REVISITING INFLATION-GROWTH NEXUS IN NIGERIA: DOES POPULATION GROWTH MATTER?

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ABSTRACT

This study investigates the relationship between inflation rate and economic growth in Nigeria taking into consideration the effect of population growth in the country. The study uses annual time-series data from 1981 to 2023. The study controls for foreign sector influence, measured in exchange rates and FDI inflows, as well as cost of capital, measured in interest rates; while Gross Domestic Product (GDP) was used as proxy for Economic Growth. Data used were sourced from the CBN Statistical Bulletin, National Bureau of Statistics and World Development Indictors (WDI) database. The variables were subjected to unit root tests using Augmented Dickey-Fuller method. The variables are integrated at level, while others at first difference; a mixture of I(0) and I(1). Consequently, autoregressive distributed-lag (ARDL) model is employed to capture both the short-run and the long-run influences of the explanatory variables. The results reveal that inflation rate has no any influence on economic growth both in the short-run and long-run. Meanwhile, population growth exerts a positive impact on GDP but only in the short-run. Specifically, a unit increase in the population growth will increase GDP by 1.77 units in the short-run but not in the long-run. Other control variables, interest rate and exchange rate depreciation, are found to have more profound effects on economic growth. The error correction term (ECM) is found to be -0.219 implying about 22% convergence per each period. Thus, the study recommends measures to control inflation and slow the growth of population, while optimizing interest and exchange rates, to achieve sustainable economic growth in the country.

Keywords: *Economic Growth, Inflation, Population Growth, FDI, Exchange Rate*

1. Introduction

Achieving economic growth with low inflation rate is the central objective of macroeconomic policy. Failure of an economy to curb inflation and achieve price stability is tantamount to steering the ship of an economy to stop (Anidiobu, *et al.,* 2018). Generally, high inflation imposes welfare costs on a nation, hinders efficient allocation of resources, and as well discourages investments and savings in an economy as it creates uncertainty. When this happens, it hampers perception and discourages the foreign investors as they would shy away from investment opportunities in a country (Babatunde *et al.,* 2019).

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The situation also affects financial development because it makes financial intermediation more costly, and the poor are mostly affected because they revert to holding assets that provides a hedge against high inflation. It also decreases international competitiveness by making exports more expensive. It may also have detrimental effects on payments balance, and generally reduces long-term real growth (Bangura & Omojolaibi, 2024). The business and households perform poorly during the period of high inflation in a country (Michael & Mbam, 2017).

Over the past few decades, the inflation rate in Nigeria has been two digits; and these rates are believed to be on a high side. As fuel pump rises in a country or state, this affects a wide range of products and services in the economy. This in turn causes the average worker or employee to spend the same amount of money on little goods or services compared to previous days. So, to ensure the economy comes back to its optimal point of operation, the government tends to reduce inflation through a major monetary policy called the contractionary monetary policy. The principal benefit of low inflation is improved certainty and hence, the ability to plan. Meanwhile, the fact that increasing price level leads to; a fall in the standard of living, unpredictability of government policy actions and of macroeconomic relationships is no more an issue of dispute (Babatunde*, et al.*, 2019).The inability of the government to proffer a lasting solution to this problem indicates the inevitability of inflation in the economy; hence, it shows that government lacks the power to curb the persistent rising prices of goods and services in the domestic economy (Taiwo, 2011).

The link between inflation and economic growth has been one of the most researched topics for many years because of the central position the two variables occupy in macroeconomics (Bangura & Omojolaibi, 2024). Considerable previous research efforts seem to either support or invalidate the prepositions that inflation exerts significant positive or negative influence on economic growth. However, such studies used different estimation techniques and received different results. Some of them conclude that inflation increases economic growth as observed by (Babatunde, et al., 2019; Anidiobu, *et al.,* 2018; Kenneth, *et al.,* 2016; Majumder, 2016; Enejoh & Tsauni 2017; Umaru & Zubairu, 2012), while others showed that inflation affect economic growth negatively (Okoro & Ife 2024; Adaramola & Dada 2020; Michael, & Mbam, 2017; Madurapperuma 2016; Munyeka 2014). Even Barro (2013) agrees thawith the notion that inflation exerts negative influence on growth. However, the work of Ogege (2019) found no convincing evidence to conclude on any link between the duets. These findings imply that the relationship between these two economic variables is far from being empirically settled. Moreover, Shuaib, *et al.,* (2015) cannot provide a valid conclusion on the direction of causality between

the two macroeconomic variables, even though macroeconomists have been advancing the argument that moderate inflation is not bad for growth since the popularization of inflation targeting as a policy.

Nevertheless, even those countries that record higher inflation rates have been witnessing growth in GDP; Nigeria inclusive (Babatunde, et al., 2019). That rekindles the question of whether other non-inflationary factors exert more influence on growth to the extent that the seeming adverse effect of the inflation would go unnoticed. Among these factors is population growth which the microeconomic theory and empirical studies recognizes as a major trigger for demand and production even in the presence of rising prices (Akinola, 2021). However, the positive impact of population growth on GDP too is far from being settled. Within the microeconomic framework, the Law of Diminishing Return, which is rooted in the Malthusian theory of population growth, suggests that unlimited population growth is detrimental to economic prosperity (Brida, et, al., 2023; Omolola, Elijah, & Ede, 2023). Moreover, combined-effects of inflation rate and population growth on economic progress have not been very well addressed in the literature; the gap that this study intends to fill.

Thus, the main objective of this paper is to investigate the combined effects of inflation and population growth on Nigeria's GDP from 1981 to 2023. The rest of the paper is divided into four sections. Section Two reviews the relevant literature, Section Three establishes the methodology, Section Four presents the analysis of results and Section Five contains the conclusion and policy recommendations.

2. Literature Review and Theoretical Framework

2.1 Empirical Review

Literature is replete with the studies that investigated inflation-growth nexus. We review a handful of such studies here to pinpoint the gaps and identify the most widely used explanatory variables as well as the most effective methods for analyzing this relationship.

Kenneth, *et al.,* (2016) in a disputable approach, adopted a two stage least square estimation to examine a simultaneous equation model of the relationship between inflation and economic growth in Nigeria. The study used the three means of estimating over-identified simultaneous equations (2SLS, GMM and LIML) to estimate the effect of inflation on GDP. The study found a paradoxical result; that inflation exerts no benefit on growth, while growth is significantly beneficial to inflation; given the positive relationship between inflation and growth and the negative relationship between growth and inflation.

Elsewhere, Madurapperuma (2016) examined the impact of inflation on economic growth in Sri Lanka. The study adopted the framework of Johansen cointegration test and Error Correction model, and found out that there is a long run negative and significant relationship between economic growth and inflation in Sri Lanka.

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Majumder (2016) in his study, employed the error correction model to investigate the relationship between economic growth and inflation in Bangladesh during the period of 1975–2013. His study found out that inflation in Bangladesh has indicated a statistically significant long run positive relationship on economic growth.

Again, Michael & Mbam, (2017) examined the effect of inflation on Nigeria's economic growth for the period ranging from 1980 to 2015. Cointegration approach, vector error correction model (VECM) and Granger causality test were employed in the analysis. Variables engaged in the study involve real gross domestic product, inflation rate, government investment expenditure, private investment expenditure and total export. The results of cointegration test showed evidence of long-run relationship among the selected variables. The VECM results demonstrated that inflation affects Nigeria's economic growth negatively in the long-run.

Idris, *et al.,* (2017), in their study utilized a descriptive method and further utilized charts to show the inflationary trend and GDP growth. Their study revealed that the inflationary trend in Nigeria is negatively affecting the realisation of sustainable growth and development.

Enejoh & Tsauni (2017) examined the impact of inflation on economic growth in Nigeria between 1970 and 2016. The unit root properties of the series were tested. The result shows that the variables were I(0) and I(1). Therefore, the paper employed ARDL approach to co-integration and error correction mechanism (ECM) to test both the short and long run impacts of inflation on economic growth. The result shows that inflation and foreign exchange have positive impact on economic growth both in the short and long run.

Anidiobu *et al,* (2018) investigated the effect of inflation on economic growth in Nigeria utilizing annualized data covering the period 1986 – 2015. Augmented Dickey-Fuller (ADF) test was carried out and Ordinary Least Square (OLS) technique was used to estimate the parameters. The regression results indicated that inflation rates had a non-significant effect on economic growth (measured in real GDP) in Nigeria for the period under study.

Babatunde, *et al.,* (2019) examined inflation and economic growth in Nigeria. Time series data from 1981-2017 was used. The study used real gross domestic product as dependent variable while interest rate, inflation rate, consumer price index (CPI), and foreign exchange rate were used as independent variables. Thus, the vector Error correction method (VECM) was employed. The study observed that there was a negative relationship between interest rate and real GDP, exchange rate has a negative relationship with real GDP and finally, consumer price index has a positive relationship with the real GDP.

Also, Ogege (2019) analyzed the influence of inflation, interest and exchange rates on economic development in Nigeria. The secondary time series data employed were collected from the CBN statistical bulletins from

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1981-2017 and were analyzed using descriptive, correlation as well as regression analysis. The empirical results revealed the existence of relative effect of macroeconomic variables on Nigeria economic development indicators including inflation.

Adaramola and Dada (2020) examined the influence of inflation on the growth prospects of the Nigerian economy, the study employed the autoregressive distributed-lag method on the selected variables, i.e. real GDP, inflation rate, interest rate, exchange rate, degree of economy`s openness, money supply, and government consumption expenditures for the period 1980–2018. The study findings indicate that inflation and real exchange rate depreciation exert a significant negative impact on economic growth, while interest rate and money supply indicate a positive impact on economic growth. Other variables in the model depict no influence on the economic growth of Nigeria.

Blessing, Okoro and Ife (2024) analyzed the influence of inflation and Stagflation on the economic growth of Nigeria from 2012 to 2024. The authors employed the autoregressive distributed lag on the selected variables, i.e. real gross domestic product (GDP), inflation rate, interest rate, exchange rate, degree of openness, money supply, and government consumption expenditures for the period. The findings indicate that inflation and stagflation have a significant negative impact on economic growth in Nigeria.

On the other hand, many other studies were carried out to solely determine the exclusive effect of population growth on economic growth, some of which are reviewed below.

Peter and Bakari (2018) examined the impact of population growth on the economic growth of African countries using panel data approach from 1980 -2015. The study used annual secondary data of fifty three (53) African countries sourced from the World Development Indicators database. Data were collected for economic growth, proxied by GDP, population growth, fertility rate, crude death rate and inflation rate. The data were analyzed using descriptive statistics, as well as dynamic panel models of difference and system GMM. The results of the difference and system GMM suggest that population growth exerts a positive impact on economic growth of Africa while fertility has a negative impact on economic growth of Africa.

Akinola (2021) analyzed the impact of population growth on the economy of Nigeria. The methodology adopted for the study is the regression method using secondary data. The result from the ordinary least square revealed that there is a positive relationship between economic growth (proxy by GDP per capita), population growth, food production index and human development index; while negative relationships was found between economic growth (proxy by GDP per capita) and fossil fuel energy consumption. The result of the ordinary least square also revealed that population growth is a stimulus to economic growth in Nigeria.

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Befikadu and Tafa (2022) investigated the effects of population growth on economic growth in Ethiopia from 1980 to 2020 using an Autoregressive Distributive Lag (ARDL) Model Approach. The ARDL result revealed that, population growth (POP) and the implication is positive and significant, according to the findings of the study. However, in response to the long-term association between population expansion and economic growth in Ethiopia, the macroeconomic variables were subjected to a limit test and a broader causality test. According to the findings of the Granger causality test, real gross domestic product can cause Ethiopian population size (POP), but population number (POP) cannot cause real gross domestic product at the same time.

Omolola, Elijah and Ede (2023) in their study assessed the effects of population growth rate on economic growth among four most populous countries of the world namely China, India, United States of America and Nigeria. Time series data from the World Development Indicators spanning from 1991- 2020 were used. Autoregressive Distributed Lag (ARDL) model was used for the analysis and results revealed that in the long-run total population growth was negatively related with economic growth in all the four countries. However, in Nigeria, change in working age population, sectoral employment (proxy for human resource utilization) and trade openness had significant positive effects on economic growth both in the long-run and short-run.

Brida *et al.,* (2023) investigated the relationship between population and economic growth. They analyze the joint dynamics of economic and demographic growth in 111 countries from the period 1960–2019. The findings confirm the existence of three country clubs, each of which exhibits a different dynamic behavior pattern. The analysis also shows that the clusters clearly differ with respect to the evolution of other fundamental variables not previously considered [gross domestic product (GDP) per capita, human capital and life expectancy, among others]. The results indirectly suggest the existence of dynamic interdependence in the trajectories of economic growth and population change between countries.

Nwosu *et al.,* (2024) investigated the role of population growth on economic growth in Nigeria and how economic growth is affected through population growth. The study employed annual secondary observation from 1960 to 2008. The empirical results were based on Augmented Dickey-Fuller (ADF) stationarity test combined with Granger Causality and Cointegration tests. Empirical results support that population growth has a significant impact on economic growth. The study also found that there is a sustainable long run equilibrium relationship between economic growth and population growth. There is also the evidence of unidirectional causality between population growth and economic growth.

Steven, *et al.,* (2024) investigated population growth and inflation effects on the economic growth of East Asia using panel data regression. The data are taken from sample of East Asian countries from 2001-2022 annually.

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The findings reveal that when population growth and inflation are considered together, they have a significant effect on the economic growth of East Asia. Specifically, it was found that population growth has a significant positive relationship on the economic growth of East Asia. Conversely, inflation does not have a significant effect on the economic growth of East Asia.

Following all these empirical studies, it is evident that consensus has not been reached on the subject matter. Moreover, most of the studies have not investigated the combined effects of population growth and inflation rate on economic growth despite the rooted theoretical link between the variables. Thus, this study investigates that.

2.2 Theoretical Framework

2.2.1 Theories of Inflation

Quantity Theory of Money

The Quantity theory of money believe that the quantity of money in circulation is the main factor that determines prices level in any economy. If the quantity of money in circulation changes, it will lead to change in the price level of goods and services. The theory was propounded by Irving Fisher in his famous equation of exchange: MV=PQ, where M is stock of money, V is the velocity of circulation of money, Q is the volume of transactions generated internally, while P is the general price level. Transforming the equation by substituting Y, which is the total amount of goods and services exchanged for money for Q, the equation of exchange becomes MV=PY. The introduction of Y provides the relationship between the monetary and the real side of the economy. However, P, V and Y are endogenously determined internally. The variable M is the policy variable, which is exogenously determined by the monetary authorities. The monetarists argued that change in quantity of money affects price level only or the monetary side of the economy with the real sector totally excluded. This implies that variations in the supply of money do not affect the real output of goods and services, rather, their values or the prices at which they are exchanged. The main trust of the monetarists' model is its focus on long run supply side properties of the economy as against the short run dynamics (Dornbusch, Fischer & Kearney, 1996).

The Neo-Keynesian Theory of Money

This theory combines both aggregate demand and aggregate supply. The theory assumes a Keynesian view in the short run and a classical view in the long run. Therefore, the approach adopted in the theory explained that a change in public expenditure or nominal money supply, which is expected to produce inflation, is zero. As a result, aggregate demand increases with real money balances and therefore, decreases with the price level. The

Neo-Keynesian theory focuses on productivity; this is because, a decline in productivity leads to diminishing returns to scale and consequently, results to inflationary pressures which widened output gap (Michael, & Mbam, 2017).

2.2.2 Theories of Population Growth

Malthus Model of Population Growth

Malthus discusses Malthus's theory, which believed that the world's population tends to increase at a faster rate than its food supply. Whereas population grows at a geometric rate, the production capacity only grows arithmetically. Therefore, in the absence of consistent checks on population growth, Malthus made the prediction that in a short period, scarce resources will have to be shared among an increasing number of individuals. The positive check to population is a direct consequence of the lack of a preventive check. When society does not limit population growth voluntarily, diseases, famines, and wars reduce population size and establish the necessary balance with resources. According to Malthus, the ultimate check to population growth is lack of food (the means of subsistence). In turn, the means of subsistence are limited by the amount of land available, the 'arts' or technology that could be applied to the land, and the social organization or land ownership patterns. A cornerstone of his argument is that population tend to grow more rapidly than the food supply does, since population has the potential for growing geometrically, two parents could have four children, sixteen grandchildren, and so on, while he believed that food production could be increased only arithmetically (Akinola, 2021).

Boserup's Model

This model has been proposed by Boserup who has rejected classical (Malthusian trap) theory and rather basically argued that we would never out strip out food supply. She considers population growth as autonomous force of exogenous factor that causes to technological progress in agriculture and postulates that aggregate agricultural production function in the long run will always shift upward in response to population pressure to maintain output per capita. Generally, the reason why she rejects classical extensive margin is that land productivity can increase due to factors. Firstly, she argues increases in physical labor input to work longer hours will give increased output per hectare. Secondly, the long-term technological progress would lead increased output per hectare that results in to shift in the production function (Befikadu & Tafa, 2022).

In both inflation and population theories presented, one observes counter intuitive arguments among the theories, signifying that the impacts of the duos on economic growth are far from being settled even at theoretical level. These seeming contrary positions further justify the study of this nature.

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3. Methodology

This study investigated the combined effects of inflation and population growth in Nigeria for the period 1981 to 2023. The choice of the base period is informed as it marks the era when inflation becomes more pronounced in the country following the oil price increase at the international and local market, while the current period reflects the year at which annual data can be found. This study includes other variables that are directly affected by inflation rate. The study employs Autoregressive Distributed Lag (ARDL) Bounds test to cointegration technique, unit root test, residual diagnostic test and stability test.

3.1 Model Specification

This paper intends to determine the combined-effects of inflation rate and population growth on economic growth in Nigeria. However, the study has reviewed models used by various authors in the empirical literature. This work therefore, adapted and modified the econometric model used by Babatunde, *et al.,* (2019) on Inflation and Economic Growth in Nigeria. They used Real GDP (RGDP) as dependent variable while, the independent variables are Inflation (INF), Interest rate (INTR), Exchange rate (EXCHR) and Consumer price index (CPI). This study eliminated the Consumer price index (CPI) in the model. However, it included the Foreign Direct Investment (FDI) and Population Growth Rate (POP) which was not previously used in several Inflation research works.

The model specification for this study will be specified in functional form below. A model is developed to explain the contemporaneous or existing relationship between inflation rate, population growth and economic growth in Nigeria. Equation 1 can be transformed into functional form as:

$$GDP = f(INF, EXR, INTR, FDI, POP) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (1)$$

In econometric terms, the representation of equation 2 will be:

$$GDP_t = \beta_0 + \beta_1 INF_t + \beta_2 EXR_t + \beta_3 INTR_t + \beta_4 FDI_t + \beta_5 POP_t + \mu_t \dots\dots\dots\dots\dots (2)$$

Where:

GDP = Real Gross Domestic Product (GDP) as a proxy of economic growth, INF = Inflation Rate, EXR = Exchange Rate, INTR = Interest Rate, FDI = Foreign Direct Investment, POP = Population Growth Rate, β_0 = Constant term, β_1- β_5=Coefficients of explanatory variables, μ_t = Error term.

Taking the natural logarithm of equation 2 yields the empirical model for estimation of the study as represented in equation 3 as:

$$lnGDP_t = \beta_0 + \beta_1 INF_t + \beta_2 EXR_t + \beta_3 INTR_t + \beta_4 FDI_t + \beta_5 POP_t + \mu_t \dots\dots\dots\dots (3)$$

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Because of highly skewed values, the variable GDP and its lagged value were logged. The logarithmic transformation was meant to transform them into a dataset that is more normalized to avoid the problem of heteroscedasticity. The remaining regressors were not expressed in logarithms since their values were not highly skewed. We utilized the Augmented Dickey-Fuller (ADF) to check the time-series properties of the data before the estimation of the growth equation. Diagnostic and stability tests were employed to check the goodness of fit and model adequacy of our specification. The estimation of the economic growth equations was done through the Autoregressive Distributed Lag (ARDL) Bounds test to cointegration suggested first by Pesaran and Shin (1999) and supported by Pesaran, Shin, and Smith (2001).

Additionally, the ARDL is based on the assumption that the series are I(0), I(1) or a combination of I(0) and I(1). Therefore, one of the precursors of the ARDL model is the determination of the order of integration of all the series through a unit root test.

This method shows the short-run dynamics besides the estimated long-run coefficients. The Autoregressive Distributed Lag (ARDL) bounds testing procedure can be mathematically specified in equation 4 as follows:

$$\Delta lnGDP_t = \alpha_0 + \beta_1 \Delta lnGDP_{t-1} + \beta_2 \Delta IFL_{t-1} + \beta_3 \Delta EXR_{t-1} + \beta_4 \Delta NTR_{t-1} + \beta_5 \Delta FDI_{t-1} + \beta_6 \Delta POP_{t-1} + \sum_{i=1}^{p} \alpha_1 \, \Delta lnGDP_{t-1} + \sum_{i=1}^{p} \alpha_2 \, INF_{t-1} + \sum_{i=1}^{p} \alpha_3 \, \Delta EXR_{t-1} + \sum_{i=1}^{p} \alpha_4 \, \Delta INTR_{t-1} + \sum_{i=1}^{p} \alpha_5 \, \Delta FDI_{t-1} + \sum_{i=1}^{p} \alpha_6 \, \Delta POP_{t-1} + \varepsilon_t \ldots\ldots\ldots (4)$$

Where ρ denotes the lag length, Δ represents the difference operator, $\alpha_0$is the drift, $\mu_t$is the error term, $\beta_1$to β_6 are coefficients of the long-run dynamics while α_1 to α_6 are coefficients of the short-run relationship. Hence, equation 4 is the base equation for estimating the short-run and long-run relationship among the variables.

Under the bounds testing approach, the existence of a level relationship between GDP and its determinants would be examined. The existence of cointegration among the variables is empirically realized through F-test.

An error correction model associated with the long-run estimates would estimate to find the parameters of short-run dynamics. In this case, an error correction model associated with the long-run and short-run estimates described as:

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$$\Delta lnGDP_t = \alpha_0 + \sum_{i=1}^{p} \alpha_1 \Delta lnGDP_{t-1} + \sum_{i=1}^{p} \alpha_2 \Delta INF_{t-1} + \sum_{i=1}^{p} \alpha_3 \Delta EXR_{t-1} + \sum_{i=1}^{p} \alpha_4 \Delta INTR_{t-1} + \sum_{i=1}^{p} \alpha_5 \Delta FDI_{t-1} + \sum_{i=1}^{p} \alpha_6 \Delta POP_{t-1} + \lambda \mathrm{ECM}_{t-1} + \varepsilon_t \dots\dots\dots\dots\dots\dots\dots (5)$$

Where α_1 to α_6 are the parameters of the short-run dynamics, λ is the speed of adjustment to long-run equilibrium following a shock to the system and ECM_{t-1} is the error correction term. The parameter λ is expected to be negative and significant to confirm the long-run relationship among the variables.

3.2 A Priori Expectation of the variables and Data sources:

A Table 1 below of the *a priori* expectation of the variables is drawn from the economic theory. Each of the model parameter estimates is expected to have its own sign as it shows the effect of the independent variables on the dependent variable. The variables used for the research including GDP as a proxy of economic growth. Other variables include inflation rate, interest rate, exchange rate, FDI and population growth rate. Sources of data for these variables are also indicated in the Table below.

Table 3.1: Variables Sources and Expectations

Variables	Expected Signs	Sources
GDP	This is the dependent variable and it shows a random behavior because of its stochastic nature.	WDI
Inflation Rate	This is an independent variable that is meant to have a negative relationship with the dependent variables. That is, β1< 0 (-)	WDI
Interest Rate	This is an independent variable that is meant to have a negative relationship with the dependent variables. That is, β2< 0 (-)	WDI
Exchange Rate	This is an independent variable that is meant to have a positive or negative relationship with the dependent variables. That is, β3> 0 or β3< 0 (+/-)	WDI
Foreign Direct Investment	This is also an independent variable that is meant to have a positive relationship with the dependent variables. That is, β4> 0 (+)	WDI
Population Growth Rate	This is also an independent variable that is meant to have a negative relationship with the dependent variables. That is, β5< 0 (-)	WDI

Source: Authors' compilation (2025)

4. Presentation and Analysis of Results

4.1 Graphical Presentation of the Variables

The graphical plots of the time series variables covering the period 1981 to 2023 are depicted in Figure 4.1. The line graphs revealed that all the variables have an intercept and trend with INTR originating from negative and all other variables are trending some upward while others downward over time.

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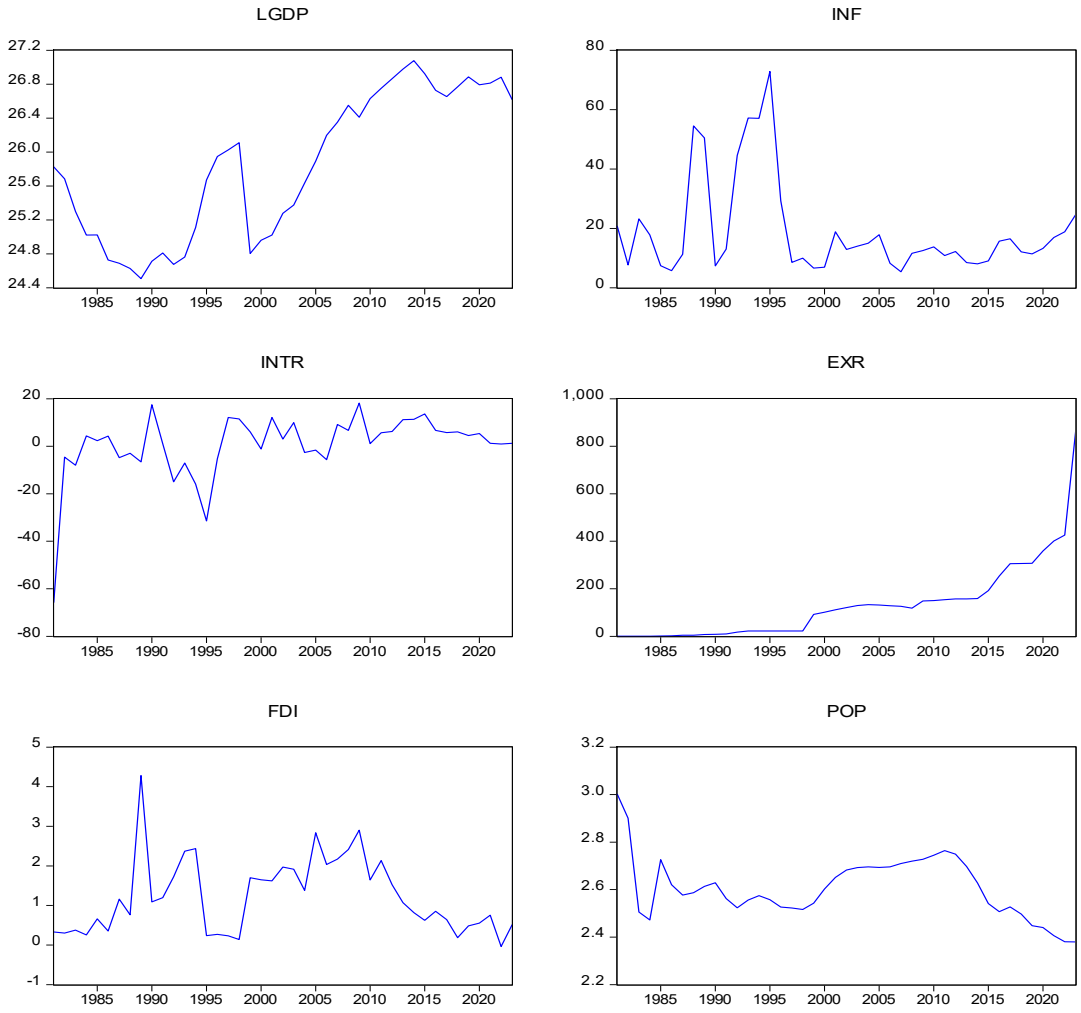

Figure 4.1 Graphical Representation of Variables

Source: Authors' computation (2025) using E-views 10.

The graph in Figure 4.1 shows pictorially trend of economic growth in Nigeria for the sampled period 1981 to 2023, as well as the other macroeconomic factors that affect its performance such as inflation rate (INF), interest rate (INTR), exchange rate (EXR), foreign direct investment (FDI) and population growth rate (POP). However, line graphs only are not enough for understanding the features of the data. Hence, a unit root tests is presented in the next section.

4.2 Unit Root Tests Results

To check the stationarity for the time series data, it is essential to carry out unit root test in order to produce the spurious results. Therefore, the Augmented Dickey-Fuller (ADF) was employed in this study.

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Table 4.1: Augmented Dickey-Fuller (ADF) Results

Augmented Dickey-Fuller (ADF)				
Variable	**Level**	**First Difference**	**Second Difference**	**Order of Integration**
GDP	-0.865144	-5.249799	-	I (1)
IFL	-3.082368	-	-	I (0)
INTR	-7.670572	-	-	I (0)
EXR	3.646698	-0.383791	-3.291538	I (2)
FDI	-3.821746	-	-	I (0)
POP	-1.709272	-4.907615	-	I (1)

Source: Authors' computation (2025) using E-views 10.

From the Table 4.1, test result shows that INF, INTR, and FDI are stationary at levels I(0) while, the GDP and POP are stationary at first difference I(1). However, result reported that the EXR are stationary at second difference I(2). Since the variables had a mixture of I(0), I(1) and I(2), the application of the ARDL procedure to our economic growth model is justified.

4.3 ARDL Long Run Form and Bounds Test

Considering the variables had a mixture of integration I(0), I(1) and I(2), for ADF unit root test, the ARDL model sets the pace for analysis.

4.3.1 Results of the Bounds Test for Cointegration

ARDL bounds test was used to test for cointegration among the variables in the model.

Table 4.2: Bounds tests for the existence of cointegration

Test Statistic	**Value**	**Significance Level**	**Bound Critical Values**	
			Lower Bound	**Upper Bound**
F-statistic	9.204394		**I(0)**	**I(1)**
		1%	3.06	4.15
		5%	2.39	3.38
		10%	2.08	3

Critical value bounds for the F-statistic at 95% confidence level from Pesaran, Shin, and Smith (2001).
Source: Authors' computation (2025) using E-views 10.

The Bounds tests for the existence of cointegration were depicted in Table 4.2. Relying on these results, the computed F-statistic for the joint test of the coefficients $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ and β_6, was 9.204394. The critical value bounds were 2.39 and 3.38 at the 95 per cent significance level. The null hypothesis of no cointegration between the variables in the model cannot be accepted since the computed F-statistic was above the 95 per cent upper bound I(1) of the critical value band computed by Narayan (2004) and Pesaran *et al*. (2001).

The rejection of the null hypothesis shows the existence of a long-run relationship among the variables in our model. The establishment of a long-run relationship among the variables in the model justifies the estimation of the long-run and short-run coefficients of the growth equation through the ARDL cointegration method.

4.3.2 Results of the Long-run Relationship

The results for the long run estimates combined effects of inflation rate and population growth on economic growth in Nigeria are reported in Table 4 below**.**

Table 4.3: Results for estimated long-run coefficients

Dependent Variable: GDP				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
INF	-0.024158	0.038337	-0.630144	0.5375
EXR	0.009717	0.002558	3.798552***	0.0016
INTR	-0.101316	0.048472	-2.090208**	0.0529
FDI	0.481698	0.406167	1.185960	0.2530
POP	4.855879	3.721297	1.304889	0.2104
C	12.51799	10.17289	1.230524	0.2363

Note: *** and ** indicate statistical significance at the 1% and 5% levels of significance, respectively.
Source: Authors' computation (2025) using E-views 10.

The long-run estimates of the relationship between inflation, population growth and economic growth in Nigeria are shown in Table 4.3. Most of the variables had the expected signs were insignificant in the long run. The inflation rate and interest rate had a negative relationship with the economic growth but this is not contrary to expectation sign on inflation rate, exchange rate and interest rate. However, the inflation rate was insignificant to economic growth but exchange rate and interest rate was significant. The result implies that a unit increase in inflation would lead to a 0.02 per cent decrease in economic growth and also that a unit increase in interest rate would lead to a 0.10 per cent decrease in economic growth. The exchange rate exerted a positive and significant relationship with economic growth but this is not contrary to expectation. This implies that a unit increase in exchange rate would lead to increase in economic growth by 0.01 per cent. This suggests that exchange rate promote economic growth in Nigeria in the long run. This result is in sharp contrast with the results of (Babatunde, et al., 2019; Anidiobu, *et al.,* 2018; Kenneth, *et al.,* 2016; Majumder, 2016; Enejoh & Tsauni 2017; Umaru & Zubairu, 2012), but this result concurs with the studies of (Okoro & Ife 2024; Adaramola & Dada 2020; Michael, & Mbam, 2017; Madurapperuma 2016; Munyeka 2014; Barro 2013; Gillman & Harris 2010). The foreign direct investment exerted a positive and insignificant relationship with economic growth in the long run. The result implies that if foreign direct investment goes up by one unit, economic growth would increase by 0.48 per cent. However, the result of population growth rate exerted a positive but insignificant relationship with economic growth. This implies that a unit increase in population

growth rate would lead to increase in economic growth by 4.85 per cent. The result revealed that, the contribution of foreign direct investment and population growth rate to economic growth in Nigeria is positive but insignificant the long run.

4.3.3 Results of the Short-run Relationship

The results for the short run estimates of combined effects of inflation and population growth on economic growth in Nigeria are reported in Table 5 below**.**

Table 4.4: Results of the short-run estimates and error correction coefficient

Dependent Variable: GDP				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(INF)	-0.001711	0.001671	-1.024295	0.3209
D(EXR)	-0.001185	0.000214	-5.531430***	0.0000
D(INTR)	-0.004801	0.002786	-1.723192	0.1041
D(FDI)	-0.097268	0.027494	-3.537752***	0.0027
D(POP)	1.771616	0.417555	4.242832***	0.0006
ECM(-1)*	-0.219738	0.023346	-9.412348***	0.0000

Note: *** and ** indicate statistical significance at the 1% and 5% levels of significance, respectively. If ECM is negative and statistically significant, it implies that there is cointegration.
Source: Authors' computation (2025) from E-views 10.

The short-run dynamic estimates of the nexus between inflation, population growth and economic growth are reported in the Table 4.4. The estimates of the short-run dynamics are to a large extent in agreement with the long-run estimates. Most of the variables had the expected signs and were significant in short run. The result revealed that, inflation rate and interest rate had a negative effect and insignificant on economic growth in the short-run. This implies that economic growth would decrease by 0.002 per cent, should inflation rate be increased by one per cent and a unit increase in interest rate would lead to decreased in economic growth by 0.005 per cent. This agrees with the result of the long-run growth equation. However, the exchange rate result exerted a negative and significant relationship with economic growth contrary to the results of the long-run equation. This implies that economic growth would decrease by 0.001 per cent, should exchange rate be increased by one unit. The result of foreign direct investment had a negative relationship and statistically significance with economic growth in the short-run. This implies that economic growth would decrease by 1.097 per cent, should foreign direct investment be increased by one unit. This is contrary with the result of long run estimated. Hence, the result of population growth rate exerted a positive and significant relationship with economic growth and implies that if population growth rate goes up by one unit, economic growth would increase by 1.771 per cent. However, the coefficient of the error correction term that measures the speed of adjustment of economic growth to equilibrium is -0.219738 and had the expected negative sign. Based on the

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coefficient of ECM (-1), 22% of the previous deviation in economic growth from equilibrium is corrected by it within one year.

4.3.4 Results of Diagnostic Test for the ARDL Model

The results of diagnostic tests reported in Table 6 below shows that, the ARDL model passes all tests including serial correlation and heteroscedasticity.

Table 4.5: Diagnostic results for ARDL-ECM model

Test	t-Statistic	P-value	Null Hypothesis	Conclusion
Breusch-Godfrey Serial Correlation LM Test	2.164167	0.3455	Ho: No Serial Correlation	Cannot reject Ho
Heteroskedasticity Test: Breusch-Pagan-Godfrey	1.505424	0.9546	Ho: Homoscedasticity	Cannot reject Ho

Source: Authors' computation (2025) from E-views 10

The diagnostic tests result for the ARDL model was depicted in Table 4.5. Going by the diagnostic tests used to certify that the parameter estimates were consistent and capable of being utilized in making economic deductions, Equation 5 was adequate and had a good fit. The Breuch-Godfrey Lagrange Multiplier (LM) test was utilized to test for serial correlation. However, autocorrelation was not confirmed in the disturbance of the error term as a result of the probability value of 0.3455 in the growth equation. At this p-value, the null hypothesis of no serial correlation cannot be rejected. In the Breusch-Pagan-Godfrey Heteroskedasticity test, a probability value of 0.9546 revealed that the errors were homoscedastic and independent of the explanatory variables. Hence, the null hypothesis of homoscedasticity cannot be rejected at the obtained p-value.

4.3.5 Stability Test Result

The CUSUM test is based on the cumulative sum of the recursive residuals. This option plots the cumulative sum together with the 5% critical lines. The test finds parameter instability if the cumulative sum goes outside the area between the two critical lines.

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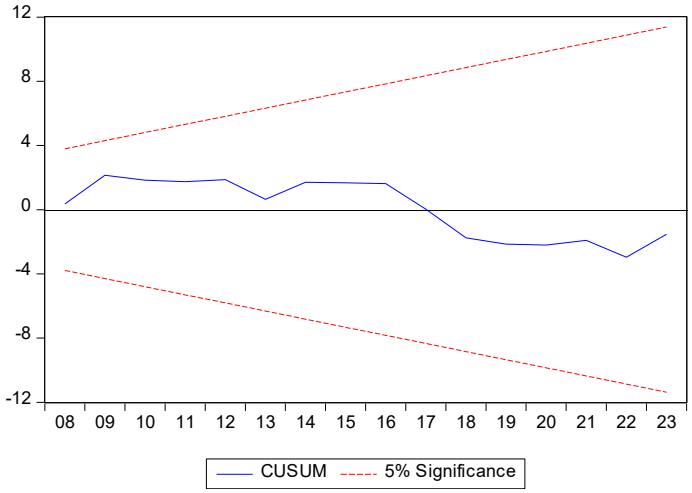

Figure 4.2: CUSUM stability test result
Source: Authors' computation (2025) from E-views 10.

The cumulative sum is generally within the 5% significance lines, suggesting that the residual variance is somewhat stable. This means that the graph above indicates that parameters are stable and there is no structural break among the variables in the model.

5. Conclusion and Recommendations

5.1 Conclusion

This paper examined the short-run and long-run relationship between inflation rate, population growth and economic growth in Nigeria from 1981 to 2023. The analysis began with trend analysis of the variables, followed by investigating the time series properties of the variables using Augmented Dickey-Fuller (ADF) unit root test. The series were found to be mixture of I(0) and I(1) which supported the use of autoregressive distributed-lag (ARDL) bounds test approach to co-integration. Finally, diagnostic tests were performed using serial correlation test, heteroscedasticity test and cumulative sum (CUSUM) stability test in order to validate the result.

The findings of the study revealed that, inflation rate has not been a determinant of economic growth in the country both in the short-run and long-run. However, interest rate has a negative impact on economic growth but only in the long-run. This rather confirmed the Keynesian orthodox belief, which maintains that increase in interest rate is detrimental to real sector investments and growth. Moreover, the study concludes that population growth rate exerts a positive effect on economic growth in the short-run but not in the long-run. The findings suggest that a unit increase in population growth rate would lead to increase in economic growth by 1.77 units in the short-run only. This is perhaps because increase in population growth influences the level of aggregate

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demand in the short-run before the effect is cancelled out by overstretched amenities, environmental problems and sustainability issues in the long-run.

Furthermore, the study concludes that FDI has a negative impact on economic growth but only in the short-run. Meanwhile, FDI does not affect the level of Nigeria's economic in the long-run. This finding rekindles the belief that domestic savings could play a better role in promoting investments than FDI flows. It is only exchange rate that is found to exert significant impact on economic growth, both in the short-run and the long-run. Whereas the impact of exchange rate on growth is found to be negative in the short-run, however, the impact is found to be positive in the long-run. This suggests the existence of the J-curve effect of exchange rate depreciation on trade balance and growth in the country.

5.2 Recommendations

Based on the findings we provide the following recommendations:

i. Government should adopt appropriate fiscal and monetary policy measures to control inflation from time to time to ensure stable economic growth. As a rider to this, inflation rate targeting may not be a better strategy than growth rate targeting in Nigeria, since inflation rate does not determine the level growth. The study therefore suggests growth rate targeting as a better policy strategy.

ii. Proper exchange rate management is necessary and very crucial to economic growth and stability in Nigeria. Thus, monetary authorities should ensure optimum and stable rates that guarantee investors' confidence to generate enough resources for investments. This is necessary to ensure price stability and steady economic growth in the country.

iii. The study also recommends that government should use appropriate measures to optimize the potentials of the country's growing population. Programmes and policies which promote human capital development (HCD), such education, healthcare and skills acquisitions, must be given priority for optimum utilization of growing human resource in the country.

iv. Lastly, monetary authorities should enact policies that mobilize and encourage domestic savings as well as capital formation, which will complement FDI in financing investments in the country. Reduction in bank charges, attractive return rates and prudent corporate management of financial institutions would go a long way in attracting domestic savings in the country.

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