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RE-EXAMINING THE EFFECT OF ECONOMIC GROWTH ON POVERTY REDUCTION IN SUB-SAHARA AFRICAN COUNTRIES

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Keywords: Monetary poverty, Multidimensional poverty, Economic growth rate, Government Expenditure, Nigeria, ARDL, NARDL.	Abstract: <i>Several nations in sub-Sahara Africa have not witnessed significant reduction in poverty levels in the recent years, even amidst speedier growth. This paper evaluates the extent to which economic growth reduces poverty in those countries using empirical data for 1985 to 2023 and Nigeria as case in point. Ex-post facto research design is used while ARDL and NARDL models are employed for data analysis. Poverty Headcount Ratio (proxy for poverty reduction) is the dependent variable, while economic growth rate, GDP per capita, government expenditure, inflation rate and unemployment rate are the explanatory variables. The results show that, in the short-run, economic growth rate has a weak positive effect on poverty reduction, GDP per capita reduces poverty largely, while unemployment rate has a slight adverse effect on poverty level. Also, increase in inflation rate is found to be reducing poverty mildly, while government expenditure is positively and significantly connected with poverty headcount ratio. The model's R-squared value shows that only 40.885% of the changes in poverty level is explained by the model, implying that, in addition to economic growth, there are other factors that must be taken into consideration for poverty level to be reduced significantly. The study suggests that governments should promote inclusive growth that addresses inequality and other related issues in order to reduce poverty level significantly.</i>
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1.0 Introduction

Of recent, the interest of scholars appears to have moved higher regarding the impact of economic growth on indigence alleviation. This has emanated from the claim that beyond 1 billion inhabitants in universe are still poor. A recurrent question in finance literature has continued to be whether economic growth will be sufficient to

reduce poverty. Both Bhagwati (2001) and Stiglitz (2002) have stressed the role of growth in bringing down poverty rate. For Bhagwati (2001), a deterioration in the rate of growth in majority of developing nations is a clear indication of the decrease in the living standards of the residents, which may bring about indigence. The more severe and enduring crisis

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that the world is now facing has enhanced global destitution- a situation that is already reversing recent trends to minimize inequality (Agbo,2023a). Most recently, about 700 million persons are living in abject poverty. Progress has delayed amid low growth. World Bank Group (2024) reports that the set- back was occasioned by COVID-19 and increased fragility Poverty rate in low-income economies are now above what they were before the pandemic. For example, approximately 3.5 billion persons poor by a standard that is more apt for upper middle-income nations (\$6.85 per day) (World bank Group,2024). To mitigate the challenge of growing poverty level across the globe, several agencies were created. Every one of them has made frantic efforts to bring poverty to an end. (Human Rights Career, 2022).

Like Oxfam, the agencies contend that concentrating resources in the top 1% slows down business activity and makes life harder for every other person particularly those human beings in the bottom of the economic ladder (Olga,2013). They opine that the gains made by the billionaires of the globe in 2017, which amounted to \$762 billion, were sufficient end penury a number of times over (Shelly,2018). This consensus showed a necessity for some poverty alleviation plans which were country-driven. In spite of their several efforts to eliminate poverty, it became more widespread in several economies in the past ten years (OECD, 2022). In spite of the fact that African nations

have witnessed strong growth in their economies especially in the past 10 to 15 years (ECA, 2015; Shaw, 2015) and that it is empirically evident that, after Asia, Africa is now the second-fastest growing continent in the universe (ACBF, 2017), the impact of the growth benefits toward poor people did not manifest particularly toward the poor by the end of 1960s (ACBF, 2017).

In sub-Sahara Africa (SSA), the standard of living has continued to be low, even though it has been witnessing speedy growth. Many countries in the sub-region have not observed significant reduction in the level of poverty. There, indigence has not only spread continuously but is now worse when compared with what it is in other sub-regions in the globe (World Bank Group,2024). According to World Bank, 16 percent of the population of the world in 2024 was in SSA; and 67 per cent of the residents in SSA were extremely poverty. The percentage reduction in the population of persons in SSA that lived in less than 1.25 Dollars between 1990 and 2015. This is the least compared to those of other developing North Africa, Caucasus/Central Asia, Latin America/Caribbean, Southern Asia and Western Asia (United Nations,2015).

The level of poverty in Nigeria has been worrisome. Consequently, the situation has been attracting the attention of several public administrations and general public for some years now (Siwu et al.,2021). Successive public authorities in the country mounted programs under different names and at different periods

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aimed at eliminating poverty. However, each of those programs died on arrival due to poor conception, wrong execution as well as unplanned, non-focused, obscure, corrupt and selfish implementation process. The result has always been an epileptic, dismal implementation or performance of poverty alleviation program. Consequently, the poverty rate in the country has kept on increasing, notwithstanding the concerted efforts made by government to bring it down (Nyako,2024; Siwu et al.,2021). Siwu et al. (2021) noted that 40.1 percent of Nigerian residents are indigent based on the 2018/2019 national poverty threshold while 63 per cent were poor based on the National multidimensional poverty index 2022. This kind of destitution was higher in the rural part of the country where 72 percent of the inhabitants were poor (NBS, 2022). According to Ozigbu, (2018), poverty incidence deepened between 2000 and 2015 when approximately 69.01 percent of Nigerians lived in penury. During the period, more than 50 percent of Nigerians were poor.

Due to the astronomical increase in the incidence of poverty, scholars from several parts of the universe have begun to doubt whether economic growth can alleviate poverty. This has motivated Breunig and Majeed (2019), Fosu and Gafa (2020) and many other scholars to reason that growth of an economy alone might not be a sharp blunt tool decreasing poverty. They became inclined to believing that, while economic growth this is necessary, it is not

sufficient for reducing poverty.

Even though authors like Fosu (2017) as well as Hailu and Nagaraja (2017) have attempted to empirically determine if the growth witnessed in Africa few decades ago reduced its poverty level commensurately, the evidence presented thus far is sparse. In addition, there are controversies and disagreements in the results obtained by the few extant studies on the link between economic growth and poverty alleviation. For example, while some scholars (see Bhagwati, 2001; Datt & Ravillion, 2002; Deaton & Dreze, 2001; Agrawal,2008; Dollar & Kraay, 2002; ; Ochi,2023; Gafa,2020; Kouadio & Gakpa,2022;) whose works were mainly located in advanced countries report that economic growth reduces poverty level significantly, many others, especially those carried out the SSA, report adverse and weak connection between the two variables growth(see Ferreira et al.,2010; Olaoye,2022; Henneh,2023; Nyako,2024;Olasode & Olalekan,2022; Ngubane et al.,2023;Ihenetu & Sotonye,2021). Also, studies on economic growth and poverty reduction in Nigeria have shown mixed results, with some studies finding a strong positive relationship and others finding a weaker or even negative relationship. Given this situation on ground, this research aims to contribute to literature by investigating the impact of economic growth on poverty reduction in the SSA countries with particular reference to Nigeria. As done in Henneh (2023), the research

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equally assesses the impact of other variables (unemployment rate, GDP per capita, inflation rate and government spending) which could mediate the effect of economic growth on poverty level. The study uses ARDL and NARDL models, like Ngubane et al. (2023), as analytical techniques. The remaining parts of this work have been arranged thus: Section 2 contains the literature review. Section 3 contains the methodology. Section 4 presents data analysis and discussion while Section 5 concludes the research.

2.0 Review of related literature

2.1 Conceptual Framework

2.1.1 Poverty

Poverty refers to strong deprivation in well-being. It has a number of dimensions such as abysmal income and not being able to obtain the essential goods and services which are needed for survival honorably (World Bank, 2024; Kuhe, et al. 2016). Also, it means the inability to access the basic needs of nature, insecurity, exposure to violence, powerlessness and exclusion of persons ,households and communities.

Three kinds of destitution were identified by Haralambos and Holborn (2000), namely, absolute, relative and subjective poverty. The authors describe absolute poverty as a situation where the living condition is really critical and it is difficult to survive. Gordon (1998) refers to absolute poverty as the absence of any two of eight basic needs: Food, safe drinking water, sanitation facilities, health, shelter, education,

information and access to services.

Relative poverty is poverty viewed in terms of adjustment from people of a particular society concerning what is regarded as a reasonable and acceptable living standard and way of life as a result of the prevailing conditions (Gordon,1998; Haralambos & Holborn, 2000). Subjective poverty, as a concept is expressed in arrange of qualities that are nnon-material and intangible; it depends on the perception of respondents regarding their living standards (Nweze & Ojowu,2002). The depth of poverty in any economy depends on both the average income and the inequality of incomes (Agbo,2023a).

In Nigeria, poverty is measured using four methods in a harmonized living standard survey. The methods include relative poverty, absolute poverty, dollar poverty and subjective poverty. In its recent studies, however, the UNDP has advocated the use of human development index (HDI). According to UNDP (2013), HDI combine three components while estimating indigence, viz: (i) life expectancy at birth (longevity); (ii) education attainment and; (iii) improved living standard determined by income per capita.

Poverty does not have a single cause or determinant. Instead, there are many factors that cause it, namely, abysmal or negative economic growth, macroeconomic policies which are inappropriate, deficiencies in the market which bring about limited job growth, abysmal productiveness and wages in the informal sector and a sluggish swing in development (Agbo,

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2023a; Ajakaiye & Adeyeye, 2002).

2.1.1.1 International Poverty Line.

This refers to a minimum amount of money that an individual should have per day below which he/she is to be regarded as indigent. It is calculated by using the poverty line from each nation after determining the value of the goods necessary to sustain an adult and converting some to their dollar equivalents. The global poverty thresholds were modernized in 2022, given the publication of the Purchasing Power Parity (PPP) (World Bank Report, 2022). The current abject poverty threshold is \$2.13 daily and succeeds the poverty line of \$1.90 which was anchored on the PPP of 2017 (World Bank Report, 2022; Kamruzzaman, 2021).

2.1.1.2 Poverty Rate

In Nigeria, poverty rate is determined by the Nigeria Bureau of Statistics (NBS) using a welfare aggregate. Three measures of poverty rate are employed, namely, poverty headcount ratio, poverty gap and Gini index (NBS, 2020). In Nigeria, the poverty headcount ratio is the percentage of the residents that live below Nigeria's poverty line, indicating the proportion of individuals in Nigeria considered poor based on their consumption expenditure (see appendix). Poverty gap is an estimate of the depth of poverty, while Gini index is a measure expenditure distribution in Nigeria. The latter ranges from near 0, which would indicate perfect equality and 100 -perfect inequality. (NBS,2020).

2.1.2 Economic Growth

Economic growth is the stable increase in the actual production of goods and services together with the boosted capability of the economy to create them (Agbo, 2023b). This increase has to be real. Consequently, it engenders a boost in the income per capita of the residents. It is an indicator regarded most highly among others. Apart from driving the financial system of nations, it increases their self-sufficiency. Economic growth has some popular measures, namely gross domestic product, gross national product, real economic growth rate and GDP per capita. Part of the instruments usually employed by governments to drive economic growth are fiscal and monetary policies. With fiscal policy, governments attempt to optimize the use of some economic instruments taxes, public spending and (Agbo, 2023). Fiscal policy also has to do with the strategies for controlling public debt and surplus income (Cai et al., 2017). It is regarded as an important means by which government intervenes in their nations' financial affairs (Kasasbeh, 2021). With monetary policy, the central bank of a country takes actions to ensure the equilibrium in the money market. Monetary policy would be directed at adjusting the money supply or moving interest rates, or both from time to time to achieve the desired aim (Osakwe et al,2019).

2.1.3 Inflation Rate

Agbo (2020) defines inflation as an increase in the average price of a collection of goods and

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services in a country over a period. It reflects a decrease in the purchasing power of money which is shown in a general increase in the prices of commodities and services in a country (Agbo, 2020). It is often expressed as a percentage. Gyeke-Dako et al. (2022) contend that inflation usually brings down the level of poverty.

2.1.4 Unemployment Rate

Unemployment has to do with a condition whereby one actively searches for employment but cannot find work (Hayes, 2024). The variable frequently employed to measure unemployment is unemployment rate which is computed by dividing the total of the persons that are not employed by the population of the entire labor force (Hayes, 2024).

2.1.5 Government Expenditure

Government spending is the expenses provision usually incurred by public authorities to maintain itself, as an institution, the economy and society (Gukat & Ogboru, 2017; Agbo & Nwankwo, 2021; Idris and Bakar, 2017). In national budgets, it is usually grouped into functional heads, namely, administration, economic services, social and community services and transfers. Each group has would have its capital and recurrent counterparts (CBN, 2011; Ogboru, 2010).

2.2 Theoretical framework

Economic growth is generally considered a powerful tool for poverty reduction, particularly when it leads to increased employment and opportunities for productive activities among the

poor. However, the relationship is complex, and the effectiveness of growth in reducing poverty depends on various factors, including the nature of growth, the level of inequality, and the policies in place (Ames et al., 2001).

2.2.1 The following theories relate to economic growth:-

2.2.1.1 Trickle-Down Theory

This traditional view-point suggests that economic growth favors all parts of society, with the rich benefiting first and then "trickling down" to the indigent (Škare & Pržiklas, 2015). A policy is considered "trickle-down" if it disproportionately favors rich businesses and persons in the short run but is made to increase the living standard for all persons in the long run. This theory founded by Will Rogers has been subjected to criticism. Critics argue that the added favors the wealthy receive add to the growing income inequality in the country.

2.2.1.2 Neoclassical Growth Models

These models developed by Robert Solow and Trevor Swan in 1956 emphasize the contributions of capital accumulation, technological progress, and factor endowments in boosting economic growth.

2.2.1.3 Endogenous Growth Models

These models developed by Paul Romer, an American economist in the 1980s and 1990s, focus on the role played by human capital, technological innovation, and institutions in increasing economic growth.

2.2.1.4 Structuralist Theories

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These theories developed by Ferdinand de Saussure, a Swiss linguist, semiotician and philosopher, emphasize the part played by structural factors, such as uneven distribution of land and resources, in perpetuating poverty and inequality.

This work is anchored on the Neoclassical, Endogenous and Structuralist growth theories.

2.2.2 Theories of poverty

2.2.2.1 Keynesian/neoliberal theory

This school of thought is more concerned with the forces of macro-economy. The proponents of this theory lay emphasis on the responsibility of government to stabilize the economy and provide public goods. They consider poverty to be mainly involuntary and as created by lack of employment opportunities

2.2.2.2 Marxian theory This poverty theory considers discrimination among classes and groups as the major causes of indigence. It assigns an essential role to the government in regulating the market place.

2.2.2.3 Social exclusion and social capital theories

These theories recognize the part played by both social and economic factors in creating poverty. Those factors help in comprehending the forerunners of poverty and its persistence over time. This paper is anchored on both the Marxian and Keynesian theories as both of them propose that government has a significant responsibility in stabilizing the economy, providing public goods and eradicating poverty.

2.3 Empirical review

Several studies have evaluated the connection between economic growth and poverty reduction. Some of the prominent studies on this topic but bc conducted outside the shores of Africa include Ravallion (2002), Donaldson (2008), Ferreira et al. (2010), Mulok et al. (2012), Kudebayeva and Barrientos (2013), Moore and Donaldson (2016), Fosu (2017), Hailu and Nagaraja (2017), Bruing and Majeed (2019), Erlando et al. (2020), Thorobeckea and Ouyang (2021) as well as Kouadio and Gakpa (2022). However, empirical evidence on Africa's growth poverty reduction nexus is scanty.

Fosu and Gafa (2020) did a study and concluded that growth in income is a significant item that determines poverty. Ferreira et al. (2010) did a study in Brazil that concluded that the effectiveness of economic growth in decreasing poverty level differs across sectors, space, and time. They found that growth in the service sector significantly decreases indigence more than it does in either agriculture or industry. They found that economic growth failed to affect poverty alleviation efforts significantly from 1985 to 2004. Using data series from over 70 nations, Dollar and Kraay (2002) discovered that a boost in real GDP per capita causes a serious reduction in poverty level. Hailu and Nagaraja analyzed the impact of growth and inequality on poverty in Ethiopia using Datt and Ravallion's (1992) approach. The authors observed that boost in real household per capital expenditure caused a

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drop in the inequality gap and reduced poverty in the Amhara region. In another study, Agrawal (2008) noted that greater reduction in poverty level and higher real wages follow higher rates of growth. Ngubane et al. (2023) sought to determine the connections among economic growth, unemployment and poverty in South Africa, using both linear and non-linear autoregressive distributed lags and historical data ranging from 2000Q1 to 2021Q1. The authors noted that economic growth is the major obstacle against poverty reduction but that unemployment is positively connected to indigence. Thorbeckea and Ouyang (2021) observed that economic growth that is faster would cause faster reduction in poverty level in developing nations outside SSA than is the case within it.

Ochi (2023) carried out some investigation on the triangular connections among abject poverty, income inequality and economic growth for 45 middle and low income nations in SSA from 2010 to 2021. The study observed the connection between those variables is nonlinear. It found that economic growth starts to bring down the level of abject poverty as soon as income inequality is at or lower than a bottom level of 35.15 for the middle-income countries. However, the authors found that, above inequality the inequality threshold levels of 35.28 and 45.15 for low income and middle-income countries, respectively, there is no link between economic growth and extreme poverty.

Olaoye (2022) examined the lofty economic growth rate and abysmal poverty reduction rate with a group of 40 SSA countries for a period of 30 years. The results showed that economic growth experienced in those years did not reduce poverty especially in the resource rich nations. Henneh (2023) studied the effect of economic growth on poverty alleviation in Ghana using monetary measurement approach using historical data that spanned from 1990 to 2021. The data was analyzed with ARDL and NARDL models. The results showed that economic growth and government expenditure have negative but significant connection with poverty reduction. In addition, the results disclosed that per capita GDP had a positive connection with poverty reduction and annual inflation levels had an inverse weak impact while unemployment was positively and weakly connected with poverty reduction.

Nyako (2024) examined the effect of economic growth on poverty alleviation in Nigeria by identifying items that influence growth in several sectors of the economy. It employed historical data covering the years from 1990 to 2023. ARDL technique was employed to analyze the data. It was found that gross capital formation has adverse and weak effect on poverty reduction both in the short run and long run.

Olasode and Olalekan (2022) explored the impact of economic growth on poverty in the past twenty years, using the desktop research design of qualitative and quantitative data. The work

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employed various sources, including academic journals, publications, books, articles, and reports. They sourced secondary statistical data from NBS of Nigeria, UNDP, the Human Development Report, the World Bank Indicators and the CBN Statistical Bulletin. The outcome of the study suggests that even though Nigeria has experienced significant economic growth in the past two decades, poverty rates in Nigeria has remained high. The reason, according to the authors, is that there are serious degrees of inequality, corruption, jobless growth and monocity in the country which hinder economic growth from reducing poverty level.

Nnam and Inyang (2022) explored the influence of economic growth on poverty reduction in Nigeria for 1980 to 2019, using ADF test Phillips-Quliaris cointegration test and Dynamic OLS for data analysis. The findings showed that economic growth has negative influence on poverty reduction in Nigeria. Ihenetu & Sotonye (2021) analyzed the impact of growth on poverty alleviation in Nigeria, using historical data obtained from CBN statistical bulletin and World Bank for 1995 to 2019. OLS regression was employed to analyze the data after conducting stationarity test with ADF. The results showed that gross domestic product, gross national product and income per capita have no strong

impact on poverty alleviation in Nigeria.

3.0 Methodology

3.1 Research design

This research employed *ex-post facto* design. It adopted both ARDL and NARDL models to

analyze the historical data just as was done in Ngubane et al. (2023) and Pesaran, et al. (2001). For the purpose of making the model robust, ARDL was selected; it is capable of accommodating the autoregressive, stationarity, trends, cycles, seasonality and structural breaks which are usually characteristic of financial time series (see Shrestha & Bhatta, 2018). Once a long-run association is established among the variables in the equations, the researcher would go ahead to explore the short-run dynamics and the long-run effect using ARDL bound test. The ARDL technique accommodates both $I(0)$ and $I(1)$ time series so long as none of the series is above $I(1)$. This analytical technique requires a cointegration approach that is based on bounds test. The latter utilizes F-statistics to validate the presence of long-run equilibrium (see Pesaran et al, 2001). To capture non-linear and asymmetric link between the variables, nonlinear autoregressive distribution lag NARDL model proposed by Shin et al. (2014) is equally employed for analysis. The NARDL model is adopted as due to its ability to recognize and incorporate the possibility of asymmetric impacts of positive and negative alterations in the independent variables on the dependent variable.

3.2 Model specification

To conduct empirical analysis of the impact of economic growth and other variables on poverty headcount ratio, the econometric form of the equation is expressed below:

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$$PH_t = \alpha + \beta_1 PH_{t-1} + \beta_2 GE_t + \beta_3 \ln GDP_{perCapita_t} + \beta_4 Infl_t + \beta_5 Unemp_t + \varepsilon_t \dots \dots \dots 3.2$$

Where:

PH = Poverty Rate

$EcoGrowR$ = Economic Growth Rate

GE = Government expenditure

$GDP_{perCapita}$ = Per capita GDP.

$Infl$ = Inflation rate

$Unemp.$ = Unemployment rate

ε_t = Error term

α = Intercept

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ = The slopes of the parameters to be estimated in the model

The function captures the relationship between the dependent variable and the independent variables. This study incorporates poverty headcount ratio for poverty reduction.

The short-run and long-run impact of economic growth on poverty reduction can be specified in Autoregressive Distributed Lag (ARDL) model.

According to Phong, et al. (2019), the general ARDL model for one dependent variable Y and a set of independent

variables $X_1, X_2, X_3, \dots, X_n$ is denoted as $ARDL(p_0, p_1, p_2, p_3, \dots, p_n)$, in which p_0 is

the lag order of Y and the rest are respectively the lag orders of $X_1, X_2, X_3, \dots, X_n$.

$ARDL(p_0, p_1, p_2, p_3, \dots, p_n)$ is written as follows:

$$\Delta PH_t = \alpha + \sum_{i=1}^p \beta_i \Delta PH_{t-i} + \sum_{j=0}^{q_1} \gamma_j \Delta EcoGrowR_{t-j} + \sum_{k=0}^{q_2} \delta_k \Delta GE_{t-k} + \sum_{l=0}^{q_3} \phi_l \Delta GDP_{perCapita_{t-1}} + \sum_{m=0}^{q_4} \psi_m \Delta Infl_{t-m} +$$

$$\sum_{n=0}^{q_5} w_n \Delta UNEM_{t-n} + \lambda_1 PH_{t-1} + \lambda_2 EcoGrowR_{t-1} + \lambda_3 GE_{t-1} + \lambda_4 GDP_{perCapita_{t-1}} + \lambda_5 Infl_{t-1} + \lambda_6 UNEM_{t-1} + \varepsilon_t \dots \dots (3.4).$$

Where:

Δ is the first difference operator

α intercept

$\beta, \gamma, \delta, \phi, \psi$ is the short run coefficients

$p, q_1, q_2, q_3, q_4, q_5$ is the optimal lag length for each variable

PH_t is the poverty headcount ratio at time t ; PH_{t-1} represents poverty headcount at time $t-1$; GE_t represents Government spending at time t ;

$EcoGrowR_t$ = Economic Growth Rate at time t .

$\ln GDP_{perCapita_t}$ is the log of GDP per Capita at time t ;

$Infl_t$ represents Inflation rate at time t ;

$Unemp_t$ represents Unemployment rate at time t ;

α is the constant term or intercept;

β_i is the coefficient of PH_{t-1} , which captures the impact of past poverty headcount on current poverty headcount; $\beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ are the coefficients of $GE, EcoGrowR, \ln GDP_{perCapita}, Infl$ and $Unemp$, respectively, which capture the impact of each independent variable on poverty headcount ratio; ε_t is the error term.

Akaike Information Criterion. Logarithmic functions have been employed to allow the researcher to convert non-linear functions into linear representations for ease of use (Indeed Editorial Team, 2024).

Since the sampled period is relatively small (1980 - 2023), the study employed the critical



values as reported by Narayan (2004) and Dada & Fanowopo (2020).

The a priori expectation criteria which is based on the signs and magnitudes of the coefficients of the variables under investigation are as follows:

$\alpha > 0$; $\beta_1 > 0$; $\beta_2 > 0$; $\beta_3 > 0$; $\beta_4 > 0$; $\beta_5 > 0$, $\beta_6 > 0$

3.3 Estimation Techniques

i) Stationarity Testing: The Augmented Dickey-Fuller (ADF) test and Phillips-Perron (PP) test will be used to assess the stationarity of the variables. This ensures that none of the variables are integrated of order 2, I (2) as the ARDL model requires variables to be I (0) or I (1).

ii) Optimal Lag Selection: The optimal lag length for the ARDL model will be determined using criteria such as the Akaike Information Criterion (AIC) or Schwarz Bayesian Criterion (SBC).

iii) ARDL Bounds Test: The ARDL bounds testing approach will be used to examine the presence of a long-run relationship between the variables. The null hypothesis of no cointegration ($H_0: \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6 = 0$) will be tested against the alternative hypothesis of the cointegration.

iv) Long-Run and Short-Run Estimation: If a long-run relationship is established, the study will estimate the long-run coefficients of the model. The short-run dynamics will be captured using an Error Correction Model (ECM), specified as;

4.0 Data Analysis and Discussion of Results

The historical data are in the appendix

$$\Delta PH_t = \alpha + \sum_{i=1}^p \beta_i \Delta PH_{t-1} + \sum_{j=0}^{q1} \gamma_j \Delta EcoGrowR_{t-j} + \dots + \phi ECM_{t-1} + \varepsilon_t$$

Here, ϕ is the speed of adjustment parameter

From theoretical estimate, the intercept is expected to be a positive integer.

The NARDL model is specified as follows

$$Y_t = \alpha + \sum_{i=1}^{p0} (\beta_{0,i} \cdot Y_{t-1}) + \sum_{j=0}^{p1} (\beta_{1,j} \cdot X_{1,t-j}) + \sum_{k=0}^{p2} (\beta_{2,k} \cdot X_{2,t-k}) + \sum_{l=0}^{p3} (\beta_{3,l} \cdot X_{3,t-l}) + \sum_{m=0}^{pn} (\beta_{n,m} \cdot X_{n,t-m}) + \varepsilon_t \dots \dots \dots (3.3)$$

In the NARDL equation as modelled above, α_i represent short run coefficients while β_i stand for the long-term coefficients with $i = 1 \dots 4$ th. While the short-term analysis relates to the immediate effect of the independent variable towards the dependent variable, the long-term analysis reveals the speed of adjustment towards equilibrium. We run Wald test to know the long run asymmetry $\beta = \beta^+ = \beta^-$ and for short run asymmetry $\alpha = \alpha^+ = \alpha^-$ for the selected variables. The data for the study were sourced from the National Bureau of Statistic (NBS), Central Bank of Nigeria (CBN) Statistical Bulletin, World Bank (World Development Indicators) and Penn World Table (PWT) Database. The data were time series in nature covering the period 1990 to 2023.

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Exploratory Data Analysis

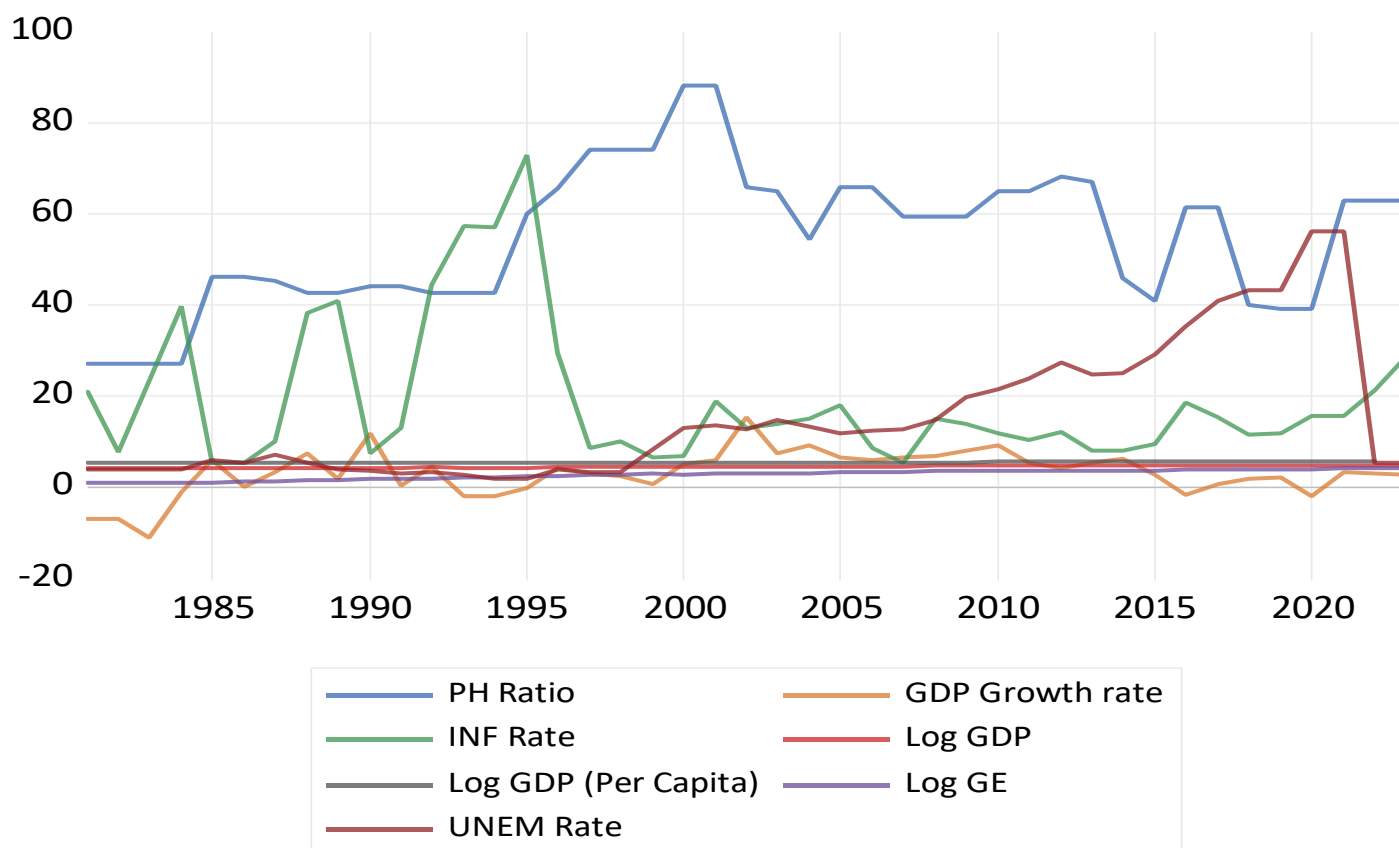


Fig 1: Single line plot of the study variable

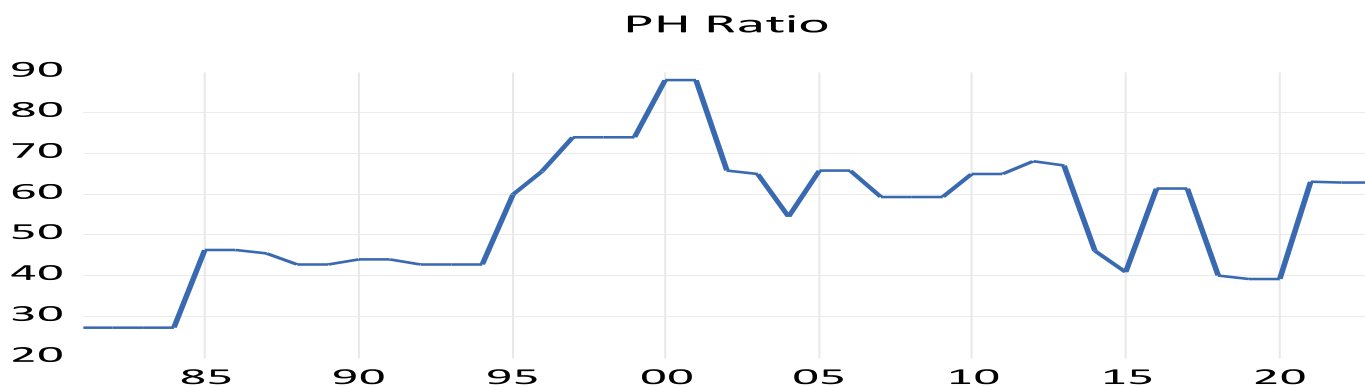


Fig 2: Line plot of Poverty Headcount 'Ratio'

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GDP Growth rate

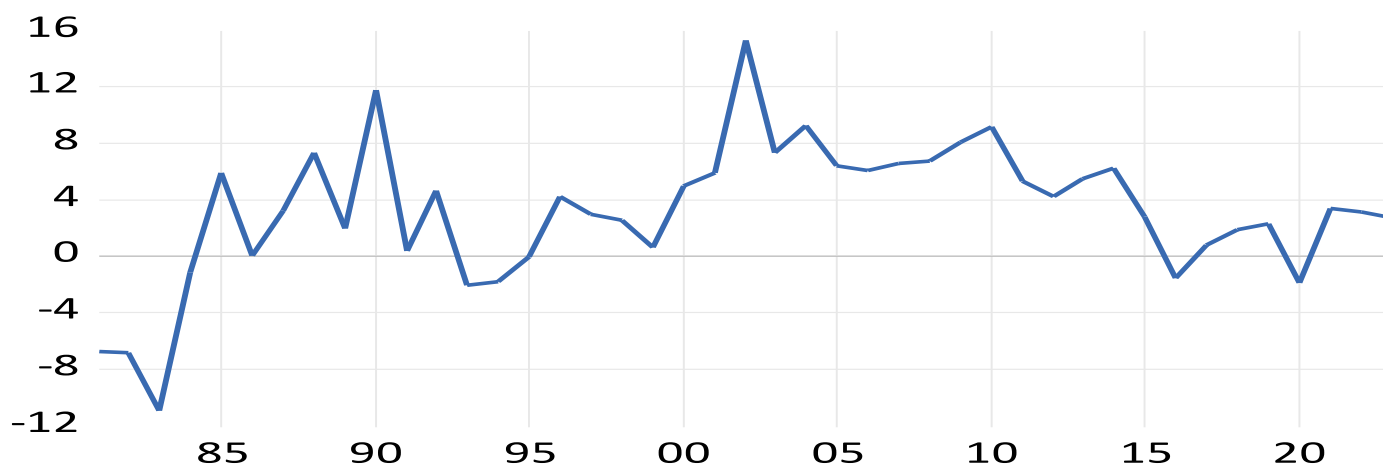


Fig 3: Line plot of GDP Growth Rate

Log GDP (Per Capita)

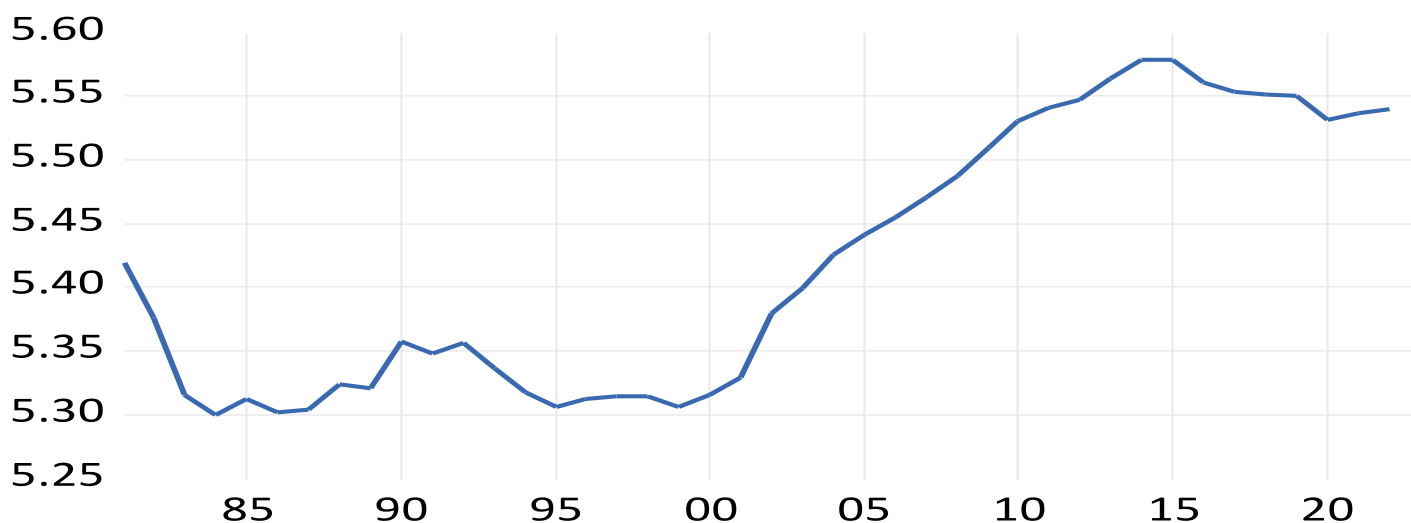


Fig 4: Line plot of Log (GDP Per Capita)

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UNEM Rate

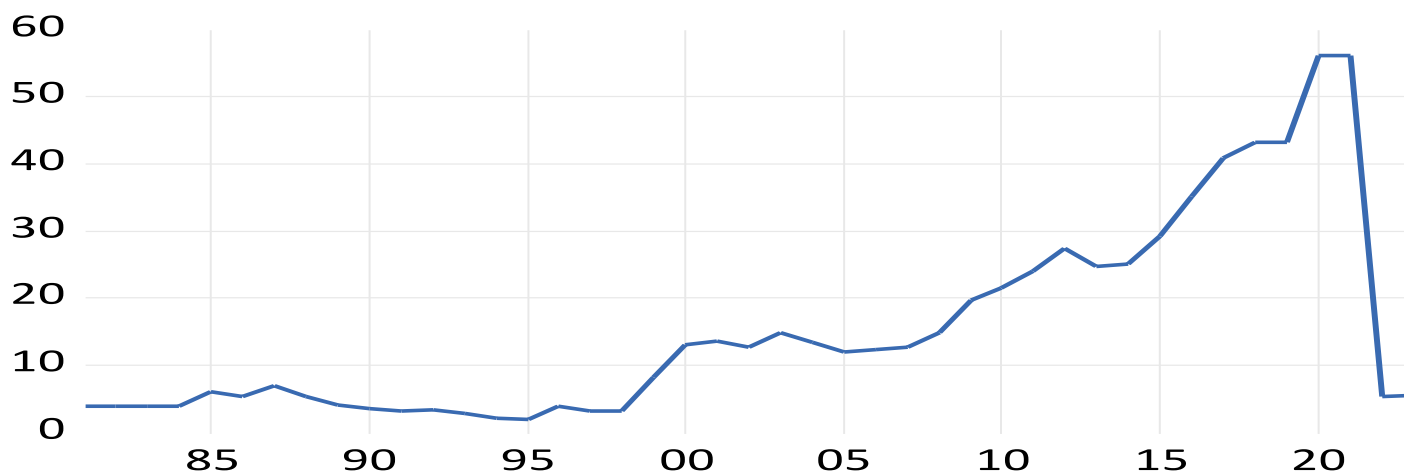


Fig 5: Line plot of Unemployment

INF Rate

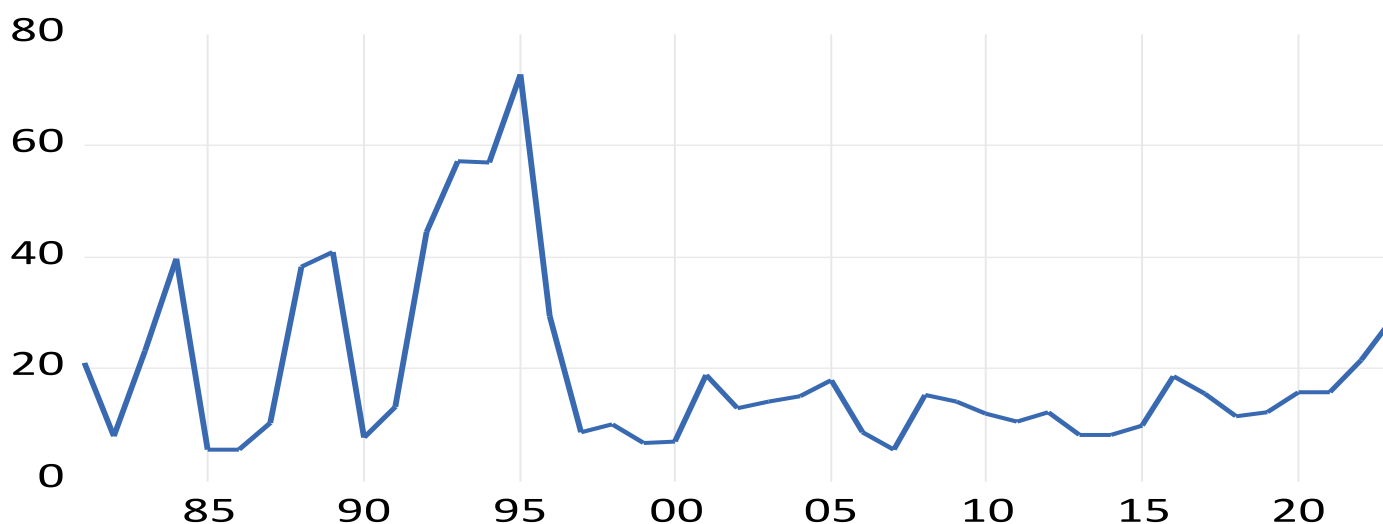


Fig 6: Line plot of Inflation Rate

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Log GE

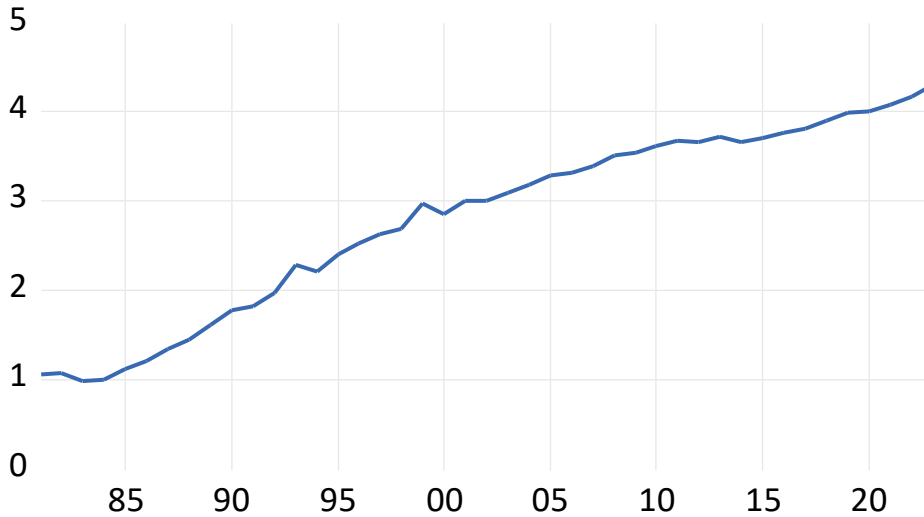


Fig.7:Line plot of government expenditure

Table 1: Descriptive Summary of the study variable

	PH	GDP Growth Rate	Log GDP per Capita	UNEM	INF	GE
Mean	54.40238	3.185691	5.419435	15.45266	18.96102	2.762779
Median	59.30000	3.299387	5.389261	12.10000	13.45000	3.007785
Maximum	88.00000	15.32927	5.578927	56.10000	72.80000	4.174532
Minimum	27.20000	-10.92503	5.299532	1.800000	5.400000	0.983919
Std.Dev	15.57737	4.938345	0.103586	14.95350	15.73691	1.026417
Skewness	0.058266	-0.441533	0.266350	1.313782	1.819655	-0.451987
Kurtosis	2.412661	3.970287	1.394439	3.829652	5.661073	1.830352
Jarque-Bera	0.627457	3.012209	5.007792	13.28673	35.57031	3.824179
Probability	0.730717	0.221772	0.081766	0.001303	0.000000	0.147771

PH=Log (Poverty Headcount Ratio), Log GDP= Log (Gross Domestic product) per capita, UNEM = (Unemployment Rate), INF= Inflation Rate, GE= Government expenditure.

Table 1 contains the descriptive statistics. Poverty Headcount ratio has high average of 54.40% with moderate spread and a nearly symmetric distribution. This suggests that indigence is widespread but is relatively stable. The GDP growth rate indicates a positive mean of 3.19% which has moderate fluctuations, a little left skew and almost a normal distribution. Similarly, the log of GDP per capita has

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a stable mean of 5.42 with low variability, slight right skewness and some flatter-than-normal distribution. Both GDP growth rate and logGDP per capita pass the Jaque-Bera test, implying that they donot greatly deviate from normality. In contrast, unemployment rate has a high mean of 15.45% and great variability. It has a significant right skew. This suggests that extreme unemployment rates are common. Inflation rate also exhibits high average of 18.96%, considerable fluctuations, strong right skewness and a highly peaked distribution, indicating frequent instances of astronomical inflation. Both Inflation rate and unemployment rate variables fail the Jaque-Bera test, confirming that their distributions significantly deviate from normality. This may indicate economic instability and periods of sharp increases in inflation and unemployment. While poverty rate, GDP growth rate and GDPper capita appear relatively stable with near-normal distributions, unemployment and inflation rates display strong skewness and high kurtosis, highlighting potential economic volatility. The log of government spending has a mean of 2.76 and a standard deviation of 1.03, indicating moderate variability. Its distribution is slightly left-skewed (-0.45) and platykurtic (1.83). This means that the graph of government spending has a longer left tail and fewer extreme values than a normal distribution. The Jaque-Bera test (3.82, $p = 0.14771$) suggests no significant departure from normality, meaning that the data of government spending are approximately normally distributed.

Table 2: ADF Unit Root Test

Model	Constant	Constant and Trend	No Constant and No Trend
PH	I (1) [-6.2051] *	I (1) [-6.2135] *	I (1) [-6.2061] *
GDP Growth Rate	I (0) [-3.0097] *	I (1) [-10.3205] *	I (1) [-10.3383] *
Log GDP Per Capita	I (1) [-4.1008] *	I (1) [-3.9958] *	I (1) [-3.9884] *
UNEM	I (1) [-5.9846] *	I (1) [-6.0335] *	I (1) [-6.0590] *
INF	I (0) [-3.7359] *	I (0) [-3.6808] *	I (1) [-7.6904] *
Log GE	I (2) [-7.0375] *	I (1) [-7.9991] *	I (2) [0.0000] *

*LPH=Poverty Headcount, Log GDP= Log (Gross Domestic product) per capita, UNEM = Unemployment rate, INF= Inflation rate, log (GE)= Log (Government expenditure). I (0) = Level Stage, I (1) = Integrated at order 1 (first difference), * represents significance at 5% level.*

The ADF unit root test outcomes show that majority of the study variables exhibit stationarity at different orders of integration. PH, LogGDP per capita and UNEM are all stationary at I(1) in all model specifications. The implication is that they require first differencing for stationarity to be achieved. GDP Growth Rate is stationary at I(0) only when a constant is included. It becomes stationary at I(1) when constant and trend or no constant and trend are included. This suggests that its stationarity relies much on the specification of the model. For Inflation rate and log (GE), the outcomes of the unit root test vary depending on the model specification used. When a constant or constant and tend are included, they are stationary at I(0) meaning that they do not require differencing. However, with no constant and no

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trend model, they become stationary at $I(1)$. These findings indicate a mix of $I(0)$ and $I(1)$ variables data which suggests the necessity for further tests such as cointegration analysis, before applying regression models to ensure valid statistical inferences. Since the variables data are stationary at $I(0)$ and $I(1)$, level, it is theoretically right to carry out cointegration test using the ARDL Bound cointegration to examine the presence of long-run relationships between the time series as shown in table 2.

Table 3: Bound Test for the ARDL Model

F-Bound Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Significant	I (0)	I (1)
F-Statistic	3.315740	10%	2.306	2.734
		5%	3.353	3.920
t-Statistic	===	10%	2.427	2.893
		5%	3.395	4.000

The bound test in Table 3 is employed in the ARDL model to determine if a long-run *nexus* exists among the variables. The test compares the computed F-statistic with the critical values of the lower bound ($I(0)$) and the upper bound ($I(1)$). Here, the computed F-statistic is 3.315740, while ($I(0)$) is 3.353 and ($I(1)$) is 3.920. Since the computed F-statistic falls below both the upper and lower critical bounds, it strongly suggests that there is no cointegration between the variables. As there is no cointegration between the variables in this study, it suggests that there is no long-run equilibrium relationship or stable relationship between them, and that the variables do not move together in the long-run. Hence, we should focus on short-run models.

Table 4: Correlations of the study variables

	Poverty Headcount Ratio	GDP Growth Rate	Log (GDP) Per Capita	Unemployment Rate	Inflation Rate	Log (GEO)
Poverty Headcount Ratio	1					
GDP Growth Rate	0.511346	1				
Log (GDP) Per Capita	0.058840	0.162841	1			
UNEM Rate	0.068872	0.052746	0.783304	1		
Inflation Rate	0.253307	0.281354	0.365013	0.324406	1	
Log (GE)	0.517568	0.373890	0.806677	0.290102	0.290102	1

PH= (Poverty Headcount Ratio), Log GDP= Log (Gross Domestic product) per capita, UNEM= (Unemployment Rate), INF= Inflation Rate

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Table 5: ARDL Results (Short Run Estimates)

	Coefficient	St. Error	t-Statistic	Prob
CointEQ *	-0.692847	0.169284	-4.092805	0.0003
GDP growth Rate	0.115924	0.342402	0.338562	0.7371
Log (GDP) Per Capita	-104.5927	35.01689	-2.986922	0.0053
Unemployment Rate	-0.064847	0.185341	-0.349882	0.7287
Inflation Rate	-0.155205	0.103659	-1.497269	0.1438
Log GE	20.70653	9.400947	2.202600	0.0347
@TREND	-0.599149	0.887215	-0.675315	0.5042
C	563.3247	189.0402	2.979919	0.0054
R-Square	0.408850			
F-Statistic	3.260479			
Prob (F-Statistic)	0.009622			

PH=(Poverty Headcount Ratio), Log GDP= Log (Gross Domestic product) per capita, UNEM = (Unemployment Rate), INF= Inflation Rate, Log (GE) = Log (Government expenditure)

Table 5 indicates the short-run estimates results. This estimate from ARDL model reveal mixed impacts of the explanatory variables on PH. The GDP Growth rate has a positive coefficient of 0.115924. This suggests that higher growth increases poverty level slightly in the short-run. However, its p-value (0.7371) shows that the link is not statistically significant. This result conflicts with those of Fosu and Gafa (2020), Ferreira et al. (2010), Dollar and Kraay (2002) and Agrawal (2008) that were carried out in developed nations and that found economic growth have strong ability to reduce poverty. However, it is consonant the results obtained by Ihenetu and Sotonye (2021), Olasode and Olalekan (2022), Olaoye (2022), Ochi (2023), Ngubane et al. (2023) and Henneh (2023) and Nyako (2024) that found either weak, strongly negative or no connection between economic growth and reduction in [poverty level. Log GDP per capita has large negative coefficient of -104.5927, implying that higher GDP per capita

significantly diminishes poverty in the short-run. The p-value of 0.0053 suggests that per capita income plays a significant part in lowering poverty levels. This result agrees those of (2017) and Henneh (2023). The unemployment rate has a negative coefficient of 0.064847. This means that an upward movement in unemployment level is linked with a little decrease in poverty level. This is counterintuitive. However, its p-value (0.7287) suggests that this connection is weak. Similarly, the rate of inflation has negative coefficient of -0.155205. The implication is that poverty level decrease as inflation rises. However, the p-value (0.1438) indicated that the impact of inflation on poverty is not significant. This result is equally in alignment with Henneh (2023) and Gyeke-Dako et al. (2022) who both found in Ghana inflation largely reduces poverty. Government expenditure (GE) has a positive and strong impact on poverty headcount ratio. This result contrasts with that of Henneh (2023) that showed an inverse between the two variables in

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Ghana. The model's R-Squared value (0.408850) shows that about 40.885% of the changes in poverty level is accounted for by the explanatory variables – a moderate explanatory power. The F-Statistic (3.260479, $p = 0.009622$)

confirms that the model is generally strong statistically. This means that not less than one of the explanatory variables has a meaningful impact on poverty.

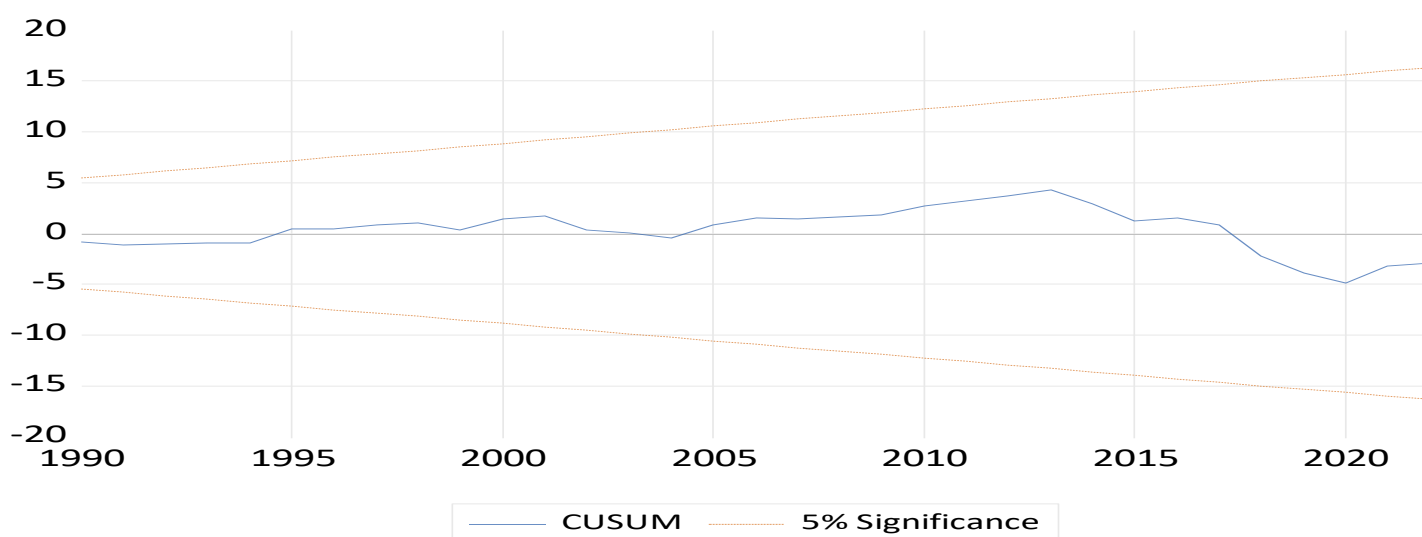


Fig 8: Cusum test

The cusum test (Fig 8) is employed to check the stability of the regression over time.

In the graph, the blue line stands for the cumulative sum of the residuals. The two red lines indicate the critical boundaries based on a 5% significance level. As the blue line remains inside the two red lines, the implication is that the model estimated is stable over time. No structural break exists, meaning that the relationships among the variables in the model did not change significantly throughout the period studied. This confirms that the regression coefficients are reliable for long-term interpretation and forecasting.

Table 6: Diagnostic Test for ARDL

Breusch-Godfrey Serial Correlation LM Test:

Null hypothesis: No serial correlation at up to 2 lags

F-statistic	2.232039	Prob. F (2,31)	0.0920
Obs*R-squared	4.951422	Prob. Chi-Square (2)	0.0537

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Heteroskedasticity Test: Breusch-Pagan-Godfrey

Null hypothesis: Homoskedasticity

F-statistic	0.093102	Prob. F (16,21)	3.3085
Obs*R-squared	7.761923	Prob. Chi-Square (16)	0.7910
Scaled explained SS	8.853187	Prob. Chi-Square (16)	0.2634

Table 6 indicates the Breusch-Godfrey Serial Correlation LM test. The results show no strong presence of autocorrelation within the model's residuals. The F-statistic of 2.23209 having a p-value of 0.0920, along with the Obs*R-squared value of 4.951422 and its corresponding p-value of 0.0537, imply that the null hypothesis of no serial correlation cannot be rejected. As the p-values are well above the conventional levels of significance (0.05 or 0.01), the residuals appear to be independently distributed, which supports the validity of the model's assumptions. Similarly, in table 6, the Breusch-Pagan-Godfrey test outcomes indicate no evidence of heteroskedasticity in the residuals. The F-Statistic of 0.93102 with a p-value of 3.3085, along with the Obs *R-squared statistic of 7.761923 and a p-value of 0.7910, show that the null hypothesis of homoskedasticity cannot be rejected. As the p-values are statistically weak, the model's residuals indicate constant variance, thereby reinforcing the model's reliability for inference. These results suggest that the regression model is well-specified, with no major issues concerning autocorrelation or heteroskedasticity.

NARDL

Table 7: Bound Test for the NARDL Model

F-Bound Test	Null Hypothesis: No levels relationship			
Test Statistic	Value	Significant	I (0)	I (1)
F-Statistic	2.278677	10%	2.517	3.650
		5%	2.933	4.224

Table 7 contains the bounds test in the NARDL model. This is employed to find out if there is a long-run cointegration among the variables of the study. The examination compares the computed F-statistic (2.278677) with the critical lower bound $I(0) = 2.933$ and upper bound $I(1) = 4.224$ at the 5% significance level. Since the F-Statistic (2.278677) is below both $I(0)$ (2.933) and upper bound (1) (4.224), the implication is that there is no evidence of cointegration among the variables and that

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poverty has no stable long- run link with the explanatory variables. As a result, the analysis should focus more on the short-run dynamics instead of long-run effects.

Table 8: NARDL Results (Short Run Estimates)

	Coefficient	St. Error	t-Statistic	Prob
CointEQ *	-0.777763	0.113089	-4.059674	0.0002
GDP growth Rate POS	-0.181994	0.457683	-0.397643	0.6937
GDP growth Rate NEG	0.515009	0.613937	0.838862	0.4082
Log GDP Per Capita POS	0.661571	0.349061	0.954897	0.3937
Log GDP Per Capita NEG	-32.67231	8.075588	-5.431516	0.0056
Unemployment Rate POS	-0.121248	0.201589	0.107805	0.6031
Unemployment Rate NEG	-0.537905	0.210961	-0.168869	0.7391
Log INF POS	0.003071	0.206360	0.014882	0.9882
Log INF NEG	-0.228368	0.168749	-1.353304	0.1861
Log GE POS	16.86364	18.27841	0.922599	0.3636
Log GE NEG	1.023468	46.01015	0.022244	0.9824
R-Square	0.431676			
F-Statistic	2.278677			
Prob (F-Statistic)	0.039765			

PH= (Poverty Headcount Ratio), Log GDP= Log (Gross Domestic product) per capita, UNEM = (Unemployment Rate), INF= Inflation Rate

The short-run estimates of the NARDL model in table 8 provide insights into how positive and negative changes in the economic indicators affect the poverty headcount ratio (PH). The positive and negative parts of GDP growth rate have coefficients of -0.181994 and 0.515009, respectively, implying that both increase and reduction in GDP growth bring is down poverty level in the short –run. However, their p-values (0.6937 and 0.4082) indicate that their impacts are not strong statistically. Similarly, a positive change in Log GDP per capita has a little positive coefficient (0.661571), while a negative change has a strong negative impact on poverty (-32.67231). The latter is statistically significant ($p = 0.0056$), implying that a decrease in GDP per capita has an overwhelming short-run effect in increasing poverty. As for unemployment rate both positive (-0.121248) and negative (-0.537905) changes show small influence on poverty reduction but their p-values (0.6031 and 0.7391) suggest that the effects are not statistically significant. This means that short-run variations in unemployment rate do not affect poverty level greatly. In contrast, inflation rate presents mixed results: a positive change has a coefficient of 0.003171, meaning rising inflation slightly increases poverty, a negative change (-0.228368), that is declining inflation, reduces poverty level seriously. Both positive (16.86364) and negative (1.023468) changes in government spending will increase poverty level slightly. The R-squared value (0.431678) suggests that the model explains about 43.1678% of the changes in poverty level, implying that it is a moderate fit. Also, the F-statistic (16.0164, $p = 0.000281$) confirms that the overall model is statistically significant.

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Conclusively, the results show that GDP per capita t decline and the reduction in inflation rate have the most significant short-run impacts on poverty level while changes in GDP growth, government expenditure and unemployment rate changes do not exhibit strong short-term impacts. —

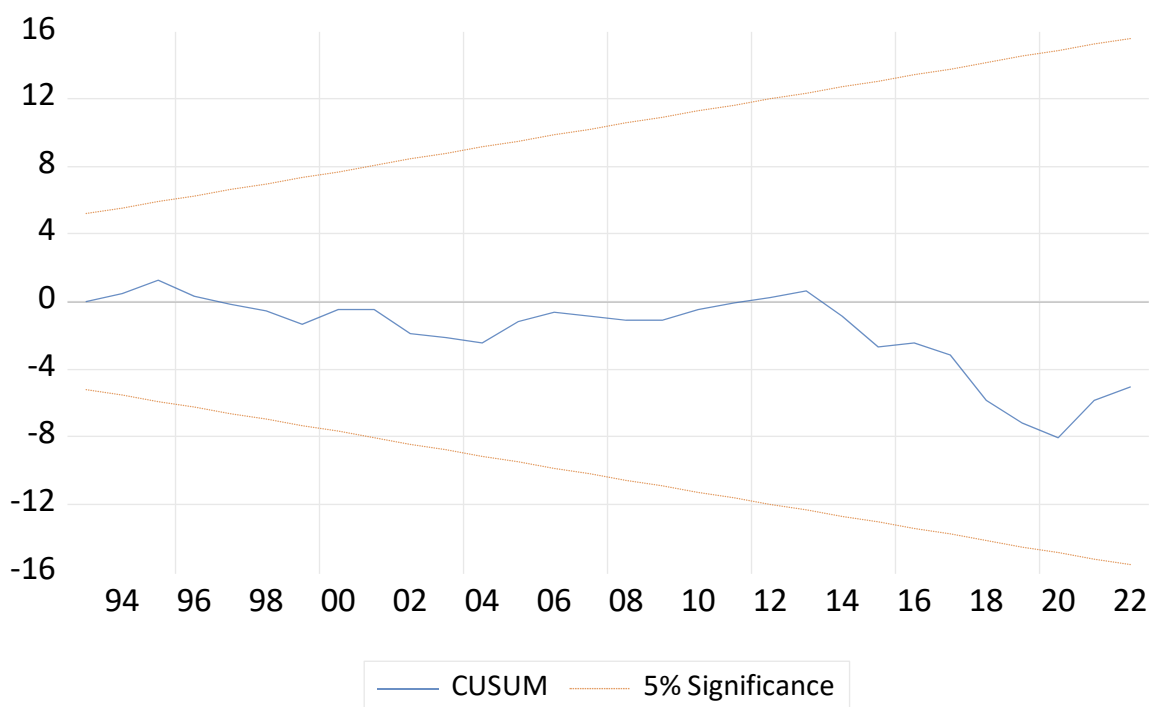


Fig 9: Cusum test

Table 9: Diagnostic Test for NARDL

Breusch-Godfrey Serial Correlation LM Test:

Null hypothesis: No serial correlation at up to 2 lags

F-statistic	2.579326	Prob. F (2,30)	0.0920
Obs*R-squared	5.849353	Prob. Chi-Square (2)	0.0537

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Heteroskedasticity Test: Breusch-Pagan-Godfrey

Null hypothesis: Homoskedasticity

F-statistic	0.496268	Prob. F(33,4)	0.1700
Obs*R-squared	11.66232	Prob. Chi-Square (33)	0.0663
Scaled explained SS	8.853187	Prob. Chi-Square (33)	0.2634

Table 9 indicates the Breusch-Godfrey Serial Correlation test. The results indicate no significant presence of autocorrelation in the residuals of the model. The F-statistic of 2.579326 with ap-value of 0.0920, along with the Obs* R-squared value of 5.849353 and its corresponding p-value of 0.0537, show that the null hypothesis of no serial correlation cannot be rejected. As the p-values are well above the conventional significance levels (0.05 or 0.01), the residuals seem to be independently distributed, which supports the validity of the assumptions of the regression model.

5.0 Conclusion and Recommendations

This study examined the impact of economic growth on poverty reduction sub-Saharan Africa using Nigeria as a point of reference. The short-run estimates of ARDL and NARDL models both revealed mixed impacts of the explanatory variables on the dependent variable, poverty headcount ratio. While economic growth is slightly and positively associated with poverty rate in the short-run, Increase in GDP per capita

reduces poverty significantly. Also, unemployment rate has adverse effect on poverty rate, rising inflation decrease poverty slightly, while government expenditure affects poverty rate in SSA positively and significantly. The model's R-squared explains only about 40.885% of changes in poverty level. This implies that there are yet more variables that are responsible for poverty reduction in the SSA countries. It also means that economic growth is a necessary but not a sufficient condition for poverty reduction. For economic growth to reduce poverty significantly, the study recommends as follows

- Economic growth must be pro-poor growth. Policies must be directly targeted at the poor and government must ensure that growth benefits the poor disproportionately (Ames et al.,2001).
- Growth has to be inclusive. This means that it has be made to benefits all segments of society. This is more likely to reduce poverty effectively.
- High levels of inequality must be avoided as that can undermine the effectiveness of growth in reducing poverty, as the benefits may be

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concentrated among the wealthy (Cerra et al., 2021)

iv) Economic growth should be made to lead to job creation and improved labor market conditions; this will be particularly effective in reducing poverty.

v) Investment should be made in education, healthcare, and other forms of human capital as doing so can enhance the ability of the poor to participate in and benefit from economic growth.

vi) Strong institutions, including the rule of law, good governance, and effective social safety nets, should be put on ground as important means for ensuring that growth is sustainable and benefits all parts of society.

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APPENDIX

Year	Government Expenditure	GDP per capita	Inflation Rate	Unemployment rate	Poverty Headcount ratio	GDP(N'Billion)
1981	11.41	262,699.47	20.90	3.90	27.20	19,549.56
1982	11.92	237,826.91	7.70	3.90	27.20	18,219.27
1983	9.64	206,604.45	23.20	3.90	27.20	16,228.81
1984	9.93	199,311.27	39.60	3.90	27.20	16,048.31
1985	13.04	205,419.99	5.50	6.10	46.30	16,997.52
1986	16.22	200,229.69	5.40	5.30	46.30	17,007.77
1987	22.02	201,380.07	10.20	7.00	45.40	17,552.10
1988	27.75	210,629.59	38.30	5.30	42.70	18,839.55
1989	41.03	209,134.29	40.90	4.00	42.70	19,201.16
1990	60.27	227,699.14	7.50	3.50	44.00	21,462.73
1991	66.58	222,734.46	13.00	3.10	44.00	21,539.61
1992	92.80	227,241.78	44.50	3.40	42.70	22,537.10

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1993	191.23	216,999.65	57.20	2.70	42.70	22,078.07
1994	160.89	207,645.33	57.00	2.00	42.70	21,676.85
1995	248.77	202,255.69	72.80	1.80	60.00	21,660.49
1996	337.22	205,483.76	29.30	3.80	65.60	22,568.87
1997	428.22	206,249.23	8.50	3.20	74.00	23,231.12
1998	487.11	206,316.20	10.00	3.20	74.00	23,829.76
1999	947.69	202,311.39	6.60	8.20	74.00	23,967.59
2000	701.05	207,000.51	6.90	13.10	88.00	25,169.54
2001	1,018.00	213,513.63	18.90	13.60	88.00	26,658.62
2002	1,018.18	239,724.86	12.90	12.60	65.70	30,745.19
2003	1,225.99	250,500.86	14.00	14.80	65.00	33,004.80
2004	1,504.20	266,395.24	15.00	13.40	54.40	36,057.74
2005	1,919.70	276,011.21	17.90	11.90	65.70	38,378.80
2006	2,038.00	284,949.40	8.50	12.30	65.70	40,703.68
2007	2,450.90	295,611.31	5.40	12.70	59.30	43,385.88
2008	3,240.82	307,139.98	15.10	14.90	59.30	46,320.01
2009	3,452.99	322,896.76	13.90	19.70	59.30	50,042.36
2010	4,194.58	339,305.97	11.80	21.40	64.90	54,612.26
2011	4,712.06	347,574.88	10.30	23.90	64.90	57,511.04
2012	4,605.30	352,453.13	12.00	27.40	68.20	59,929.89
2013	5,185.32	365,960.42	8.00	24.70	67.00	63,218.72
2014	4,587.39	378,959.93	8.00	25.10	46.00	67,152.79
2015	4,988.86	379,251.58	9.60	29.20	40.75	69,023.93
2016	5,858.56	363,881.63	18.55	35.20	61.33	67,931.24
2017	6,456.70	357,659.72	15.37	40.87	61.33	68,490.98
2018	7,813.74	355,548.13	11.44	43.27	40.10	69,799.94
2019	9,712.22	354,611.42	11.98	43.27	39.09	71,387.83
2020	10,232.33	339,852.28	15.75	56.10	39.10	70,014.37
2021	12,164.15	343,872.15	15.63	56.10	63.00	72,393.67
2022	14,946.25	346,703.24	21.34	5.30	62.90	74,639.47
2023	19,808.44		28.92	5.40	62.90	76,684.94

**SOURCE: NBS, CBN AND WORLD
BANK**

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