Inflation, External Debt and Economic Growth in Nigeria: Empirical Appraisal using ARDL

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ABSTRACT

Eternal debt when incurred and manage well can increase and sustain economic growth, thus increase the standard of living of citizens in an economy. In the same vein, an economy can not have a measure of zero inflationary digit, this implies a significance level of inflation is needed for the stabilization of an economy. Despite the above, Nigeria is experiencing a high level of inflationary level and huge external debt. Thus, the study examines the interplay among inflation, external debt and economic growth in Nigeria using the Auto-Redistributive lag methodology. The study reveals, both inflation and external debt has a reverse effect on economic growth in Nigeria. While an increase in the exchange rate leads to a substantial decrease of roughly 13.62 units in GDP. External debt's direct impact on GDP is insignificant, but lagged external debt variables exhibit negative impacts. Additionally, trade openness shows a minor adverse effect on GDP, with a one-unit increase resulting in a negligible decrease of about 0.05 units. The study also reveals only two (2) percent convergence annually to long run equilibrium from short run disturbance. The study concludes that High inflation, unfavorable exchange rates, and excessive external debt can hinderGDP growth. Thus, the study recommends that, managing exchange rate fluctuations is crucial. Policies should aim to stabilize the exchange rate to promote trade and investment. While the current external debt level does not significantly affect GDP, the lagged external debt variables do. Hence prudent debt management is essential to prevent long-term negative effects on economic growth. Trade openness has a minor impact on GDP. Improving infrastructure and reducing trade barriers are key to harness the benefitsof globalization.

Keyword: Trade Openness, exchange rate, inflation, growth

INTRODUCTION

External debt is used by countries to bridge their deficits and carry out economic projects that are able to increase the standard of living of the citizenry and promote sustainable growth and development. External debt also improves total factor productivity through an increase in output, which in turn enhances the GDP growth of a nation (Utomi, 2014). The importance of external debt cannot be overemphasized as it is an ardent booster of growth and thus improves living standards thereby alleviating poverty (Eswaran & Meenakshisundaram, 2017, and Utomi, 2014). Also, Hameed et al. (2008) argue that external borrowing ought to accelerate economic growth especially when domestic financing is inadequate. However, many Africa countries including Nigeria are face with major economic challenges known as external debt and besiege with high level of inflationary activities. Inflation and external debt are integral parts of a nation's economy. In these modern global economies, the level of inflation and external debts are of paramount concern as their activities can weaken macroeconomic policy of the government if not controlled. Government can borrow either internally or externally to accelerate the level of economic operations. Irrespective of the nature of debt, it can be used to drive the process of economic growth and development

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or to support existing level of economic activities. External debt has its implication since it is not free and it is subjected to external influences such as interest rate, exchange rates and volatility in inflationary trends. External debt is associated with debt servicing and this creates problems for many for developing countries. In reality, debt servicing is an unavoidable enemy as huge is sum of money is committed to it and it is usually greater than the actual amount borrowed. This indicates that debt servicing imposes a great burden on the country's growth. It drains financial resources that would have been used in developing a country

External debt can be classified on the basis of the status of the donor and the maturity structure. The classification based on donor is generally divided into official and private debts. Official debts are loans obtained from national governments or their agencies or from international agencies like the World Bank and the IMF. On the other hand, private debts consist of loan obtained from private creditors and include Eurodollar loans, suppliers' credit for exports, and loans from private commercial banks. While from the stand of the maturity structure of external debt, the loan can either be Short-term debts or long term. The short-term debt is those with an original maturity of one year or less. Long-term debts are generally subdivided into public or publicly guaranteed debt and private nonguaranteed debt. Publicly guaranteed external debt is usually defined as the external debt obligation of a private debtor that a public entity guarantees for repayment.

In Nigeria, external debt has a long history as its subject in the country is as old as the nation itself. This is evident as external debt in Nigeria dates back to 1958 with a contracted loan of US$28.0 million from the World Bank for railway construction. The implication and consequences of this loan seemed to be insignificant and pose no serious burden because interest charged on public loans was relatively small, averaging N3.2 million per annum and representing 0.2 per cent of GDP (Obadan, 2004). Between 1958 and 1977, debts contracted were concessional debts from bilateral and multilateral sources with longer repayment periods. This is because the country had little need for much external borrowing. Most of this borrowing consisted of short-term trade credits and was done by the States with explicit guarantees by the federal government through the federal export credit agency. Between 1982 and 1983, trade arrears were accumulated for the first time with much of the new debt not reflected in the new lending by the country (Iyoha, Ighodaro & Oligbi 2016)

In the early 1980's Nigeria witnessed a fall in the price of oil weaken the oil market thereby causing a reduction in export earnings. During this period, inappropriate macroeconomic policy complimented with the depletion of the nation's foreign exchange reserves resulted in larger external borrowing. The economic situation got worsen and borrowing continues in the 1970's but became worse between 1978 and 1983. During this period, the country witnesses a level of inflationary pressure as economic activities were distorted. This necessitated and implementation the introduction of the structural adjustment program in 1986. The oil prices collapsed between 1981 and 1983 leading to the devaluation of the naira and increased inflation (which was more than 20 percent) that discouraged foreign direct investment. The increased capital flight led firms to build up large inventories of imports often with over-invoicing or under-pricing of exports with the difference placed on deposits abroad (Iyoha, Ighodaro & Oligbi 2016)

According to Okungbowa, Oligbi & Iyoha (2018), In 1990, Nigeria's external debt rose again to US$33.1 billion. After a brief decline to US$27.5 billion in 1992, it rose steadily to US$32.6 billion at the end of 1995 representing an increase of about 10.7 percent from 1994 figure. In the second half of the 1990s, the growth rate of the external debt stock was generally negative or low such that the average growth rate over the 1996 – 2000 period was -2.6 percent. The debt stock stood at US$28,273.7 million in 2000 representing a marginal increase of 0.7 percent from 1999 figure (Obadan, 2003). From 2001, the debt stock resumed its upward trend, rising to US$35,944.7 million in 2004 representing an increase of about 9.2 percent.

This study adds to literature on the subject matter by applying ARDL approach to more recent data covering the period spanning from 1985 to 2023. This is very important because first, Africa in general and Nigeria

specifically has not received fair attention relative to its counterparts, especially industrialized economies. Second, studies on the relationship that exist among inflation, external debt and economic growth have been contentious, some studies have found negative relationship, others conclude that there is a positive relationship while others observed no relationship, making it somewhat difficult for policy decision making. Thus, unquestionably, the effect of inflation and external debt in relation to economic growth is a serious problem that needs to be addressed, and hence there is a need for further empirical studies investigating the effect of inflation and external debt on Nigeria economy.

LITERATURE REVIEW

Sharaf & Shahen, (2023, examined the symmetric and asymmetric impact of external debt on inflation in Sudan from 1970 to 2020 utilizing an Auto Regressive Distributed Lag (ARDL) model. The asymmetric impact is examined using a Nonlinear ARDL (NARDL) model. The existence of a long-run relationship between inflation and external debt is tested using the bounds-testing approach to cointegration, and a vector error-correction model is estimated to determine the short parameters of equilibrium dynamics. The linear ARDL model results show that external debt has no statistically significant impact on inflation in the long run. On the contrary, the results of the NARDL model show that positive and negative external debt shocks statistically affect inflation in the long run. The estimated long-run elasticity coefficients of the linear and nonlinear ARDL models reveal that the domestic money supply has a statistically significant positive impact on inflation. In contrast, the nominal effective exchange rate has a statistically significant negative impact on inflation.

Enongene & Etape (2023), investigate the effect of external debt stocks on inflation using World Bank data from 1980 to 2020 in Cameroon. The study makes use of non-linear ARDL to examine the positive and negative changes in external debt stocks and their effects on inflation. The results indicate a long-run increasing and decreasing asymmetry effect of external debts on inflation. Only the coefficient of positive external debt stock on inflation is positive and significant in the long run while in the short run, positive and negative external debt stocks respectively have a negative and positive significant impact on inflation. The study recommends that the government should be mindful of increasing external debt as it will become inflationary in the long run.

Yeboah (2022), studied the effect of external debt, unemployment rate, and inflation on economic growth in Ghana to determine the causal relationship between the variables to serve as an important factor for policymakers. The econometrics methods used include the stationarity test, Johansen cointegration test, and regression (ordinary least squares) and the data used was from the World Bank from 1991-2021. The stationarity test showed that external debt, GDP, and unemployment were non-stationarity and integrated at the first-order difference, whereas inflation was stationary at the level. The Johansen cointegration test found a long-run relationship between selected variables, but only external debt positively impacted economic growth in the long term. In contrast, inflation and unemployment had a negative impact. The regression results found external debt to be positively correlated to growth in Ghana, but inflation and unemployment harm it with GDP as the explained variable. The findings also indicate that external debt increased inflation, whereas GDP reduced inflation, but unemployment did not influence inflation. The outcome further proves that external debt positively impacted the unemployment rate, and GDP negatively influenced it.

El Aboudi & Khanchaou (2021) seek to empirically assess the effect of inflation and external debt on economic growth in Morocco during period of 1985 to 2019 using ARDL approach. The results from the ARDL model show that external debt negatively influences the country's growth in the short and long terms. Due to its direct effect, inflation slows down economic activity and leads to lower GDP growth. The econometric estimate indicates that the low level of inflation leads to difficulties in repaying debt and,

consequently, reduced economic growth.

Epaphra & Mesiet (2021), examined the external debt burden and economic growth in Africa using a panel data analysis covering 45 African countries over the 1990 to 2017 period. Based on the preferred models, it is revealed that relatively low levels of external debt-to-GDP ratio have a positive effect on eco-nomic growth and public investment in Africa. However, considerably high levels of external debt are likely to hamper both economic growth and public investment. Similarly, the debt service-to-export ratio tends to have a deleterious effect on public investment, which consequently results in lower economic growth. The burden of external debt and debt payments has been a remarkable cause of insufficient funds for public investments and growth, thus African countries need to expedite effective and efficient external debt management strategies that will favour timely repayment. The fact that trade has a positive impact on both investment and economic growth; growth activities in African countries should be financed through increased export earnings spearheaded by export-led-growth strategy as these would be the best alternative to external debt in the long-run. Pursuing policies that strengthen exports, sound exchange rate, and effective use of the labour force will lead to an improvement in economic growth.

Dawood, Baidoo & Shah (2021) investigated the determinants of external debt in 32 Asian developing and transitioning economies for the period 1995–2019 using the generalized method of moments (GMM). The results show that in both the short- and long-run, economic growth and investment reduce external debt, whereas exchange rate, trade, and government expenditure increase external debt. Diagnostic tests confirm the reliability and consistency of our findings, which should be taken into account by policymakers for policy formulation and implementation. Based on our empirical findings, relevant policy implications, aimed at reducing external debt in the selected Asian developing and transitioning economies, are provided for policy consideration.

Okungbowa, Oligbi & Iyoha (2018), examined External debt and economic growth in Nigeria interrogating the existence of a Debt Laffer Curve Using quarterly data for the years 1981 through 2015. Their study finds strong empirical evidence for the existence of both a debt overhang effect and a debt Laffer curve for Nigeria. Given these empirical results, the study recommends that policymakers should make effort to reduce Nigeria's external debt in order to promote rapid and sustainable economic growth in the years ahead.

Iyoha, Ighodaro & Oligbi (2016). Investigated Nigeria's External Debt Overhang in Nigeria with the use of OLS and the Cochrane –Orcutt method where there are established cases of auto-correlation in the residuals. Their study found that, overall, external debt has not positively contributed to economic growth in Nigeria and that there is no discernable evidence for the existence of a smooth inverted U-shaped debt Laffer curve in Nigeria. In sum, too much external debt is bad for economic growth in Nigeria; hence any externally borrowed funds should be judiciously utilized in order to benefit the economy

METHODOLOGY

The study adopted a well-known approach called autoregressive distributed lag (ARDL)/bounds testing cointegration procedure to estimate the long run and short run relationships and dynamic interaction among the variables of interest in Nigeria. Although ARDL models have been used in econometrics for decades, they have gained popularity in recent years as a method of examining cointegrating relationships. Two seminal contributions in this regard are Pesaran and Shin (1998) and Pesaran, Shin and Smith (2001). Pesaran et al. (2001) proposed an ARDL/Bounds Testing approach to investigate the existence of cointegration relationship among variables. In particular, they argue that ARDL models are especially advantageous in their ability to handle cointegration with inherent robustness to misspecification of integration orders of relevant variables. ARDL models are linear time series models in which both the dependent and independent variables are related not only contemporaneously, but across historical (lagged)

values as well. The ARDL model is considered as the best econometric method compared to others in a case when the variables are stationary at I(0) or integrated of order I(1). Based on the study objectives, it is a better model than others to catch the short-run and long-run impact of independent variables on economic growth. ARDL affords flexibility about the order of integration of the variables. ARDL is suitable for the independent variable in the model which is I(0), I(1), or mutually cointegrated (Frimpong & Oteng 2006).

Econometric Modelling via ARDL Bound Testing Approach

The study model national output as a function of inflation, external debt, exchange rate and trade openness in Nigeria. We specify the equation as follows:

$$GDP = f(INF.EDEBT, EXR, OPEN)\ldots \ldots \quad (1)$$

This is further transformed into an econometric model

$$GDP = \beta_0 + \beta_1 INF + \beta_2 EDEBT + \beta_3 EXR + \beta_4 OPEN + \mu \quad (2)$$

Where β_0 represents the intercept, β_i represents the coefficients of respective dependent variables and μ represents the error term, which has a zero mean.

Transforming the model in Equation (2) based on the ARDL approach, we obtain

$$\Delta GDP = \beta_0 + \beta_1 lnGDP_{t-1} + \beta_2 INF_{t-1} + \beta_3 EDEBT_{t-1} + \beta_4 EXR_{t-1} + \beta_5 OPEN_{t-1}$$

$$+ \sum_{i-0}^{p^1} \delta_7 \Delta GDP_{t-1} + \sum_{i-0}^{q^2} \delta_8 \Delta INF_{t-1} + \sum_{i-0}^{q^3} \delta_9 \Delta EDEBT_{t-1} + \sum_{i-0}^{q^4} \delta_{10} \Delta OPEN_{t-1} + \theta ECM_{t-1} + \mu_t \quad (3)$$

where, Δ indicates the differencing in the variables, that is $\Delta y_t = y_t - y_{t-1}$. We apply an autoregressive distributed lag (ARDL) model advanced by Pesaran et al. (2001) to Equation (3) to obtain the long-run and short-run effects of the independent variables on agriculture. The ARDL bound testing cointegration approach provides evidence on the long-run cointegrating relationship which may exist among the variables. Unlike the existing cointegrating models, the ARDL bounds testing approach is suitable irrespective of whether the variables are integrated of I(1), or I(0) or mutually cointegrated. Another advantage of this approach is its flexibility over small or large sample size.

The first part of equation (3) is the long run equation, when estimated, it is expected that $\beta_2 > 0$, $\beta_4 > 0$ since the indices indicate relatively peaceful conditions by higher figures. We also expect β_1 and β_3 to be negative. The same a-priori expectations apply to the second part of the equation which is the short-run of the model.

PRESENTATION AND DISCUSSION OF RESULTS

This session starts with a quick review of the annualized data collected from CBN 2022 report. The annualized time series data for the Nigerian economy from 1985 to 2022 and highlighted with the graphical chart below, here are some observations and insights:

GDP Trend: The Gross Domestic Product (GDP) of Nigeria has shown a generally increasing trend over the years, indicating economic growth and development. However, there are fluctuations in the growth rate, which may be attributed to various factors such as changes in government policies, global economic

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conditions, and internal socio-political factors.

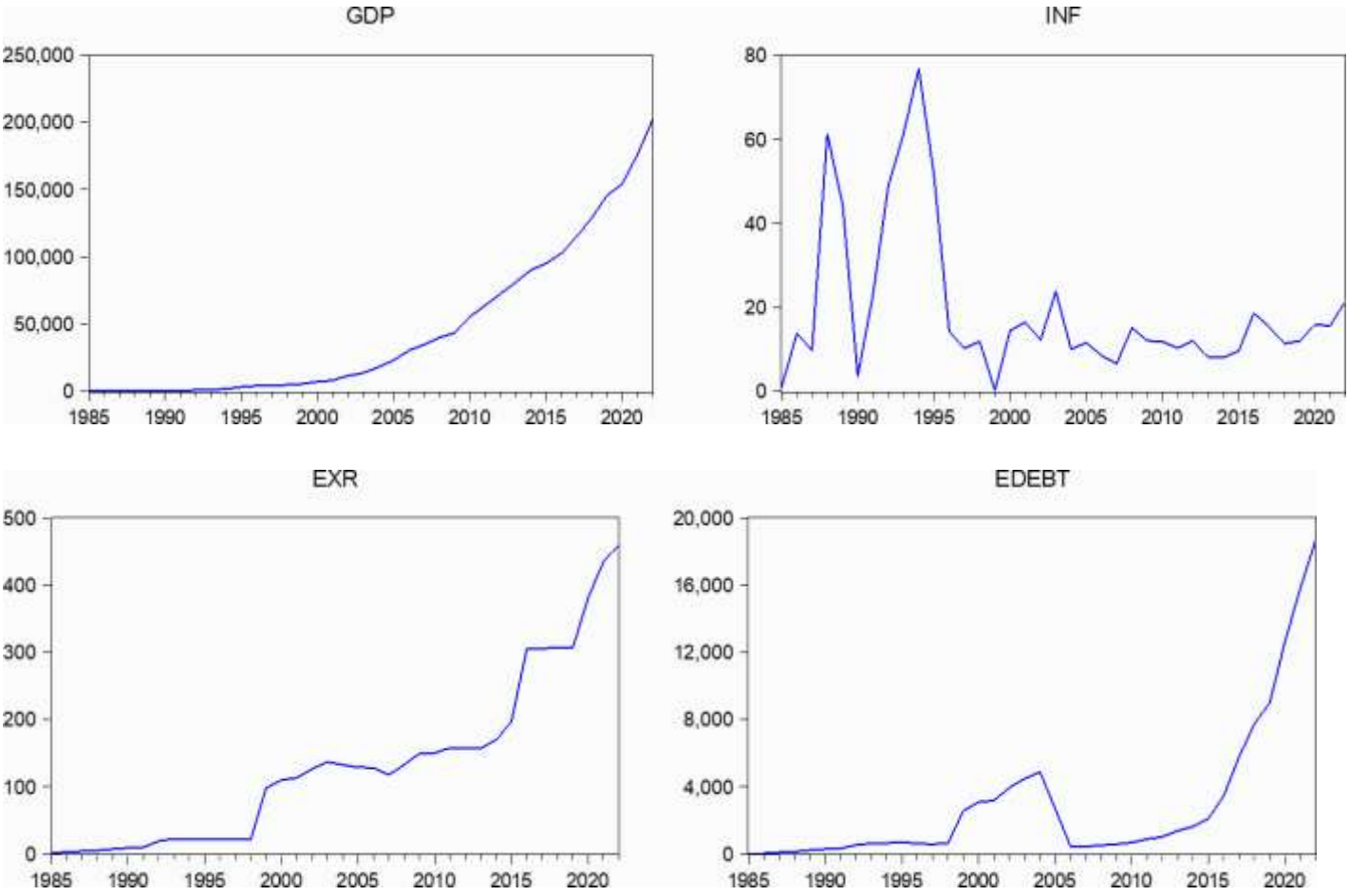
Inflation Dynamics: Inflation rates have varied significantly over the years, ranging from single digits to double digits. High inflation rates, especially in the late 1980s and early 1990s, indicate periods of economic instability and macroeconomic challenges. However, there have been efforts to stabilize inflation in more recent years.

Exchange Rate Fluctuations: The exchange rate of the Nigerian Naira (NGN) against major currencies such as the US Dollar (USD) has shown considerable volatility over time. This volatility can have implications for trade competitiveness, foreign investment, and inflationary pressures, highlighting the importance of effective monetary policy and exchange rate management.

External Debt Dynamics: Nigeria's external debt has increased substantially over the years, reflecting borrowing to finance infrastructure projects, budget deficits, and other development initiatives. Managing external debt sustainability and debt servicing obligations is crucial to prevent debt distress and maintain macroeconomic stability.

Trade Openness and Economic Integration: The data shows a significant increase in trade openness, as reflected in the ratio of trade to GDP. This indicates Nigeria's growing integration into the global economy and the importance of international trade for economic growth and development.

In more recent years, Nigeria has experienced relatively high GDP growth rates, although challenges such as inflation, exchange rate volatility, and external debt remain. Efforts to diversify the economy, improve infrastructure, enhance productivity, and attract investment will be essential for sustaining economic growth and achieving long-term development objectives.



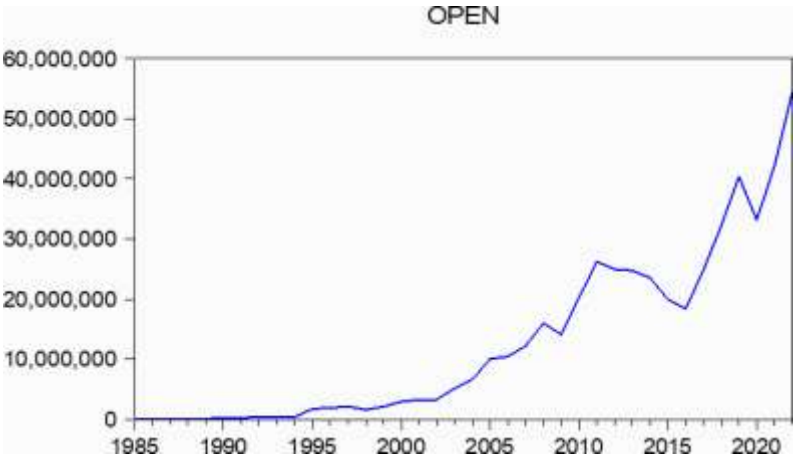


Fig 4. 1. Graphical analysis of inflation, external debt, and economic growth

Table 4.1: DESCRIPTIVE STATISTICS

	Mean	Median	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Probability
GDP	45824.72	15840.52	57118.9	1.201993	3.345943	9.339802	0.009373
INF	19.27847	12.1	17.9462	1.813391	5.304195	29.23286	0
EXR	133.1319	127.585	126.2933	1.013346	3.277424	6.625371	0.036418
EDEBT	2985.713	806.8576	4409.854	2.218675	7.353594	61.1861	0
OPEN	12622574	5878974	14327110	1.09358	3.406134	7.835307	0.019888

Source: Author's computation (2024)

The result reveals the following:

The GDP data shows a wide range of values, with a mean of approximately 45824.72 and a median of about 15840.52 with standard deviation relatively high, indicating significant variability in GDP across the observations. The positive skewness (1.201993) suggests that the distribution is skewed towards higher values, meaning there might be a few very large GDP values. The Jarque-Bera test indicates that the GDP data significantly deviates from a normal distribution.

Inflation Rate (INF): The inflation rate (INF) varies moderately across observations, with a mean of 19.27847 and a median of 12.10. The positive skewness (1.813391) indicates that the distribution is skewed towards higher inflation rates.

Exchange Rate (EXR): The exchange rate data has a mean of 133.1319 and a median of 127.5850. The standard deviation suggests moderate variability in exchange rates..

External Debt (EDEBT): The standard deviation suggests considerable variability in external debt across observations. The skewness (2.218675) indicates a significant right skew, suggesting some very high external debt values.

Openness (OPEN): The openness data has a mean of 12622574 and a median of 5878974. The standard deviation is exceptionally high, indicating substantial variability in openness across observations. The skewness (1.093580) suggests a slight right skew in the distribution.

Overall, these series show considerable variability and non-normality, suggesting that they may require

special consideration in statistical analyses and modeling.

Table 4.2: PRINCIPAL COMPONENT ANALYSIS:

Eigenvalues: (Sum = 5, Average = 1)					
				Cumulative	Cumulative
Number	Value	Difference	Proportion	Value	Proportion
GDP	3.750902	2.812217	0.7502	3.750902	0.7502
INF	0.938685	0.701602	0.1877	4.689587	0.9379
EXR	0.237083	0.182242	0.0474	4.92667	0.9853
EDEBT	0.054841	0.036352	0.011	4.981511	0.9963
OPEN	0.018489	—	0.0037	5	1

Source: Author's computation (2024)

The principal component analysis (PCA) or factor analysis, where the eigenvalues represent the variance explained by each component reveals the following:

Eigenvalues: The sum of eigenvalues indicates the total variance in the dataset, while the average represents the average amount of variance explained by each component. In this case, the sum of eigenvalues is 5, indicating that the components collectively explain all the variance in the dataset.

Cumulative Proportion: This column indicates the proportion of total variance explained cumulatively by each component. GDP: It explains 75.02% of the total variance, INF (Inflation Rate) explains an additional 18.77% of the total variance, resulting in a cumulative proportion of 93.79% when combined with GDP. EXR (Exchange Rate) explains 4.74% of the total variance, resulting in a cumulative proportion of 98.53% when combined with GDP and INF while external debt and trade openness explain the balance.

The high proportion of variance explained by GDP suggests that it is the most significant factor influencing the overall variation in the raw dataset. This indicates that changes in GDP have the greatest impact on the observed data patterns.

Inflation Rate (INF): While not as influential as GDP, the inflation rate still explains a substantial portion of the variance, indicating its importance in understanding economic trends.

This analysis suggests that GDP, inflation rate, exchange rate, external debt, and openness to trade are the primary factors driving the observed variation in the dataset, with GDP being the most dominant factor.

Table 4.3: STATIOARITY AND UNIT ROOT TEST

Group unit root test: Summary				
Series: GDP, INF, EXR, EDEBT, OPEN				
Exogenous variables: Individual effects				
Automatic selection of maximum lags				
Automatic lag length selection based on SIC: 0 to 1				
Newey-West automatic bandwidth selection and Bartlett kernel				
Null: Unit root (assumes common unit root process)				
Method	**Statistic**	**Prob.****	**Cross sections**	**Obs**

Levin, Lin & Chu t*	16.5308	1	5	184
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	11.4825	1	5	184
ADF – Fisher Chi-square	6.39023	0.7815	5	184
PP – Fisher Chi-square	6.98087	0.7272	5	185

Source: Author's computation (2024)

The results of the group unit root tests suggest that the individual series, including GDP, inflation (INF), exchange rate (EXR), external debt (EDEBT), and trade openness (OPEN), exhibit the presence of unit root processes. This indicates that these series may be non-stationary and display persistent behavior over time.

Specifically, both the Levin, Lin & Chu test (LLC) and the Im, Pesaran and Shin W-stat test indicate high probabilities of 1.0000, suggesting that we cannot reject the null hypothesis of a unit root in either a common unit root process or individual unit root processes for each series. Similarly, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests also yield relatively high probabilities, further indicating insufficient evidence to reject the presence of a unit root.

Given the non-stationarity of the individual series, the use of Autoregressive Distributed Lag (ARDL) models for further analysis may be appropriate. ARDL models can accommodate non-stationary variables and provide insights into both short-term and long-term relationships among the variables. Further diagnostic tests, such as cointegration tests, to ensure the suitability of ARDL modeling for capturing the relationships among the variables, differencing or other transformations to achieve stationarity was also applied before fitting the ARDL model.

ARDL RESULTS AND ANALYSIS

Table 4. 4. MODEL LAG LENGTH SPECIFICATION USING (AIC)

Model	577	452	582
LogL	-248.511715	-247.664701	-249.906235
AIC*	15.618336	15.627335	15.641543
BIC	16.381516	16.435409	16.359831
HQ	15.878602	15.902911	15.8865
Adj. R-sq	0.999923	0.999922	0.999921
Specification	ARDL(4, 0, 1, 4, 3)	ARDL(4, 1, 1, 4, 3)	ARDL(4, 0, 1, 3, 3)

Source: Author's computation (2024)

The table provides information about different specifications of the ARDL (Autoregressive Distributed Lag) model along with various model evaluation metrics. Each row represents a different model specification. The table compares the best three different specifications of the ARDL model. Each specification has different lag orders for the dependent and independent variables. AIC, BIC, and HQ are used to compare the models. Lower values of these criteria indicate better model fit. In this case, the first model (ARDL(4, 0, 1, 4, 3)) has the lowest values of AIC, BIC, and HQ, suggesting that it may be the best model. This was also in agreement with the high result of the adjusted R-squared value (above 95%) signifying the model with the lag specification remains the best fit.

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Table 4.5: BOND TEST FOR LONG RUN RELATIONSHIP

ARDL Bounds Test		
Null Hypothesis: No long-run relationships exist		
Test Statistic	Value	K
F-statistic	15.83124	4
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.45	3.52
5%	2.86	4.01
2.50%	3.25	4.49
1%	3.74	5.06

Source: Author's computation (2024)

The ARDL (Autoregressive Distributed Lag) Bounds Test is a method used to determine whether long-run relationships exist between variables in a regression model. The F-statistic (15.83124) exceeds the upper critical value bounds at all significance levels, we reject the null hypothesis of no long-run relationships. This suggests that there are statistically significant long-run relationships among the variables in the model

Table 4.6: TEST RESULT/EQUATION

Test Equation:				
Dependent Variable: D(GDP)				
Method: Least Squares				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(GDP(-1))	-1.256944	0.155019	-8.10834	0
D(GDP(-2))	-0.736766	0.215804	-3.414051	0.0033
D(GDP(-3))	-0.433344	0.16816	-2.576973	0.0196
D(EXR)	-13.6213	5.554057	-2.452495	0.0253
D(EDEBT)	-0.135465	0.163739	-0.827321	0.4195
D(EDEBT(-1))	-1.451478	0.215028	-6.750192	0
D(EDEBT(-2))	-0.570334	0.287782	-1.981829	0.0639
D(EDEBT(-3))	0.308746	0.256107	1.205534	0.2445
D(OPEN)	0.000762	4.66E-05	16.34288	0
D(OPEN(-1))	-9.94E-05	0.000109	-0.91418	0.3734
D(OPEN(-2))	-0.00013	6.39E-05	-2.02656	0.0587
C	74.47347	288.7869	0.257884	0.7996
INF	3.581477	6.189812	0.578608	0.5704
EXR(-1)	3.103167	3.598369	0.862382	0.4005
EDEBT(-1)	0.736613	0.143006	5.150916	0.0001
OPEN(-1)	0.001129	0.000133	8.51115	0
GDP(-1)	0.021963	0.01764	1.245023	0.23
R-squared	0.996764	Mean dependent var		5942.63

Adjusted R-squared	0.993719	S.D. dependent var		6450.633
S.E. of regression	511.2216	Akaike info criterion		15.61834
Sum squared resid	4442908	Schwarz criterion		16.38152
Log likelihood	-248.5117	Hannan-Quinn criter.		15.8786
F-statistic	327.3202	Durbin-Watson stat		2.280357
Prob(F-statistic)	0			

Source: Author's computation (2024)

The coefficients of the lagged variables (D(GDP(-1)), D(GDP(-2)), D(GDP(-3)), D(EXR), D(EDEBT), etc.) indicate their impact on the dependent variable (D(GDP)). The high R-squared and adjusted R-squared values indicate that the model fits the data well. The ARDL Bounds Test suggests that there are significant long-run relationships between the variables included in the model, particularly with GDP.

Table 4.7: MODEL ESTIMATE AND LONG-RUN FORM

ARDL Cointegrating And Long Run Form				
Dependent Variable: GDP				
Selected Model: ARDL(4, 0, 1, 4, 3)				
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1))	-1.256944481	0.155018724	-8.108339757	3.20E-04
D(GDP(-2))	-0.73676567	0.215803945	-3.414050986	0.003305695
D(GDP(-3))	-0.433344316	0.168160214	-2.576972915	0.019590165
D(INF)	3.581476706	6.18981249	0.578608272	0.570440568
D(EXR)	-13.62129775	5.554056967	-2.452495146	0.02528442
D(EDEBT)	-0.135464997	0.163739342	-0.827321004	0.419517368
D(EDEBT(-1))	-0.881144293	0.327056127	-2.694168429	0.015360852
D(EDEBT(-2))	-0.879079618	0.368076443	-2.388307198	0.028799138
D(EDEBT(-3))	0.308745598	0.256106819	1.205534469	0.244509531
D(OPEN)	0.000762143	4.66E-05	16.34287914	7.88E-12
D(OPEN(-1))	3.01E-05	0.000141336	0.213185023	0.833718273
D(OPEN(-2))	-0.00012956	6.39E-05	-2.026560231	0.058690857
CointEq(-1)	0.021962527	0.017640262	1.24502272	0.230013119
Cointeq = GDP – (-163.0722*INF -141.2937*EXR -33.5395*EDEBT -0.0514*OPEN -3390.9337)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF	-163.0721628	338.8990446	-0.481182126	0.636522086
EXR	-141.2937212	235.121809	-0.600938389	0.55580951
EDEBT	-33.53954695	24.52558258	-1.36753314	0.189267447
OPEN	-0.05141329	0.040218355	-1.278353883	0.218303126
C	-3390.933688	11974.51172	-0.283179287	0.780458845

Source: Author's computation (2024)

Cointegrating Form:

The cointegrating form shows the relationship between the dependent variable (GDP) and the independent variables in the long run.

- **Coefficients**: The coefficient of -1.2569 for D(GDP(-1)) implies that a one-unit increase in lagged GDP leads to a decrease in current GDP.
- **Probabilities (Prob.)**: p-value of 0.0033 for D(GDP(-2)) indicates that the coefficient is statistically significant at the 1% significance level.
- **CointEq(-1)**: his represents the cointegrating equation, which defines the long-run relationship between the variables. It shows how each variable contributes to the equilibrium level of GDP in the long run. it shows 2% rate of convergence to stability.

Long Run Coefficients: The long-run coefficients represent the impact of each independent variable on the dependent variable in the long run. A coefficient of -163.0722 for INF implies that a one-unit increase in inflation leads to a decrease of approximately 163.0722 units in GDP in the long run. The long run equation is as stated below

GDP = – 163.07INF -141.29EXR -33.54EDEBT -0.051OPEN -3390.9337

Table 4.8: RESIDUAL TEST

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	6.955671	Prob. F(2,15)	0.0073
Obs*R-squared	16.35986	Prob. Chi-Square(2)	0.0003

Source: Author's computation (2024)

The Breusch-Godfrey Serial Correlation LM Test is used to detect serial correlation (also known as autocorrelation) in the residuals of a regression model. Both the F-statistic and the Obs*R-squared statistic yield low p-values, indicating strong evidence against the null hypothesis of no serial correlation. We reject the null hypothesis and conclude that there is significant serial correlation present in the residuals of the regression model. Serial correlation in the residuals can lead to biased parameter estimates and unreliable hypothesis tests, so it's essential to address it in the model.

Table 4.9: HETEROSCADESTICITY TEST

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	1.07767	Prob. F(16,17)	0.4386
Obs*R-squared	17.1205	Prob. Chi-Square(16)	0.3778
Scaled explained SS	4.802415	Prob. Chi-Square(16)	0.9967

Source: Author's computation (2024)

The Breusch-Pagan-Godfrey test is a test used to detect heteroskedasticity in regression residuals.

Both the F-statistic and the Obs*R-squared statistic yield high p-values, indicating no evidence of heteroscedasticity. Therefore, we fail to reject the null hypothesis of homoscedasticity. Lack of heteroscedasticity ensures that the assumptions of ordinary least squares (OLS) regression are not violated,

which enhances the reliability of the regression results.

Based on the Breusch-Pagan-Godfrey test results, there is no evidence of heteroscedasticity in the regression residuals. Thus, the assumptions of OLS regression regarding constant variance of residuals are met, and the regression results can be considered reliable.

Table 4.10: MODEL DIAGNOSTIC

Ramsey RESET Test			
Equation: UNTITLED			
Specification: GDP GDP(-1) GDP(-2) GDP(-3) GDP(-4) INF EXR EXR(-1) EDEBT EDEBT(-1) EDEBT(-2) EDEBT(-3) EDEBT(-4) OPEN(-1) OPEN(-2) OPEN(-3) C			
Omitted Variables: Squares of fitted values			
	Value	**df**	**Probability**
t-statistic	0.127791808	16	0.899906121
F-statistic	0.016330746	(1, 16)	0.899906121
F-test summary:			
	Sum of Sq.	df	Mean Squares
Test SSR	4530.126155	1	4530.126155
Restricted SSR	4442907.78	17	261347.5165
Unrestricted SSR	4438377.654	16	277398.6034

Source: Author's computation (2024)

The Ramsey RESET test, also known as the Specification Error Test, is used to detect whether there are omitted variables in a regression model, particularly nonlinear relationships that may not be captured by the existing set of independent variables.

The high p-values associated with both the t-statistic and the F-statistic indicate that there is no significant evidence of omitted variables in the model. Thus, we fail to reject the null hypothesis, suggesting that the specified model adequately captures the relationship between the dependent and independent variables. The model's specification appears to be appropriate for explaining the variation in the dependent variable.

The coefficients, t-statistics, and probabilities suggest the statistical significance of each variable in explaining GDP. The extremely high R-squared value indicates that the model explains almost all of the variance in GDP, suggesting a very good fit. The F-statistic has an extremely low p-value (5.81E-32), indicating that the model as a whole is highly statistically significant in explaining GDP. The model appears to be well-specified and provides valuable insights into the relationship between the included variables and GDP.

CONCLUSION AND RECOMMENDATIONS

The relationship between the selected independent variables on economic growth of Nigeria was succinctly and methodologically evaluated using ARDL process. The analysis indicates that the ARDL model adequately captures the relationship between the independent variables (inflation, exchange rates, external debt, and trade openness) and the dependent variable (GDP). Based on the review of the data and the subsequent analysis, the following policy implications was drawn.

Results from ARDL and Statistical Recommendations:

1. **Address Autocorrelation**: Given the evidence of autocorrelation and partial correlation in the residuals, incorporating additional variables to better capture the dynamics of the relationship between the independent and dependent variables is recommended.
2. **Focus on Significant Predictors**: Particular attention should be paid to the statistically significant predictors identified in the model, such as lagged values of GDP, exchange rates, and external debt. Policies aimed at managing exchange rate stability and reducing external debt burdens could positively impact economic performance.
3. **Monitor Inflation and Trade Openness**: While inflation and trade openness were not found to be statistically significant predictors of GDP in the current model, policymakers should continue to monitor these variables as they can have significant effects on economic performance over the long term.

ECONOMIC POLICY RECOMMENDATIONS

Below are the economic policy suggestions drawn from the analysis,

1. **Exchange Rate Stability**: Given the significant impact of exchange rates on GDP, policymakers should prioritize measures to maintain exchange rate stability. This may include implementing monetary policies aimed at controlling inflation and managing currency fluctuations through interventions in the foreign exchange market.
2. **Debt Management**: The significant influence of external debt on GDP underscores the importance of prudent debt management policies. Policymakers should focus on reducing reliance on external borrowing, exploring options for debt restructuring, and implementing strategies to improve debt sustainability. This may involve pursuing fiscal discipline, enhancing debt transparency, and diversifying funding sources.
3. **Export Promotion**: Given the potential positive impact of trade openness on economic performance, policymakers should prioritize measures to promote exports and enhance trade competitiveness. This could involve reducing trade barriers, improving trade facilitation infrastructure, negotiating favorable trade agreements, and supporting domestic industries to increase their export capacity.
4. **Inflation Control**: Although inflation did not emerge as a significant predictor of GDP in the current model, policymakers should remain vigilant about inflationary pressures. Implementing appropriate monetary and fiscal policies to control inflation within acceptable limits is essential for maintaining macroeconomic stability and sustaining economic growth.
5. **Policy Coordination**: Effective economic policymaking requires coordination across different policy areas, including monetary, fiscal, trade, and debt management policies. Policymakers should work collaboratively to ensure coherence and consistency in policy decisions, minimizing potential conflicts and maximizing synergies to support sustainable economic development.
6. **Long-Term Planning and Vision**: Economic policymaking should be guided by a long-term vision and strategic plan that outlines clear objectives, priorities, and targets for sustainable economic development. Policymakers should engage in evidence-based policy formulation, stakeholder consultations, and periodic reviews to ensure alignment with national development goals and aspirations.

Economists and Policymakers should use the insights gained from this analysis as part of a broader decision-making process, considering both statistical/econometric findings and economic theory, to formulate effective policies aimed at promoting sustainable economic growth and development. Additionally, continuous monitoring and evaluation of policy effectiveness are essential to adapt and refine policies in

response to changing economic conditions and emerging challenges.

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