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Investigating the Impact of Growth Variables an ARDL Bound Testing Approach

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ABSTRACT

This study examines the impact of inflation, interest rates, and exchange rates on the Nigerian economy using time series data from the CBN spanning from 1986 to 2022. With two main objectives, it investigates their effects and estimates the short-term impact on GDP. Utilizing methods like Augmented Dickey-Fuller unit root test, Autoregressive Distributed Lag (ARDL) Bound Test, and Granger causality test, the study establishes an ARDL short-run model to measure the influence of GDP, inflation, interest rates, and exchange rates on economic growth. Diagnostic tests, including the Fisher test, validate the model, explaining 98.5% of GDP variation. Stability in model parameters and error term constancy is confirmed by CUSUM tests, affirming the model's robustness. Granger causality tests indicate that GDP does not precede inflation, interest rates, or exchange rates. The study underscores the importance of stabilizing exchange rates for consistent short-term economic performance in Nigeria, urging policymakers to prioritize monitoring and stabilization measures.

Keywords: Gross Domestic Product, Inflation Rate, Interest Rate, Exchange rate, Auto-Regressive Distributed Lag (ARDL) Model.

INTRODUCTION

The intricate interplay among inflation, interest rates, and exchange rates plays a crucial role in shaping economic dynamics. While moderate inflation can drive growth, high and unpredictable inflation can disrupt consumer purchasing power and long-term planning. Similarly, lower interest rates can stimulate borrowing and investment, but excessively low rates may lead to overborrowing, while high rates can hinder economic activity.

A stable and competitive exchange rate can positively affect international trade and attract foreign investment, enhancing export competitiveness. Conversely, excessive volatility or a sharp depreciation of the local currency can raise import costs, contributing to inflationary pressures and potentially increasing external debt burdens. Central banks often use interest rates to control inflation, but while higher rates may curb inflation, they may simultaneously restrain economic growth, whereas lower rates may spur growth but also fuel inflationary pressures.

In Nigeria, inflation is currently very high at 33.2%. This is primarily caused by the local currency losing its value and the removal of subsidies on fuel. Food prices, which make up a significant portion of Nigeria's inflation measure, have risen sharply to 40%. Additionally, the core inflation rate, which excludes food and energy prices, has reached 25.9%, indicating widespread price increases across various sectors. Despite this high inflation, the monthly increase in consumer prices has slightly decreased from 3.1% to 3%. (NBS, Nigeria, 2023).

In May 2023, Nigeria's inflation hit a near 18-year high of 22.41%, up from 22.22% the previous month, driven by increased food prices and gasoline shortages due to the removal of a government fuel subsidy. Food

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prices rose by 24.82%, mainly driven by higher costs of vegetables, oils, bread, fruits, meat, and tubers. Transportation costs surged due to gasoline shortages. Core inflation, excluding farm products, was 20.06%, slightly down from the previous month's high. Monthly consumer prices rose by 1.94%, the highest increase in seven years, up from 1.91% in April. (NBS, Nigeria, 2023).

Nigeria faces challenges from inflation, fluctuating interest rates, and exchange rate volatility, which can cause short-term shocks and long-term structural shifts. Despite various studies on these factors, none have comprehensively analyzed their interdependencies. Investigating these relationships using advanced econometric models like ARDL and VECM is crucial for sustainable development and economic stability. This study aims to fill this gap by examining how inflation, interest rates, and exchange rates collectively impact Nigeria's economic growth. It seeks to provide valuable insights for evidence-based policymaking.

In the contemporary global landscape, understanding the intricate relationships between inflation, interest rates, exchange rates, and their collective impact on economic growth demands sophisticated analytical tools. The Autoregressive Distributed Lag Model (ARDL) provide insights into the nuanced dynamics shaping Nigeria's economic landscape.

EMPIRICAL REVIEW

Various studies have explored the impact of inflation on economic growth across different regions and timeframes. Mamo (2012) analyzed 13 Sub-Saharan African countries from 1969 to 2009, highlighting a negative relationship between inflation and economic growth. Additionally, they found that inflation rates in one country can predict growth rates in others. Similarly, Kaur (2019) investigated factors influencing inflation in India from 1996-97 to 2016-17, emphasizing the importance of maintaining low and stable prices within India's economic framework.

Bhowmik (2015) delved into inflation and its causes in India from 1970 to 2013, noting a slow adjustment towards long-term equilibrium. In Turkey, Bozkurt (2014) explored the relationship between inflation, money supply, and growth from 1999 to 2012, highlighting the need for structural changes to reduce dependence on foreign markets. Meanwhile, Mkhatshwa et al. (2015) studied the impact of inflation on economic and agricultural growth in Swaziland, finding a negative relationship between inflation and overall economic growth but a positive association with agricultural growth.

In Ethiopia, Denbel et al. (2016) examined relationships among money supply, inflation, and economic growth, supporting a relationship from economic growth to inflation and from money supply to economic growth. Shifting focus to Nigeria, Adaramola & Dada (2020) studied the impact of inflation on economic growth, revealing negative influences of inflation and the real exchange rate on economic growth, while interest rates and money supply had positive impacts.

Meanwhile, Matarr and Momodou (2021) focused on the impact of interest rates on economic growth in Gambia from 1993 to 2017, employing the VECM. While no immediate association emerged between Gambian economic growth and interest rates, a significant long-run connection was identified, particularly from real interest rates and real exchange rates to GDP, underscoring their pivotal role in shaping economic development.

In another study, Aderemi et al. (2020) investigated the relationship between monetary policy and macroeconomic variables

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in Nigeria, utilizing the Bounds Test Error Correction Model (ECM) and the ARDL model. They observed an initially insignificant negative relationship between monetary policy and real GDP in the short run, which shifted to a positive correlation in the long run. Consequently, the Nigerian monetary authority was urged to swiftly implement a contractionary monetary policy.

Ajayi et al. (2017) explored the impact of interest rates on economic growth in Nigeria using the ECM. Their findings revealed a negative short-run relationship between interest rates and GDP growth, with a causal link identified between savings deposits and GDP. To foster capital formulation, the study recommended implementing policies aimed at enhancing the savings culture.

In a broader context, studies such as Kenny (2019) underscored the significance of exchange rate policies, emphasizing the influences of currency rates, foreign reserves, and capital inputs on Nigeria's growth trajectory. Nevertheless, Okorontah and Odoemena (2016) suggested enhancing Nigeria's competitive edge through export diversification due to a weak link between exchange rates and growth.

Inyiama (2013) conducted research exploring the relationship between inflation, interest rates, and exchange rates on Nigeria's economic growth. Using the ordinary least squares method and analyzing data spanning from 1979 to 2010 for each variable, a multiple regression analysis was employed. The findings indicated a negative association between inflation and real gross domestic product, while a positive correlation was observed for exchange rates and interest rates, albeit not statistically significant. Nevertheless, the influence of increasing interest rates on Nigeria's economic growth has continued to raise doubts, Acha (2011).

Similarly, Idris and Suleiman (2019) examine the inflation-economic growth nexus in Nigeria from 1980 to 2017 using the vector error correction mechanism (VECM) methodology. They find a long-run relationship among key variables - GDP, inflation rate, interest rate, and exchange rate—suggesting lasting effects of changes in one variable on others. Particularly, high inflation and interest rates negatively impact Nigeria's economic growth, eroding purchasing power, inducing uncertainty, and discouraging investment and borrowing, thus constraining economic expansion.

Despite providing valuable insights, the studies conducted by Inyiama (2013) and Idris and Suleiman (2019) encounter limitations, including reliance on historical data that may not fully capture recent economic trends, methodological constraints, and statistically insignificant correlations. While both studies explore correlations between variables, they do not definitively establish causation. Potential confounding factors such as omitted variables, reverse causality, or endogeneity could complicate the observed relationships, making it challenging to establish direct causal links. Consequently, although these studies contribute to the existing literature, further research is necessary to overcome these limitations and gain a more comprehensive understanding of the inflation-economic growth relationship in Nigeria.

This study could enhance Inyiama's and Idris and Suleiman's research by employing ARDL technique capable of capturing nonlinear dynamics and structural breaks. Additionally, extending the time period of analysis would allow for a more accurate depiction of evolving economic dynamics and structural changes over time. Rigorous investigation of causality using Toda-Yamamoto procedure would help address potential omitted variables and reverse causality issues. By addressing

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these aspects, this study could significantly contribute to enhancing the findings and implications of both Inyiama's and Idris and Suleiman's research on inflation and economic growth in Nigeria.

MATERIALS AND METHODS

This paper adopts the ARDL co-integration Bound test as its econometric methodology. It utilizes yearly time series data spanning from 1986 to 2022, sourced from the World Bank National Account data and CBN Statistical Bulletin. To assess stationarity, the Augmented Dickey-Fuller (ADF) Unit Root Test is employed. Additionally, the study utilizes the Toda & Yamamoto test procedure to examine Granger causality among the variables under investigation. Finally, a series of post-estimation diagnostic tests, including the Breusch-Godfrey Serial Correlation LM Test, Ramsey's RESET test, Normality Test Durbin Watson test, Jarque Bera test, Cusum test, and Cusum of Square test, are conducted.

Model Specification

In an effort to explore the influence of inflation, interest rates, and exchange rates on Nigeria's economic growth, this study adapts the model proposed by Inyiama and (2013). Idris Suleiman (2019). Following their framework, the model for this investigation is represented as follows:

$$LNGDP = f(LNINF, LNINT, LNEXCH). \quad (1)$$

Expanding Equation (1) yields

$$LNGDP = f(\beta_0 + \beta_1 LNINF + \beta_2 LNINT + \beta_3 LNEXCH + \mu_i). \quad (2)$$

Here, LNGDP denotes the logarithm of GDP, LNINF stands for the logarithm of inflation rate, LNINT represents the logarithm of interest rate, LNEXCH symbolizes the logarithm of exchange rate, and μ_i signifies the error term, assumed to follow a normal and independent distribution with zero mean and constant variance. This term captures other explanatory variables influencing the exchange rate but not explicitly included in the model. Additionally, β_0 represents the intercept of the regression model, indicating the predicted value of the dependent variable when all independent variables are held constant, while β_1, β_2 and β_3 denote the partial elasticities of LNGDP concerning LNINF, LNINT, and LNEXCH, respectively.

Unit Root Test

Macroeconomic variables often exhibit a random walk nature, necessitating the transformation of such variables into first differences. Datta and Kumar (2011) caution against regressing a non-stationary series on another, as it may yield misleading results. To mitigate this risk, the Augmented Dickey-Fuller (ADF) technique, developed by Dickey and Fuller (1979), is employed. This test is crucial as it guides the selection of appropriate estimation techniques for the analysis. The equations representing the trend and intercept of the unit root are as follows:

$$\Delta Y_t = \beta_0 + \lambda Y_{t-1} + \beta_i \Delta Y_{t-1} + \mu_{ti} \quad (3)$$

for the intercept, and

$$\Delta Y_t = \beta_0 + \lambda Y_{t-1} + \beta_{it} + \beta_i \Delta Y_{t-1} + \mu_{ti} \quad (4)$$

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for trend.

where Y_t is the tested variable for unit root, Δ is the first difference, μ_{ti} denotes error term at period i, Y_{t-1} represents the one period lag of the tested variable for unit root.

The ADF equations test the following pairs of hypotheses:

H_o: $\beta_1 \neq \gamma_1 \neq \varphi_1 = 1$ (the series contains a unit root) against

H_1: $\beta_1 \neq \gamma_1 \neq \varphi_1 < 1$ (the series is stationary)

Test for Co-Integration

Modeling time series to maintain their long-run information can be achieved through cointegration. Granger (1981) and Engle and Granger (1987) were the pioneers in formalizing the concept of cointegration. They provided tests and estimation procedures to assess the existence of a long-run relationship between a set of variables within a dynamic specification framework.

Cointegration tests are used to determine if there is a correlation between multiple time series in the long term. The idea was first introduced by Nobel laureates Robert Engle and Clive Granger in 1987, following the publication of the spurious regression concept by British economist Paul Newbold and Granger.

To examine the short run relationships between economic growth, inflation, interest rate and exchange rate different order of integration when there is no cointegration as in this study, the bounds test for co-integration within the autoregressive distributed lag (ARDL) modelling technique is employed in this study. This model was developed by Pesaran et al. (2001). Thus, the ARDL model used in this paper involves estimating the following conditional error correction models.

$$\Delta LNGDP = \beta_0 + \sum_{i=1}^{n} \beta_1 \Delta LNGDP_{t-1} + \sum_{i=1}^{n} \beta_2 \Delta LNINF_{t-1} +$$

$$+ \sum_{i=1}^{n} \beta_3 \Delta LNINT_{t-1} + \sum_{i=1}^{n} \beta_4 \Delta LNEXCH_{t-1} +$$

$$+ \alpha_1 LNGDP_{t-1} + \alpha_2 LNINF_{t-1} + \alpha_3 LNINT_{t-1} + \alpha_4 LNEXCH_{t-1} + \mu_i . \quad (5)$$

The ARDL long-run model is estimated if cointegration is found while the short-run model is estimated if otherwise.

$$\Delta LNGDP = \beta_0 + \beta_1 LNGDP_{t-1} + \beta_2 LNINF_{t-1} + \beta_3 LNINT_{t-1} + \beta_4 LNEXCH_{t-1} + \mu_i . \quad (6)$$

$$\Delta LNGDP = \alpha_0 + \sum_{i=1}^{n} \alpha_1 \Delta LNGDP_{t-1} + \sum_{i=1}^{n} \alpha_2 \Delta LNINF_{t-1} +$$

$$+ \sum_{i=1}^{n} \alpha_3 \Delta LNINT_{t-1} + \sum_{i=1}^{n} \alpha_4 \Delta LNEXCH_{t-1} + \mu_i . \quad (7)$$

where β_0 - β_4 are short-run elasticities, α_0 - α_4 are long-run elasticities, ECM_{t-1} is one lag of error correction term, Δ is first difference, μt is white noise, β_0 is constant term.

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RESULTS AND DISCUSSION

Preliminary Analysis

Figure 1 shows a line graph of natural log transformation of the macro-economic variables used in this study. Growth Domestic Product was at the lowest point in 1993 while its highest point was in 2014. Inflation Rate had its highest and lowest points in 1994 and 2001 respectively. Interest Rate had its lowest point in 1995 and was fluctuating during the period under consideration. While Exchange rate was on the increase from 1986 to 1991 then fluctuates to lowest level in 2020.

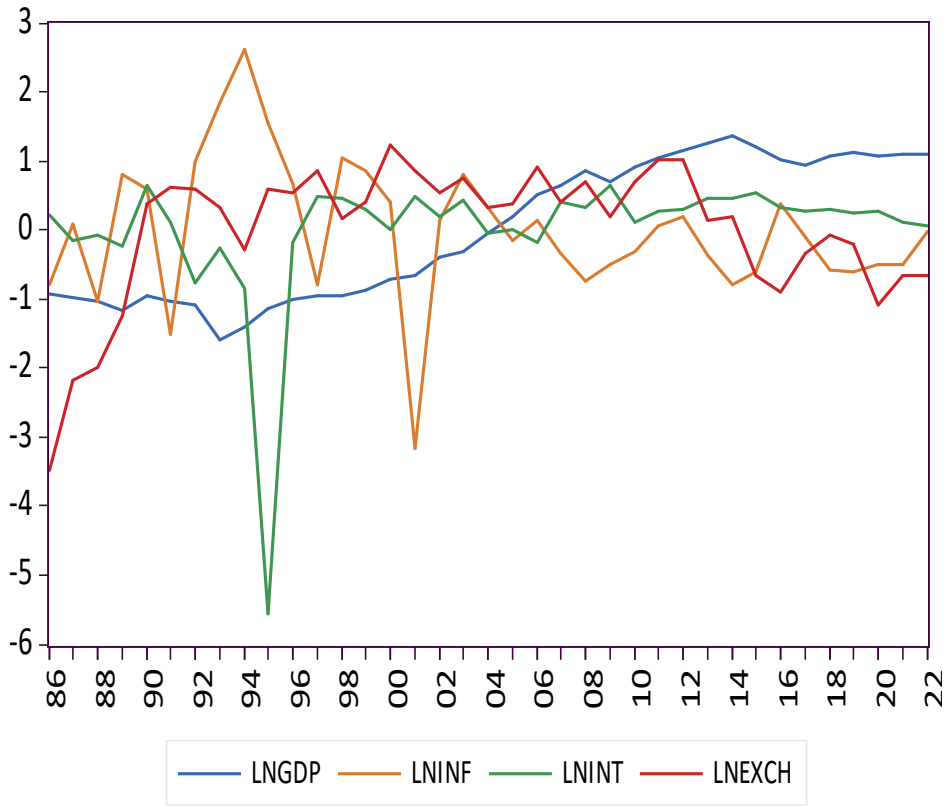

Figure 1: A Graph of macro economic variables

Source: Authors' computations (2024)

Descriptive Analysis

This section begins with descriptive statistics of the variables. This is followed by analyzing the time series property using test statistics of Augmented Dickey Fuller (ADF) to provide the basis for the analysis was also considered.

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Table 1: Descriptive statistics of variables

	LNGDP	LNINF	LNINT	LNEXCH
Mean	25.68790	2.761442	3.416308	2.797194
Median	25.63419	2.740195	3.595178	3.008343
Maximum	27.07622	5.383256	3.913622	3.584165
Minimum	24.04658	-0.400478	-0.804225	0.562197
Std. Dev.	1.022079	1.003048	0.757786	0.643159
Skewness	-0.023125	-0.195318	-4.852612	-1.603071
Kurtosis	1.304781	4.992551	27.51981	5.634989
Jarque-Bera	4.433691	6.356071	1072.094	26.55138
Probability	0.108952	0.041667	0.000000	0.000002
Sum	950.4523	102.1733	126.4034	103.4962
Sum Sq. Dev.	37.60727	36.21977	20.67264	14.89154
Observations	37	37	37	37

Source: Authors' computations (2024)

Table 1 summarizes statistics for GDP, inflation rate, interest rate, and real exchange rate. GDP has the highest standard deviation (1.022), indicating greater volatility. Exchange rate has the lowest (0.643). All variables show negative skewness, meaning they are skewed to the left. GDP is platykurtic (kurtosis < 3), while the others are mesokurtic (kurtosis > 3). The Jarque-Bera test shows only GDP deviates from normal distribution ($p > 0.05$), while the others do not.

Unit Root Tests

The Augmented Dickey-Fuller test was used to assess the order of integration and stationarity of the variables. All variables showed trends and intercepts, requiring the unit root test to consider both. The results are presented below.

Table 2: Unit root stationarity result

Variables	Augmented Dickey-Fuller (ADF) test					
	With Constant		With Constant & Trend		Without Constant & Trend	
	Level	First difference	Level	First difference	Level	First difference
LNEXCH	0.0025 ***	0.0000 ***	0.0263 **	0.0000 ***	0.6837 No	0.0000 ***
LNINTR	0.0006 ***	0.0000 ***	0.0016 ***	0.0000 ***	0.9953 No	0.0000 ***
LNINFL	0.0009 ***	0.0000 ***	0.0020 ***	0.0001 ***	0.4862 No	0.0000 ***
LNGDP	0.9134 No	0.0005 ***	0.7708 No	0.0034 ***	0.9708 No	0.0001 ***

Source: Authors' computations (2024)

Tables 2 displays ADF unit root results for level and first difference. Exchange rate, interest rate, and inflation rate are integrated at order zero with constant and trend, while real GDP is stationary at first difference. Due to the varied integration levels, we use the

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ARDL bounds testing approach by Pesaran et al. (2001) to examine long-run relationships between the variables.

ARDL Bound Test

We used a VAR model to determine the optimal lag length between variables for estimating the ARDL model. AIC results led us to select 3 lags.

Table 3: ARDL Bounds Test Result

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	2.945006	10%	3.47	4.45
k	3	5%	4.01	5.07
		2.5%	4.52	5.62
		1%	5.17	6.36
Actual Sample Size	34	Finite Sample: n=35		
		10%	3.8	4.888
		5%	4.568	5.795
		1%	6.38	7.73
		Finite Sample: n=30		
		10%	3.868	4.965
		5%	4.683	5.98
		1%	6.643	8.313
t-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
t-statistic	-1.765075	10%	-3.13	-3.84
		5%	-3.41	-4.16
		2.5%	-3.65	-4.42
		1%	-3.96	-4.73

Source: Authors' computations (2024)

The ARDL Bounds test results in Table 3 suggest no long-run relationships between GDP and the three independent variables. F-statistic (2.945) and t-statistics (1.765) are lower than significance levels, meaning the null hypothesis stands, indicating no co-integration. Thus, only short-run relationships exist among GDP, Inflation Rate, Interest Rate, and Exchange Rate in Nigeria.

Econometric Model of the Economic Growth in Nigeria

In the short-run ARDL model for Nigeria, GDP is positively influenced by its own lagged value at lag 1 and negatively at lag 3. Exchange Rate positively and significantly affects GDP, with a coefficient of 0.3139, indicating that a unit increase in the exchange rate leads to a 0.3139 increase in Nigeria's economic growth. Inflation Rate and Interest Rate have negative influences on GDP, they are not statistically significant.

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Table 4: Short Run Coefficient of ARDL (3 0 0 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNGDP(-1)	0.836941	0.193859	4.317268	0.0002
LNGDP(-2)	0.525650	0.296673	1.771819	0.0886
LNGDP(-3)	-0.492068	0.207858	-2.367324	0.0260
LNINF	-0.008970	0.032994	-0.271872	0.7880
LNINT	-0.087226	0.046741	-1.866148	0.0738
LNEXCH	0.313932	0.096932	3.238688	0.0034
LNEXCH(-1)	-0.160818	0.083821	-1.918587	0.0665
C	2.897541	1.921004	1.508347	0.1440
@TREND	0.017268	0.007882	2.190909	0.0380

Source: Authors' computations (2024)

In the short run, GDP is significantly and positively influenced by its own lagged values. Exchange Rate has a highly significant positive impact on current GDP, with a coefficient of 0.313932, indicating that a unit increase in Exchange Rate leads to a 0.313932 increase in GDP, holding other variables constant. However, the coefficients of Inflation Rate and Interest Rate are not significant at the 5% level. The equation for the short-run equilibrium relationship is as follows:

$$LNGDP = 2.8975 - 0.0089(LNINF) – 0.0872(LNINT) + 0.3139(LNEXCH)$$

The diagnostic tests, including Breusch-Godfrey Serial Correlation LM Test, Ramsey's RESET test, Normality Test, and Heteroscedasticity test, were conducted. The results, shown in Table 4, indicate that the short-run ARDL model concerning Inflation Rate, Interest Rate, and Exchange Rate is statistically significant at a 5% risk level. The determination coefficient suggests that 98.5% of GDP variation is explained by the ARDL model. Additionally, diagnostic tests for coefficient stability, model correctness, and residual hypotheses such as normality, no serial correlation, and homoscedasticity confirm the accuracy and suitability of the model.

The CUSUM and CUSUM of square residuals tests were used to assess stability and constancy of the error term. The CUSUM square detects systemic parameter variations, while the CUSUM test assesses model stability. Both tests showed stability in model parameters and constancy of error terms, as indicated by the blue lines staying within the 5% significance boundary.

Table 5: ARDL Diagnostic Estimations

Statistics	Value	Probability
R-Squared	0.985	98.5%
Adjusted R-Squared	0.98	98.0%
F-statistic	177.52	0.000*
Ramsey RESET Test	1.320	0.199*
Breusch–Godfrey Serial Correlation LM	0.273	0.764*
Breusch–Pagan–Godfrey	1.688	0.145*
ARCH test	0.42	0.521*
Durbin Watson	1.7259	

Source: Authors' computations (2024)

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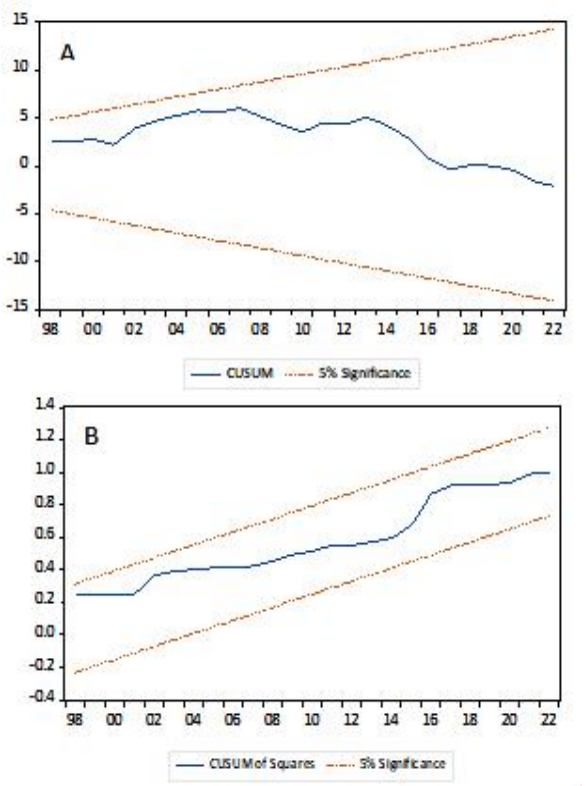

Figure 2: Plots for the (a) CUSUM and (b) CUSUM of Squares.

Granger Causality Test

To ensure the robustness of previous results, we conduct a Granger causality test using the Toda-Yamamoto procedure. A two-equation VAR model is established in the data levels, with an intercept in each equation. Based on FEC and AIC criteria, a maximum lag length of 3 for each variable is chosen (Table 3). Residuals of the VAR model are tested for serial correlation (Table 5), showing no significance, indicating dynamic stability. This allows for the application of the Toda-Yamamoto procedure for Granger causality testing, the results of which are presented in Table 6.

Table 7 indicates that GDP does not Granger cause inflation, interest rate, or exchange rate in Nigeria. However, there's a one-way causality from inflation to GDP and exchange rate, and another from interest rate to inflation and exchange rate. In other words, inflation influences GDP and exchange rate, while interest rate affects inflation and exchange rate.

Table 6: VAR residual serial correlation LM tests

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	24.36837	16	0.0818	1.647460	(16, 58.7)	0.0846
2	20.90781	16	0.1821	1.374677	(16, 58.7)	0.1864
3	20.73703	16	0.1888	1.361583	(16, 58.7)	0.1932
4	10.69484	16	0.8279	0.648560	(16, 58.7)	0.8304
5	14.61993	16	0.5526	0.914353	(16, 58.7)	0.5574
6	19.07837	16	0.2646	1.236172	(16, 58.7)	0.2696
7	14.84617	16	0.5359	0.930163	(16, 58.7)	0.5408
8	17.16383	16	0.3751	1.095297	(16, 58.7)	0.3803
9	17.46323	16	0.3563	1.117057	(16, 58.7)	0.3615
10	15.17922	16	0.5116	0.953536	(16, 58.7)	0.5165
11	15.62207	16	0.4796	0.984798	(16, 58.7)	0.4847
12	15.69047	16	0.4748	0.989646	(16, 58.7)	0.4799

Source: Authors' computations (2024)

Table 7: Granger causality test result based on Toda-Yamamoto procedure

Variable	Modified Wald Test			
	LNGDP	**LNINF**	**LNINT**	**LNEXCH**
LNGDP	**....**	16.22938 [0.0003] **	5.449277 [0.0656]	4.075258 [0.1303]
LNINF	4.356046 [0.1133]	**....**	12.93226 [0.0016] **	1.433103 [0.4884]
LNINT	0.950133 [0.6218]	5.373053 [0.0681]	**....**	0.670623 [0.7151]
LNEXCH	1.510596 [0.4699]	9.457120 [0.0088] **	10.12794 [0.0063] **	**....**

Note: ** denotes significant of the test statistic at 5% and 10% levels. Numbers in parenthesis are p-values.

Source: Authors' computations (2024)

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DISCUSSION

The short-term analysis reveals GDP is positively influenced by its lagged values and Exchange Rate, while Inflation Rate and Interest Rate lack significance. Exchange Rate fluctuations notably affect immediate GDP changes, indicating its significant role. In contrast, Inflation Rate and Interest Rate show inconsistent impact on short-term GDP fluctuations. Granger causality test suggests GDP doesn't directly affect inflation, interest rates, or exchange rates in Nigeria. Instead, a one-way causal link exists from inflation to GDP and exchange rates, and another from interest rates to inflation and exchange rates, indicating predictive roles of interest rates and inflation on subsequent economic variables. These insights can guide policymakers and analysts in economic strategy formulation.

CONCLUSION

The study conducts an extensive analysis of economic variables in Nigeria, employing various statistical tests and models. Initial steps include verifying normal distribution and time series properties, followed by ARDL bound tests for co-integration. Diagnostic tests ensure model reliability, confirmed by the Fisher test. The ARDL model effectively explains GDP variation, with diagnostic tests validating its appropriateness. Granger causality tests reveal directional relationships, indicating inflation's influence on GDP and exchange rates, and interest rates' impact on inflation and exchange rates. This underscores the importance of monitoring and stabilizing exchange rates for sustained short-term economic growth in Nigeria, suggesting policy focus in this area.

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