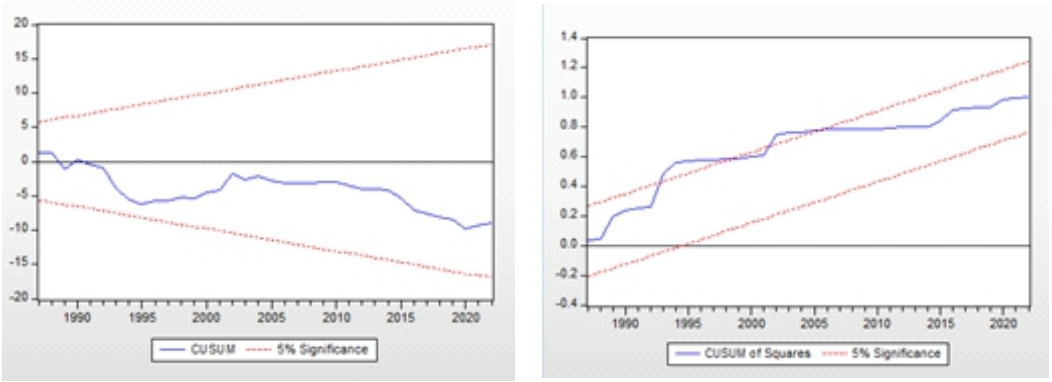

Table 4: Estimated long-run Coefficients of ARDL Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.811235	5.472468	0.148239	0.8828
RGDP(-1)	0.213720	0.112211	1.904619	0.0632
EXR(-1)	0.005645	0.006084	0.927879	0.0384
LTOP(-1)	0.815089	1.665760	0.489319	0.0270
LFDI_NET_INFLO W(-1)	2.269596	1.089392	2.083361	0.0429
INT(-1)	-0.093486	0.121623	-0.768654	0.0461

R-squared	0.575390	Mean dependent var	3.773922
Adjusted R-squared	0.494878	S.D. dependent var	5.059374
S.E. of regression	4.539705	Akaike info criterion	5.973732
Sum squared resid	927.4014	Schwarz criterion	6.201006
Log likelihood	-146.3302	Hannan-Quinn criter.	6.060580
F-statistic	3.420476	Durbin-Watson stat	2.000162
Prob(F-statistic)	0.010536		

Source: Researcher's compilation extracted from Eviews10 result

Evaluation of Research Hypotheses

Hypothesis 1

H_0: The exchange rate has no significant impact on Nigeria's real gross domestic product.

Decision: The outcome of the estimated long-run ARDL model shows that the exchange rate has a positive impact on RGDP and is statistically significant at the 5% significance level.

Hypothesis 2

H_0: The value of trade openness has no significant impact on Nigeria's real gross domestic product.

Decision: The outcome of the estimated long-run ARDL model shows that the value of trade openness has a positive impact on RGDP and is statistically significant at the 5% significance level.

Hypothesis 3

H_0: Foreign direct investment net inflows have no significant impact on Nigeria's real gross domestic product.

Decision: The outcome of the estimated long-run ARDL model shows that foreign direct investment net inflow has a positive impact on RGDP and is statistically significant at the 5% significance level.

Discussion of Results

The findings from the estimated long-run ARDL (Autoregressive Distributed Lag) model indicate significant positive impacts of the exchange rate, trade openness, and foreign direct investment (FDI) net inflows on Real Gross Domestic Product (RGDP).

Exchange Rate Impact on RGDP

The statistically significant positive impact of the exchange rate on RGDP suggests that changes in the exchange rate positively influence the country's economic output in the long run. A positive relationship indicates that a stronger or appreciating domestic currency contributes to higher RGDP. This could be due to several factors:

1. Export Competitiveness: A stronger exchange rate might make domestic goods relatively cheaper for foreign buyers, boosting exports. Increased exports lead to higher revenues for domestic industries, potentially enhancing overall economic output.
2. Attracting Foreign Investment: A stronger currency might attract more foreign investors looking to take advantage of favorable exchange rates. This influx of foreign investment can stimulate economic growth through job creation, technology transfer, and infrastructure development.

Trade Openness Impact on RGDP

The positive impact of trade openness on RGDP signifies that a more open economy, engaged in international trade, contributes positively to economic output in the long term. This relationship aligns with economic theories emphasizing the benefits of free trade:

1. Economies of Scale and Specialization: Increased trade openness allows countries to

benefit from economies of scale by producing goods where they have a comparative advantage. This specialization can enhance productivity and lead to increased RGDP.

2. Access to Diverse Markets: Opening up to international trade provides access to diverse markets, allowing for increased export opportunities. This fosters growth by expanding the consumer base for domestic goods and services.

Foreign Direct Investment (FDI) Impact on RGDP

The statistically significant positive impact of FDI net inflows on RGDP suggests that foreign investment contributes significantly to the long-term economic output of the country:

1. Capital Inflows and Technology Transfer: FDI brings in capital, expertise, and technology, which can lead to increased productivity and innovation within the domestic economy. This influx of resources and knowledge can contribute to RGDP growth.
2. Job Creation and Economic Development: FDI often results in the creation of jobs and the development of infrastructure, positively impacting the economy and contributing to overall economic growth.

In conclusion, the findings suggest that a stronger exchange rate, increased trade openness, and higher FDI net inflows are associated with higher RGDP. Policymakers can consider leveraging these relationships by fostering a conducive environment for trade, encouraging foreign investment, and maintaining stable exchange rates to promote sustained economic growth. However, it's crucial to continually monitor and manage these factors to mitigate potential risks and ensure long-term economic stability.

Conclusion

In conclusion, the empirical results offer robust support for the proposition that a stronger exchange rate, increased trade openness, and higher FDI net inflows are associated with notable improvements in RGDP. Recognizing these relationships is pivotal for policymakers seeking to formulate strategies that encourage favorable exchange rates, promote trade liberalization, and attract foreign investment, thereby fostering sustained economic growth and development. However, continued monitoring and prudent management of these factors remain essential to mitigate potential risks and ensure the stability of long-term economic prosperity.

Recommendations

1. **Foster Exchange Rate Stability and Competitiveness**

Given the positive impact of exchange rates on RGDP, maintaining a stable exchange rate environment is crucial. Policymakers should aim to implement measures that promote stability while also considering policies that enhance competitiveness. This may involve monitoring and managing currency fluctuations to ensure they remain favorable for both domestic industries and export activities.

2. **Promote Trade Liberalization and Integration**

Building upon the positive impact of trade openness on RGDP, emphasis should be placed on

policies that further liberalize trade and facilitate integration into global markets. This could involve reducing trade barriers, negotiating favorable trade agreements, and investing in infrastructure to facilitate smoother trade processes. Encouraging diversification of exports and promoting access to new markets can enhance economic growth.

3. **Create a Favorable Environment for Foreign Direct Investment**

Recognizing the significant positive impact of FDI net inflows on RGDP, efforts should be directed toward creating an attractive investment climate. Policymakers should focus on initiatives that streamline regulatory processes, offer incentives for foreign investors, and ensure legal and institutional frameworks that protect investments. Additionally, promoting technology transfer and knowledge sharing through FDI can amplify its positive impact on economic growth.

4**. Enhance Economic Resilience and Risk Management**

While these factors positively influence RGDP, it's essential to recognize potential risks. Policymakers should develop strategies to mitigate risks associated with over-dependence on certain types of foreign investment, sudden currency fluctuations, or trade imbalances. Diversification of export markets and investment sources can help cushion against external shocks.

5. **Invest in Human Capital and Innovation**

To fully leverage the benefits of these factors on economic growth, investing in human capital and fostering innovation is crucial. Education and skill development programs can enhance the workforce's ability to adapt to changing economic landscapes. Encouraging research and development, technological advancements, and entrepreneurship can further propel economic growth fueled by these positive influences. By implementing these recommendations, policymakers can harness the positive impacts of exchange rates, trade openness, and FDI net inflows, fostering a more robust and resilient economy poised for sustained growth and development.

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