Econometric Analysis of the impact of inflation, unemployment, and economic growth on poverty reduction: A novel application of Asymmetric technique

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26 June 2023

ECONOMETRIC ANALYSIS OF THE IMPACT OF INFLATION, UNEMPLOYMENT, ECONOMIC GROWTH ON POVERTY REDUCTION IN NIGERIA: A NOVEL APPLICATION OF THE ASYMMETRIC TECHNIQUE

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Abstract

This study conducts an econometric analysis using time series data from 1980 to 2021 to examine the relationship between explanatory factors and poverty in Nigeria. The study employs both short-run and long-run estimates through the Non-Linear Autoregressive Distributive Lag (NARDL) approach. By utilizing a comprehensive dataset and applying various econometric methodologies, the study aims to provide reliable results. The findings suggest that in the short run, inflation, unemployment (positive and negative shocks), and population significantly influence poverty rates in Nigeria. However, these effects are not statistically significant at conventional levels. In the long run, population growth, unemployment, and inflation (negative shock) do not have a substantial impact on poverty. On the other hand, economic growth, as measured by GDP growth, demonstrates a positive relationship with poverty reduction. The analysis indicates that sustained economic growth leads to lower poverty rates over the long term. Based on these results, the study emphasizes the importance of promoting sustainable economic growth as a key strategy for poverty reduction in Nigeria. Policy measures that focus on job creation, inflation control, and investment in human capital development are crucial for poverty alleviation. Additionally, addressing the specific needs of vulnerable populations and regions with high poverty rates should be prioritized. This study contributes to the existing literature by providing empirical evidence on the relationship between explanatory factors and poverty in Nigeria. The findings underscore the significance of a comprehensive approach that combines inclusive economic growth with targeted policies to address the structural factors underlying poverty.

Key words: Inflation, Unemployment, poverty, NARDL, Positive shock, Negative shock

1. Introduction

Economists and policymakers often engage in debates regarding the role of unemployment and inflation as crucial determinants of economic progress and poverty rates, particularly in developing countries (Ademola et al., 2014; Ramzon, 2021). These variables carry significant importance in measuring and evaluating the growth and performance of both emerging and developed economies. Expansionary monetary policies, such as increased money supply, are frequently attributed to the occurrence of inflation, which refers to the persistent increase in the price level within an economy (Rafindadi 2012). Additionally, the classical school of economics recognizes the existence of a natural unemployment rate, known as the equilibrium level of unemployment. Inflation, an economic concept used to gauge the rise in prices over time, can be classified into two types: cost-push inflation and demand-pull inflation. Cost-push inflation occurs when input prices involved in production increase, subsequently leading to higher commodity prices. Conversely, demand-pull inflation arises when the overall demand for a product exceeds its supply, resulting in price levels rising above the equilibrium point (Shahid, 2014).

The interplay between unemployment, poverty, inflation, and their causal factors is a subject of significant debate among economists in the context of developing economies. The Nigerian economy is no exception to this complexity. As a researcher, the question arises as to whether substantial economic growth has any influence on the poverty level in the economy, and what the interrelationships are between economic growth, unemployment, and inflation. In the pursuit of economic growth, accompanied by an increase in the economy's productive capacity that should ideally reduce unemployment, there is often a corresponding increase in the price level (inflation). The crucial question then becomes whether these developments have a meaningful impact on poverty levels.

However, the inflationary trend observed in Nigeria diverges from the aforementioned dynamics. The state of the Nigerian economy reveals that economic growth has shown little to no impact on reducing the poverty level. In Nigeria, the prices of goods and services are predominantly driven by fluctuations in petroleum prices rather than substantial increases in wages and salaries (Aigbokan 2000). Consequently, while nominal incomes may increase, the real income of many individuals is decreasing. For instance, the proposed removal of petroleum subsidies, considered a growth-promoting policy, is expected to stimulate long-term economic growth. This policy aims to foster investment in sectors such as education, which would yield a skilled workforce, and capital investment, leading to employment opportunities and enhancing the economy's productive capacity. However, this policy change would directly impact the consumer price index of goods due to increased transportation costs. As a result, the burden would be shifted to consumers without a substantial increase in their income.

Nigeria, with its rapidly growing population of approximately 200 million people and a nominal GDP of around $207 billion in 2006, is often considered the fastest-growing economy in Africa (UNCTAD, 2006). However, despite this promising outlook, Nigeria continues to face significant challenges, particularly in the areas of unemployment, poverty, and inflation (Aiyedogbon et al 2012). The country's unemployment rate has been on the rise, and despite its abundant human

and natural resources, the economy remains largely underdeveloped. This situation has resulted in high levels of poverty, low standards of living, and persistently high rates of unemployment and inflation, along with various socio-economic issues. The high level of poverty in Nigeria can be attributed to the widespread unemployment and underemployment experienced by many individuals. This refers to a situation where the income earned by the majority of workers is insufficient to provide them with an adequate level of satisfaction in meeting their basic needs for shelter, clothing, and food (Aiyedogbon et al 2012, Kale 2012). The sight of numerous people desperately malnourished and lacking the basic necessities of life raises doubts about the effectiveness of growth policies that prioritize economic expansion but fail to have a significant impact on the average citizen (Okoroafor et al 2012).

The economic situation in Nigeria is indeed perplexing. Despite various macroeconomic policies implemented by the government, consistent price stability, increased employment, and sustained growth that would reduce the poverty level in the economy have not been achieved. It appears that government interventions in the economy have been unable to address the existing challenges effectively. Over the years, the economy's performance has been unsatisfactory in relation to the poverty rate (Aminu et al 2012). While the relationship between unemployment, inflation, and economic growth has been extensively studied, the question that remains is whether economic growth itself has a direct impact on the poverty level.

This raises the question: What is the impact of growth-promoting policies and unemployment on the poverty index in Nigeria's economy? When nominal income remains constant while the price level of essential commodities increases significantly, a scenario arises where more money chases fewer goods, making it increasingly difficult for consumers to afford previously attainable purchases. This exacerbates the challenges faced by the average consumer. Consequently, it is essential to assess the extent to which growth-promoting policies and unemployment contribute to the poverty index in Nigeria's economy.

Although economic growth, stable prices, and full employment are the primary macroeconomic objectives pursued by the government, it is crucial to understand how these achievements contribute to poverty reduction. Therefore, the investigation into the extent to which economic growth influences the poverty level becomes paramount (Ademola et al., 2014; Ramzon, 2021). Poverty poses a significant challenge to attaining a high standard of living and is widespread in Nigeria. Unemployment, a crucial factor, has been identified as one of the primary causes of poverty. An increase in unemployment levels leads to a corresponding rise in poverty. While the correlation between poverty and unemployment has been extensively studied, the relationship between economic growth and poverty in Nigeria remains unclear. This study aims to contribute to the existing literature on unemployment, economic growth, inflation, and poverty in Nigeria, addressing a crucial research gap in this area.

Previous research has quantitatively explored the relationship between unemployment, poverty, and economic growth in Nigeria. For instance, Okoroafor et al. (2013) found no correlation between poverty, discomfort index, and economic growth in Nigeria. Akeju et al. (2014) applied Okun's law to analyze the relationship between economic growth and unemployment in Nigeria, revealing an inverse relationship between the two variables. While unemployment and poverty have been extensively studied, the link between economic growth and poverty in the Nigerian

context remains understudied. Therefore, this study investigates the relationship between unemployment, inflation, economic growth, and poverty from 1980 to 2021, exploring the long-run relationship between these variables.

To analyze the variables, annual data was collected, and stationarity tests were conducted to ensure the reliability of the data. The study employed a double unit root test to confirm the stationarity of the variables. The nonlinear Autoregressive Distributed Lag (NARDL) model was utilized to examine the positive and negative influences of decomposed variables on economic growth, allowing for the analysis of short-run and long-run dynamics.

The subsequent sections of the paper are organized as follows: Section 2 reviews the existing literature on the topic. Section 3 describes the methodology, including the data sources and model specification (Section 3.1). Section 4 presents the empirical findings and provides a detailed discussion. Finally, Section 5 summarizes the study's findings and offers policy recommendations.

2. Literature Review

The issue of unemployment has been a significant obstacle to global economic growth, affecting both developed and emerging economies. While the level of unemployment has relatively decreased in wealthy countries, developing economies are experiencing a rapid increase in unemployment rates, leading to reduced family income and a decline in the standard of living. This rise in unemployment contributes to the persistence and severity of poverty in these countries (Jibir et al., 2015). The lack of economic opportunities is a major setback to economic growth and exacerbates the problem of poverty. Economic inequality further intensifies the absence of social mobility (Ogbeide et al., 2015). Poverty is primarily associated with the unavailability of financial resources to meet basic needs such as food, shelter, and clothing. It is often quantified using the poverty line, which represents the monetary value required to meet these fundamental needs. However, the level of poverty in a specific economic location is influenced by numerous factors (Misim et al., 2017).

Various studies have examined the impact of economic growth, inflation, and unemployment on poverty. Inflation, underemployment, unemployment, and inequality are destructive global phenomena that affect individuals across all socioeconomic strata. Economic growth, in general, has the most significant impact on poverty reduction, although a high GDP growth rate alone is not sufficient to eliminate poverty entirely. Additionally, a strong prospect of economic growth does not necessarily lead to fewer people living below the poverty line if income inequality persists (Misim et al., 2017; Peter et al., 2017; Nurdiana et al., 2020). Khan et al. (2001) conducted a study using a structural vector autoregressive (SVAR) econometric model to explore the interconnectedness between unemployment, inflation, and poverty in 140 emerging and developed countries from 1960 to 1998. They identified an apex level of inflation at which the increase in both unemployment and inflation justifies a rise in poverty. For developed economies, the poverty increase ranged from 1% to 3%, while for emerging countries, the parameter ratio was around 11% to 12%.

Osterling (2007) employed a consumption-based technique to analyze the relationship between inflation and the consumption poverty rate in the West Africa region. Using panel data from eight different countries over a 12-year period (2000-2012), the study found a positive relationship between inflation rate and consumption poverty rate. Other researchers contend that inflation affects the poor by significantly reducing the purchasing power of their nominal income in the short run. Yelwa et al. (2015) investigated the link between unemployment, inflation, and economic growth in Nigeria. Using ordinary least squares (OLS) analysis, they discovered an inverse relationship between inflation, unemployment, and economic growth. The authors suggested that inflation may be attributed not to aggregate demand imbalances but rather to disequilibrium in the supply channel of productive capacity, which can be linked to the unemployment situation in the country. They recommended creating a conducive environment for accurate macroeconomic policies that enhance productive capacity and domestic output.

Talukdar (2012) conducted a comprehensive examination of the causal relationship between inflation and poverty using panel data from 115 developing countries between 1981 and 2008. Regression analysis was performed, considering variables such as external debt, income level, and educational attainment. The study found a positive relationship between inflation and poverty, despite variables like educational attainment, the efficiency of governmental structure, and income displaying a negative relationship with poverty. The author also explored the relationship between inflation and unemployment across low-income and middle-income countries, observing a positive correlation in most low-income countries and a negative but insignificant relationship in some cases.

Ahmed et al. (2011) proposed that maintaining a constant and low volatile inflation rate can positively impact a country's development, leading to increased growth potential and decreased poverty rates. They conducted a study in Bangladesh using an error correction model and found a long-run negative relationship between inflation, poverty rate, and economic growth. The derived threshold model indicated a 6% benchmark level of inflation, beyond which inflation has an adverse effect on economic growth and subsequently increases the incidence of poverty. Ibrahim et al. (2008) analyzed the determinants of poverty and coping strategies among farming households in Nasarawa State, Nigeria. The study included 150 households engaged in farming and employed cost-of-calorie and discriminant analysis to assess poverty and its determinants. The results showed a high rate of poverty among the sampled households, with key determinants including household size, income sources for the household head, and the level of education among male and female adults. Coping strategies employed by the households included reducing meal quantities and intentionally skipping meals.

Gordon (2013) examined the situation of poverty in Nigeria using data from economic growth and MDGs expenditure. The study applied panel data analysis techniques, including fixed effects, random effects, pooled models, and weighted least squares. The findings revealed a positive relationship, indicating that a 1% increase in per capita GDP led to a 0.6% increase in poverty.

In summary, the discussed studies provide valuable insights into the relationship between unemployment, inflation, and poverty. They highlight the interconnectedness of these factors and their impact on economic growth and poverty levels. Understanding these dynamics is crucial for

policymakers to formulate effective strategies and create an enabling environment for economic development and poverty reduction.

3. Study, methodology and Data

This research key objective was to examine the impact of inflation, unemployment, population growth and economic growth on poverty in Nigeria using the annual datasets adapted from the World Bank data base for the years 1980 to 2021.

The study focuses on several variables: economic growth, inflation, poverty rate, unemployment rate, and population growth. Figure 1 illustrates the annual trends of these variables. Figure 2 provides an overview of the study's methodology, which involves conducting tests to assess the stationarity of the variables, such as the Augmented Dickey Fuller test and the Phillips and Perron test. The lag-length criteria are also explored. Subsequently, bounds testing is performed to confirm the presence of cointegration, and Johansen cointegration testing is employed to examine the robustness of the relationships among the variables. Finally, the Non-linear Autoregressive Distributed Lag approach is utilized to analyze the long-run and short-run dynamics, specifically focusing on the impact of inflation, unemployment, population growth, and economic growth on poverty.

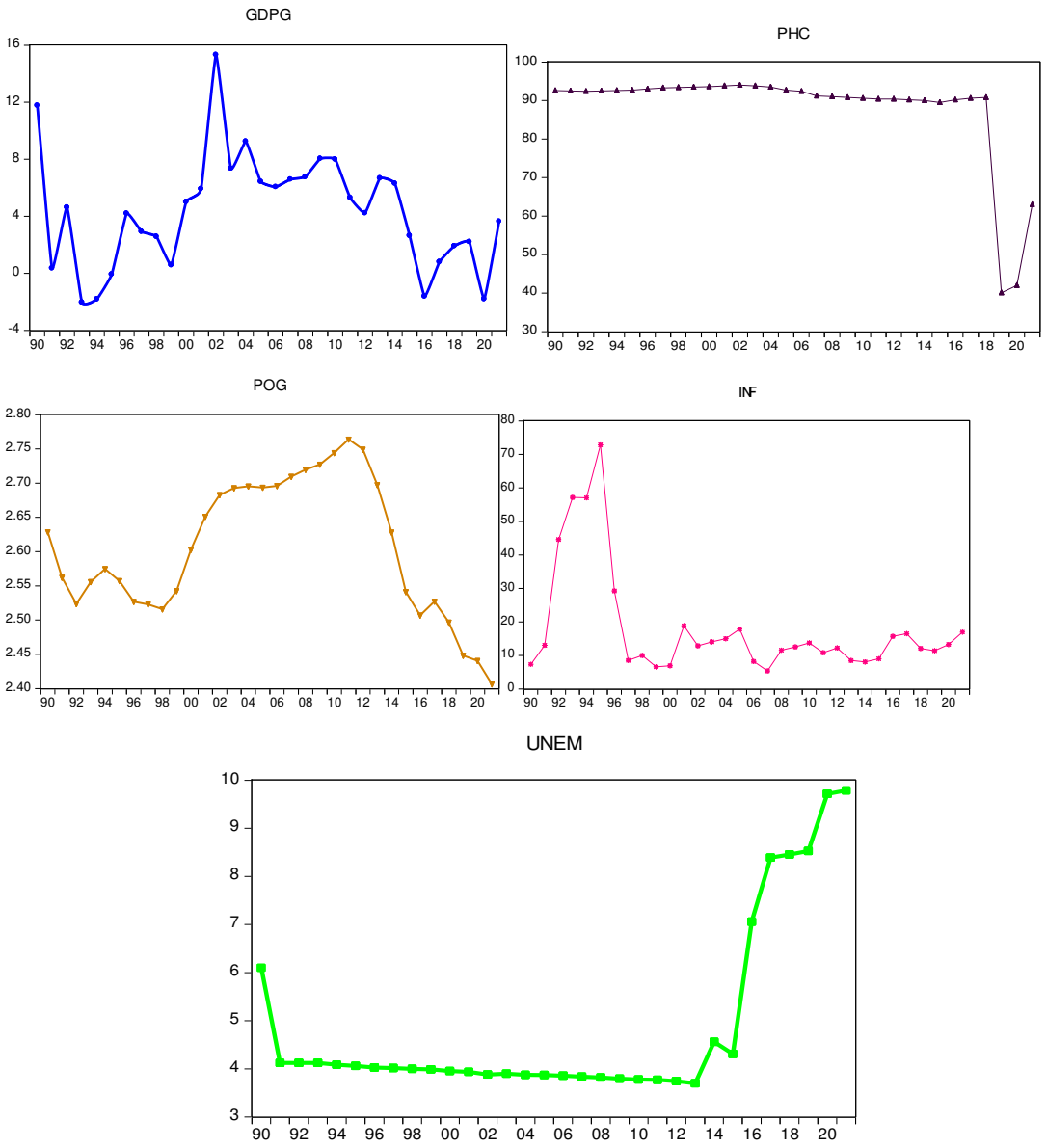

Figure I: Year-wise trend of the study variable

3.1 Study Model

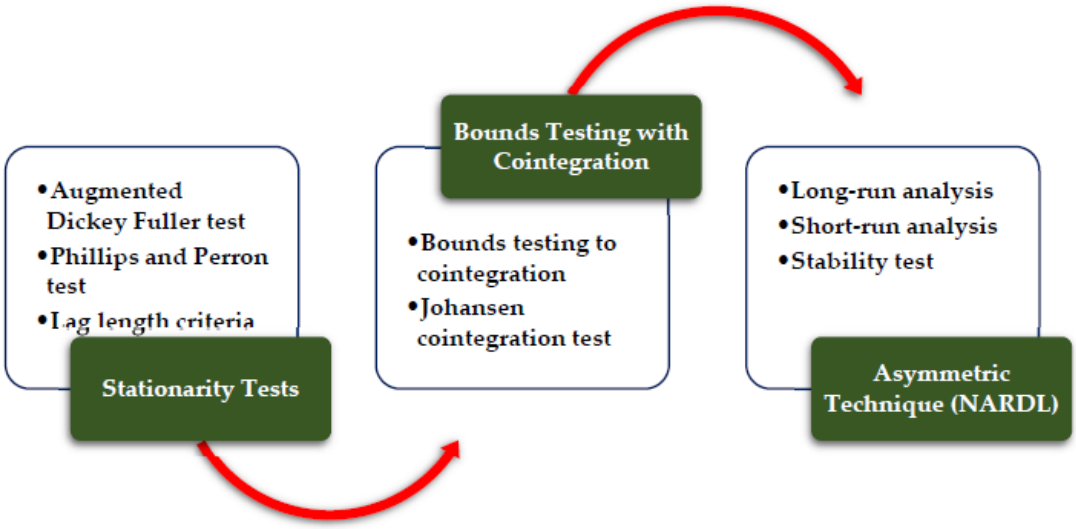

Figure II: Study methodological map.

Various econometric estimation techniques have been employed in different research studies to explore the connections between the variables. In a study conducted by Chen et al. (2021), co-integration and Granger causality techniques were utilized to examine the nexus among the variables using time series data. Johnson et al. (2023) employed dynamic panel system-generalized moment techniques to analyze the interactions between the variables. Similarly, Rodriguez et al. (2023) utilized the symmetric Autoregressive Distributed Lag (ARDL) approach with fully modified least squares and dynamic least squares techniques to investigate the influence of the variables. In this research, I have employed the asymmetric Non-Linear Autoregressive Distributed Lag (NARDL) technique to explore the relationship between unemployment, gross domestic product growth rate, inflation, population growth, and poverty (head count) in Nigeria. The NARDL approach allows for both short-run and long-run estimations, providing a comprehensive analysis of the variables' impact. By adopting this methodology, I aim to uncover the asymmetric effects and dynamic interactions between the variables in the context of Nigeria. This approach takes into account the nonlinearities and potential asymmetries in the relationships, allowing for a more nuanced understanding of how changes in the explanatory variables affect poverty levels in both the short and long run. The following model can be stated as follows:

$$POV_t = f\,(INF_t, UNEMP_t, GDPg_t, POG_t) \quad (1)$$

In order to maintain the level of consistency, equation (1) can be written as follows:

$$POV_t = \partial_0 + \partial_1 INF_t + \partial_2 UNEMP_t + \partial_3 GDPg_t + \partial_4 POG_t + \varepsilon_t \quad (2)$$

In equation 2, POV represent the poverty rate, INF denotes inflation rate, UNEMP represent unemployment rate, GDPg represent the economic growth, and POG represent population growth.

$\partial_0 - \partial_4$ Represent the coefficient of the model and t shows the time extent. The ARDL (Autoregressive distributive lag) model which was initially organized by Pesaran et al 2001 was introduced in this relationship to examine the interaction amide the variables and can be estimated as follow;

$$\Delta POV_t = \alpha_0 + \sum_{t=1}^{1} \theta_t \Delta POV_{t-1} + \sum_{t=0}^{1} \xi_t \Delta INF_{t-1} + \sum_{t=0}^{1} \Upsilon_t \Delta UNEM_{t-1} + \sum_{t=0}^{1} \Pi_t \Delta GDPg_{t-1} + \sum_{t=0}^{1} \chi_t \Delta POG_{t-1}$$
$$+ \Psi_1 POV_{t-1} + \Psi_2 INF_{t-1} + \Psi_3 UNEM_{t-1} + \Psi_4 GDPg_{t-1} + \Psi_5 POG_{t-1} + \varepsilon_t \quad (3)$$

The equation (3) presented in the study demonstrates a strong connection between the variables, making it a more suitable approach compared to other commonly used methods when dealing with limited sample sizes. This particular methodology also provides an added advantage of motivating respondents to participate actively. In a study conducted by Shin et al. (2014), they adopted a broader time frame to employ the F-test for the purpose of verifying long-term predictions. Once co-integration is established, the long-term elasticity can be calculated and subsequently adjusted through a regularization process. When decomposable variables such as population growth (POG), Inflation (INF), growth rate (GDPg) and Unemployment (UNEM) are decomposed into positive (POG^{+}_{Υ} ; INF^{+}_{Υ} ; $GDPg^{+}_{\Upsilon}$; $UNEM^{+}_{\Upsilon}$) and negative shocks (POG^{-}_{Υ} ; INF^{-}_{Υ} ; $GDPg^{-}_{\Upsilon}$; $UNEM^{-}_{\Upsilon}$), an asymmetric approach can be implemented which can be shown as follows:

$$POS(INF_t) = INF_Y^+ = \sum_{Y=1}^{Y} \Delta INF_Y^+ = \sum_{Y=1}^{Y} Max(\Delta INF_Y^+) \quad (4)$$

$$NEG(INF_t) = INF_Y^- = \sum_{Y=1}^{Y} \Delta INF_Y^- = \sum_{Y=1}^{Y} Min(\Delta INF_Y^-) \quad (5)$$

$$POS(UNEM_t) = UNEM_Y^+ = \sum_{Y=1}^{Y} \Delta UNEM_Y^+ = \sum_{Y=1}^{Y} Max(\Delta UNEM_Y^+) \quad (6)$$

$$NEG(UNEM_t) = UNEM_Y^- = \sum_{Y=1}^{Y} \Delta UNEM_Y^- = \sum_{Y=1}^{Y} Min(\Delta UNEM_Y^-) \quad (7)$$

$$POS(GDPg_t) = GDPg_Y^+ = \sum_{Y=1}^{Y} GDPg_Y^+ = \sum_{Y=1}^{Y} Max(GDPg_Y^+) \quad (8)$$

$$NEG(GDPg_t) = GDPg_Y^- = \sum_{Y=1}^{Y} GDPg_Y^- = \sum_{Y=1}^{Y} Min(GDPg_Y^-) \quad (9)$$

$$POS(POG_t) = POG_Y^+ = \sum_{Y=1}^{Y} POG_Y^+ = \sum_{Y=1}^{Y} Max(POG_Y^+) \quad (10)$$

$$NEG(POG_t) = POG_Y^- = \sum_{Y=1}^{Y} POG_Y^+ = \sum_{Y=1}^{Y} Max(POG_Y^+) \quad (11)$$

Eqn (4) to (11) shows the impact of positive and negative shocks on the variables, as a result the model asymmetric representation can be summarized as follows:

$$\begin{aligned}\Delta POV_t = {} & \beta_0 + \sum_{b=1}^{x} \alpha_b \Delta POV_{t-b} + \sum_{b=0}^{x} \lambda_b \Delta INF_{t-b}^+ + \sum_{b=0}^{x} \kappa_b \Delta INF_{t-b}^- + \sum_{b=0}^{x} \eta_b UNEM_{t-b}^+ + \sum_{b=0}^{x} \Omega_b UNEM_{t-b}^- \\ & + \sum_{b=0}^{x} \upsilon_b GDPg_{t-b}^+ + \sum_{b=0}^{x} \in_b GDPg_{t-b}^- + \sum_{b=0}^{x} f_b POG_{t-b}^+ + \sum_{b=0}^{x} \Im_b POG_{t-b}^- + \mu_1 POV_{t-1} + \mu_2 INF^+_{t-1} \\ & + \mu_3 INF^-_{t-1} + \mu_4 UNEM^+_{t-1} + \mu_5 UNEM^-_{t-1} + \mu_6 GDPg^+_{t-1} + \mu_7 GDPg^-_{t-1} + \xi_t \end{aligned} \quad (12)$$

Equation (12) explores the asymmetrical representation for the variables. The exploration of the error correction model can be stated as follows:

$$\begin{aligned}\Delta POV_t = {} & \beta_0 + \sum_{b=1}^{x} \alpha_b \Delta POV_{t-b} + \sum_{b=0}^{x} \lambda_b \Delta INF_{t-b}^+ + \sum_{b=0}^{x} \kappa_b \Delta INF_{t-b}^- + \sum_{b=0}^{x} \eta_b UNEM_{t-b}^+ + \sum_{b=0}^{x} \Omega_b UNEM_{t-b}^- \\ & + \sum_{b=0}^{x} \upsilon_b GDPg_{t-b}^+ + \sum_{b=0}^{x} \in_b GDPg_{t-b}^- + \sum_{b=0}^{x} f_b POG_{t-b}^+ + \sum_{b=0}^{x} \Im_b POG_{t-b}^- + \mu_1 POV_{t-1} + \mu_2 INF^+_{t-1} \\ & + \mu_3 INF^-_{t-1} + \mu_4 UNEM^+_{t-1} + \mu_5 UNEM^-_{t-1} + \mu_6 GDPg^+_{t-1} + \mu_7 GDPg^-_{t-1} + \sigma ECM_{t-1} + \xi_t \end{aligned} \quad (13)$$

Eqn (13) gives a description of the exploration of error correction model

4. Empirical Finding and Discussion

4.1 Summary Statistics and Correlation

Based on the descriptive statistics and correlation matrix provided, we can assess whether the variables are behaving well for analysis. Poverty head count (PHC): The variable shows a wide range, with a mean of 80.68167 and a standard deviation of 24.91834. It has a negatively skewed distribution and a positive kurtosis, indicating that the data is not normally distributed and has some extreme values, Population (POP) has a small standard deviation of 0.13901, suggesting relatively less variability. It also exhibits positive skewness and positive kurtosis, indicating departure from a normal distribution, Inflation (INF) has a larger standard deviation of 16.51315, indicating significant variability in inflation rates. It is positively skewed and has positive kurtosis, suggesting a non-normal distribution and potential outliers.

The correlation matrix provides insights into the relationships between the variables. Based on the correlation coefficients:

PHC and GDPG have a relatively strong positive correlation (0.613990236).

UNEM and PHC have a relatively strong negative correlation (-0.648238639).

The implications of the summary statistics and correlations can be observed in Tables 1 and 2. Moreover, it was identified that all the variables exhibited similar patterns. The statistical significance of the Jarque-Bera test suggests that there are no issues with the distribution of the variables in the dataset. Additionally, a strong association was found between the dependent and

independent variables. However, if the model variables are integrated at the second difference, it is not possible to employ asymmetric analysis. Consequently, we will examine some of the statistics to determine the sources of the issues encountered in the investigation.

Table 1: **Descriptive Statistics**

	PHC	POP	INF	GDPG	UNEM
Mean	80.68167	2.628613	18.73532	3.069167	5.306333
Median	92.405	2.608257	12.7072	3.921555	4.1035
Maximum	94	3.063712	72.8355	15.32916	11
Minimum	14.4	2.406363	5.388008	-13.1279	3.5
Std. Dev.	24.91834	0.13901	16.51315	5.322386	2.110712
Skewness	-1.79101	1.137186	1.892202	-0.84323	1.22896
Kurtosis	4.472264	4.619233	5.460031	4.740206	3.121537
Jarque-Bera	26.24714	13.6407	35.65356	10.27679	10.59826
Probability	0.000002	0.001091	0	0.005867	0.004996
Sum	3388.63	110.4018	786.8833	128.905	222.866
Sum Sq. Dev.	25457.87	0.792274	11180.05	1161.44	182.6593
Observations	42	42	42	42	42

Table II: Correlation amid the study variables

	PHC	POP	INF	GDPG	UNEM
PHC	1	-0.17061	0.104996	0.61399	-0.64824
POP	-0.17061	1	-0.21013	0.045736	-0.21487
INF	0.104996	-0.21013	1	-0.20945	-0.09476
GDPG	0.61399	0.045736	-0.20945	1	-0.58002
UNEM	-0.64824	-0.21487	-0.09476	-0.58002	1

4.2 Stationarity testing aid variables

In this study, a unit root test was conducted to assess the stability of the variables. The results of the unit root test are presented in Table 3. Two common unit root approaches, namely the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests, were employed to determine the order of integration for each variable. Based on the test statistics, it was found that the variables exhibit a stationary trend. The non-stationary variables in the model were transformed into stationary variables using a single-step differencing (I(1)). The stationarity of the variables indicates that they do not need to be differenced iteratively as they are considered stationary.

Table III : Unit Root Testing

	ADF Test (at the level) (1(0)				
	PHC	POP	INF	GDPG	UNEM
T test and P-value*	-3.981 (0.003)**	-3.195 (0.029)**	-3.094 (0.034)**	-2.795 (0.067)	-1.653 (0.446)
	At the First difference 1(1)				
T test and P-value*	-3.220 (0.026)**	-	-5.985 (0.000)**	-11.867 (0.000)**	-7.012 (0.000)**
	P-P Test (at the level) 1(0)				
T test and P-value*	-2.468 (0.130)	-3.293 (0.021)**	-2.959 (0.047)**	-3.743 (0.006)**	-1.902 (0.328)
	At the First difference 1(1)				
T test and P-value*	-6.162 (0.000)**	-5.230 (0.001)**	-12.396 (0.000)**	-12.729 (0.000)**	-7.204 (0.000)

** shows 5% percent level of significance

4.3 Bound Test Co-integration

The objective of this analysis was to investigate the influence of inflation, unemployment, and population growth and economic growth on poverty in Nigeria using the NARDL (Nonlinear Autoregressive Distributed Lag) methodology. To conduct the bounds test and assess co-integration, it is crucial to generate an F-statistic within an appropriate timeframe, as determined by the Akaike Information Criterion (AIC). Table 4 presents the results indicating that the F-statistic yields statistically significant estimates.

Table IV: Bound Test Result

	N-Hypothesis found No level connection		
	Significance	1(0)	1(1)
F- stat value (348.513)	10%	(1.95)	(3.06)
	5%	(2.22)	(3.39)
	2.5%	(2.48)	(3.7)
	1%	(2.79)	(4.1)

In addition to the bound test result aimed to established a co-integration relationship,, this study also employ the technique of Johansen and Juselius with critical values of 5%, and the consequences of this are explored in Table 5.

Table V: Co-integration Technique among the variables

Hypo-No. of CE(s)	**Eigenvalue**	**Trace Statistic**	**C- Value(0.05)**	**Prob.****
None *	0.730069	107.8636	69.81889	0
At most 1 *	0.565091	55.4801	47.85613	0.0082
At most 2	0.338111	22.17536	29.79707	0.2889
At most 3	0.132115	5.669037	15.49471	0.7342
At most 4	2.98E-05	0.00119	3.841466	0.9717
Maximum Eigen value				

Hypo-No. of CE(s)	Eigenvalue	Trace Statistic	C-Value(0.05)	Prob.**
None *	0.730069	52.38352	33.87687	0.0001
At most 1 *	0.565091	33.30474	27.58434	0.0082
At most 2	0.338111	16.50633	21.13162	0.1966
At most 3	0.132115	5.667847	14.2646	0.6561
At most 4	2.98E-05	0.00119	3.841466	0.9717

Note: * Specifies the denial of the hypothesis at the 0.05 level; ** shows the probability values of MacKinnon-Haug-Michelis (1999).

4.4 Optimal Lag Length Criteria

It is important to consider the dynamism that is peculiar to the qualities of the model while choosing the perfect lag duration. AIC (Akaike information Criterion) is mostly used in analyzing data to determine the optimal order of data that is lagged. As a result of these criteria, we employ the used of AIC (Akaike information criterion) to derive the perfect lag for the variables that will be included in the model. Table 6 gives report on the result of the optimal lag length criteria.

Table VI: Optimal Lag length criteria

Lag	Log-L	LR	FPE	AIC	SC	HQ
0	-454.5754	NA	11832.94	23.56797	23.78125	23.64449
1	-379.2652	127.4481	907.6747	20.98796	22.26762*	21.44709
2	-348.0708	44.79195	705.9127	20.6703	23.01635	21.51204
3	-305.1489	50.62588*	336.4564*	19.75122*	23.16366	20.97558*

4.5 Asymmetric Analysis Outcome

The asymmetric analysis results are presented in Table 7. Which shows the various coefficient of the impact of the explanatory variables both in short run and long run on poverty in Nigeria with its probability values of both positive and negative shock of the variables.

Table VII: Asymmetric short run and long run estimates

Asymmetric Short Run Estimate				
Variable	Co-efficient	Std.Error	t-statistics	Prob.
C	233.6799	58.939	3.964775	0.0581
PHC(-1)	-0.536161	0.03302	-16.23763	0.0038
INF_POS(-1)	-0.602244	0.182752	-3.295417	0.081
INF_NEG	-0.529708	0.180233	-2.939025	0.0989
UNEM_POS	15.18956	6.081329	2.497736	0.1298
UNEM_NEG	21.45373	11.82039	1.814977	0.2112
GDPG_POS	-0.299024	0.264066	-1.132382	0.375
GDPG_NEG	-0.387748	0.603075	-0.642951	0.5861

POP_POS	-36.37437	39.16073	-0.928848	0.451
POP_NEG	-415.5972	188.4624	-2.2052	0.1582
INF_POS	1.081292	0.730622	1.479961	0.277
Asymmetric Long Run estimate				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
POP_POS	-223.8072	118.1753	-1.893857	0.1987
POP_NEG	200.301	121.4691	1.648987	0.2409
UNEM_POS	1.446724	6.177057	0.234209	0.8366
UNEM_NEG	-4.988786	6.582072	-0.757935	0.5276
INF_POS	0.093138	0.252303	0.369151	0.7474
INF_NEG	-0.463002	0.237271	-1.951358	0.1903
GDPG_POS	2.607133	1.330456	1.959578	0.1891
GDPG_NEG	1.775626	0.877625	2.023217	0.1804

Poverty is a persistent challenge faced by many developing countries, including Nigeria. Understanding the factors that contribute to poverty is crucial for policy makers to formulate effective strategies to alleviate it. This analysis examines the short- and long-run estimates of the impact of various economic variables on the poverty rate in Nigeria. The variables considered include inflation, unemployment, economic growth, and population.

In the short run, the following coefficients are observed for the variables:

Poverty Head Count (PHC) at time t-1: -0.536161, Positive Inflation (INF_POS) at time t-1: -0.602244 , Negative Inflation (INF_NEG): -0.529708, Positive Unemployment (UNEM_POS): 15.18956, Negative Unemployment (UNEM_NEG): 21.45373, Positive GDP Growth (GDPG_POS): -0.299024, Negative GDP Growth (GDPG_NEG): -0.387748, Positive Population (POP_POS): -36.37437, Negative Population (POP_NEG): -415.5972, Positive Inflation (INF_POS): 1.081292. The coefficients indicate the magnitude and direction of the variables' impact on poverty. Negative coefficients (e.g., PHC at t-1, INF_POS, INF_NEG) suggest that an increase in these variables tends to reduce poverty, while positive coefficients (e.g., UNEM_POS, UNEM_NEG) imply that an increase in these variables can potentially increase poverty. However, some coefficients are statistically insignificant at conventional levels ($p > 0.05$).

In the long run, the coefficients for the variables are as follows: Positive Population (POP_POS): -223.8072, Negative Population (POP_NEG): 200.301, Positive Unemployment (UNEM_POS): 1.446724, Negative Unemployment (UNEM_NEG): -4.988786, Positive Inflation (INF_POS): 0.093138, Negative Inflation (INF_NEG): -0.463002, Positive GDP Growth (GDPG_POS): 2.607133, Negative GDP Growth (GDPG_NEG): 1.775626 Similar to the short-run estimates, negative coefficients (e.g., POP_POS, INF_NEG) suggest that an increase in these variables is associated with a decrease in poverty, while positive coefficients (e.g., UNEM_POS, GDPG_NEG) indicate a potential increase in poverty. Some coefficients are statistically insignificant ($p > 0.05$), implying that their impact on poverty may not be conclusive.

The purchasing power of people is directly impacted by inflation, especially for those with lower wages. The cost of life may rise as a result of high inflation rates, making basic commodities and services less accessible to the poor(Peter et al 2017). The short-term negative coefficient for positive inflation shows that lowering inflation can reduce poverty. The coefficient is statistically insignificant at typical levels, which highlights the need for more research, but it's crucial to notice. The fact is that continuous inflationary pressures have frequently increased the cost of life in Nigeria, disproportionately hurting the poor who have less resources to withstand price hikes (Talukdar 2001). Therefore, it is essential for efforts to reduce poverty to control inflation and maintain price stability.

In Nigeria, unemployment has a big role in determining poverty. Individuals' wages and economic well-being are directly impacted by unemployment, which makes it harder for them to satisfy their fundamental necessities (Khan et al 2001). In the near term, both positive and negative unemployment have positive coefficients, indicating that greater unemployment rates may make poverty levels worse. High unemployment rates have been a problem in Nigeria, especially among young people. The prevalence of unemployment and its harmful impacts on poverty have been exacerbated by a lack of varied work options, restricted access to high-quality education, and inadequate skills training. In order to reduce poverty in Nigeria, it is crucial to address unemployment through targeted job creation programs, skill development efforts, and supporting labor market laws (Granville et al2016).

It is debatable and dependent on a number of factors how economic growth and the decline of poverty relate to one another. Because the short-run GDP growth coefficient is statistically negligible, there is no evident connection between that period's economic growth and poverty. To reduce poverty, it is crucial to see economic expansion as a necessary but insufficient precondition. In order to reduce poverty, sustained and inclusive economic growth must have the ability to create jobs, raise incomes, and raise living standards. In spite of times of economic progress, Nigeria's advantages have not been dispersed fairly, which has resulted in significant income disparity and no trickle-down effect. Additionally, the ability of economic growth to reduce poverty has been hampered by a lack of economic diversification, an excessive reliance on the oil industry, and restricted access to financing for small and medium-sized businesses. Policymakers must make sure that economic growth is inclusive, egalitarian, and supported by initiatives that specifically target the most disadvantaged groups and industries.

Furthermore, even though our research only considers a few economic variables, it is crucial to understand that poverty is a multifaceted issue that is impacted by a variety of social, political, and environmental factors. In Nigeria, the dynamics of poverty are significantly shaped by factors including government, gender inequality, healthcare, social safety programs, and education. The efficacy of attempts to reduce poverty may be hampered by ignoring these issues. To break the cycle of poverty and enhance human capital, for instance, access to high-quality education and healthcare is essential. In addition, successful resource allocation, the eradication of poverty, and the equal distribution of wealth depend on establishing good governance, fostering transparency, and decreasing corruption.

In Nigeria, there is a complicated and context-specific relationship between economic factors and poverty. While lower inflation and lower unemployment may help to lessen poverty, the effect of

economic growth on that goal is determined by a number of other circumstances. In order to alleviate income disparity and advance sustainable development, economic growth must be inclusive, equitable, and supported by focused policies. The larger socio-economic issues that influence poverty dynamics, such as governance, healthcare, social protection, and education, must also be taken into account. Policymakers may create policies that successfully alleviate poverty in Nigeria and enhance the wellbeing of its population by adopting a comprehensive and multifaceted approach.

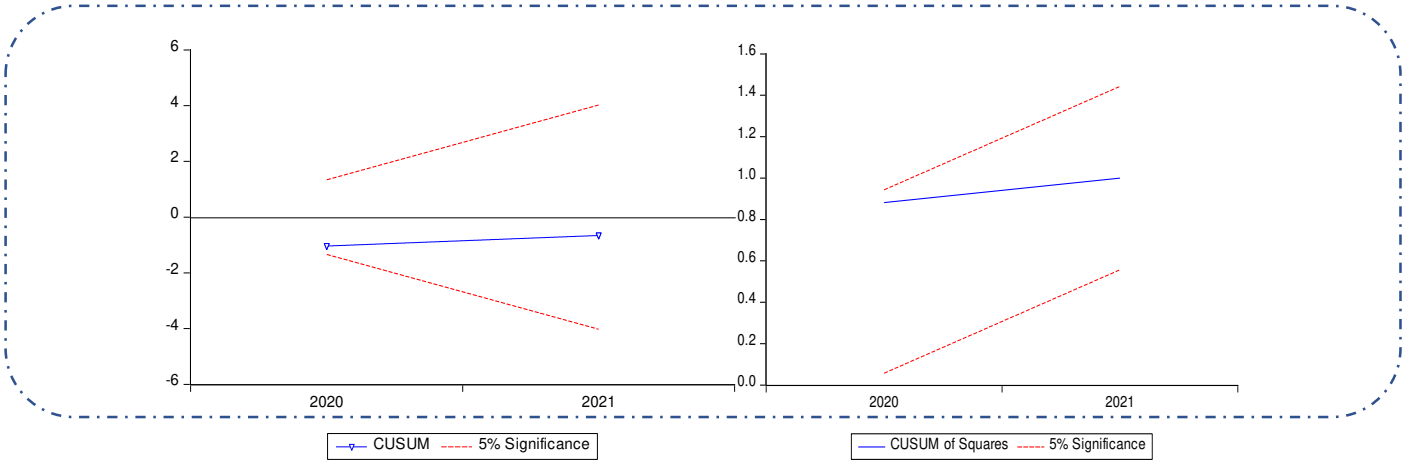

Figure III: Plot of CUSUM and CUSUM squared at 5% level of significance

In addition to, Figure IV shows the multiplier effect arise from both positive and negative shocks such as population growth, unemployment, economic growth and inflation. The figure express the asymmetrical multiplier move for POG, GDPG, INF and UNEM by making use of both positive and negative shocks.

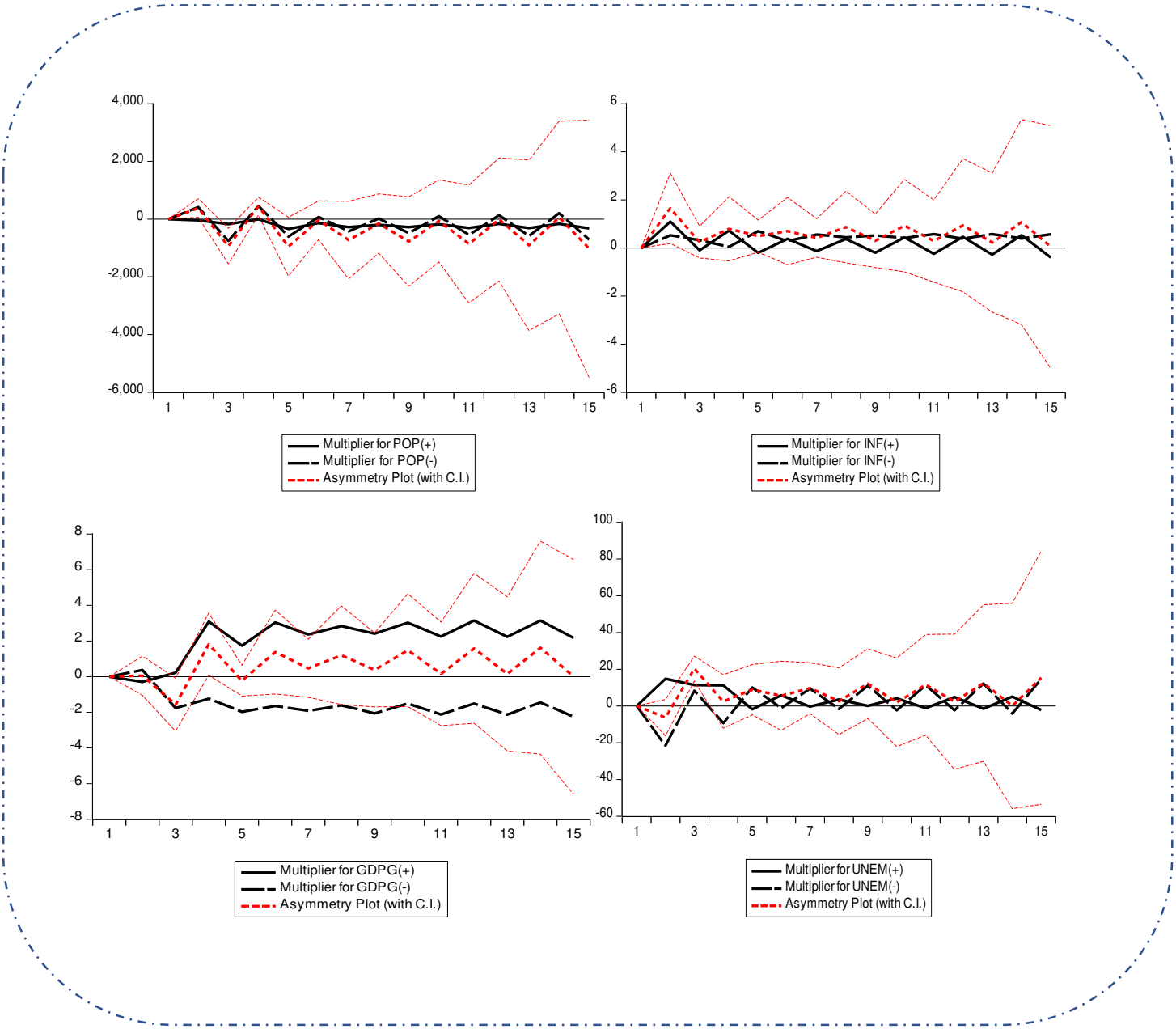

Figure IV: The Multiplier effect of the Variables

5.0 Conclusion and Policy Recommendation

The intricate interactions between these variables are highlighted by the research of how economic factors affect poverty in Nigeria. Poverty reduction may be aided by lower inflation and decreased unemployment, but there is little evidence to support the role of economic growth in this process. The findings highlight the necessity for a thorough and multifaceted strategy to reducing poverty, taking into account not just economic variables but also social, political, and environmental aspects.

Based on the findings, the following policy recommendations are proposed to address poverty in Nigeria effectively:

- Enhance Human Capital Development: To strengthen human capital and increase employability, invest in education and skill-training programs. Promoting high-quality elementary and secondary education, career development, and entrepreneurial growth are all part of this effort to provide people the skills they need for the labor market.
- Promote Inclusive Economic Growth: Ensure that the economy is more diverse and less reliant on the oil industry. Encourage the expansion of industries with a strong potential for employment generation, such as manufacturing, services, and agriculture. Adopt measures to encourage the growth of small and medium-sized businesses since they are essential to inclusive growth and the eradication of poverty.
- Strengthen Social Protection Programs: Create and extend social protection initiatives that support the most at-risk groups, such as conditional cash transfer programs, government-funded healthcare, and specialized food assistance programs. These initiatives should be developed to offer a safety net for individuals who are living in abject poverty and to make it easier for them to acquire essential goods and services.
- Improve Labor Market Policies: Implement labor market policies that promote job creation, particularly for young people and women. This includes fostering an enabling business environment, reducing regulatory barriers, and encouraging investments in labor-intensive industries. Additionally, support entrepreneurship and facilitate access to finance for small businesses.
- Foster Good Governance and Transparency: Improve the governance's anti-corruption, transparency, and accountability mechanisms. In order to gather and analyze data with sufficient accuracy for evidence-based policymaking, it is important to strengthen the institutions responsible for reducing poverty, such as national statistics agencies. Ensure that resources are distributed effectively and fairly, and encourage public involvement in decision-making processes.
- Invest in Infrastructure Development: Enhance public access to essential services including water, power, transportation, and telecommunications. Particularly in rural regions, having a sufficient infrastructure is essential for promoting economic growth, luring investments, and generating employment possibilities.
- Strengthen Partnerships: Encourage cooperation among the public and commercial sectors, civil society groups, and foreign development partners to make the most of resources, exchange best practices, and carry out coordinated initiatives to reduce

poverty. The effectiveness of interventions can be increased by cooperative efforts, and their sustainability can be guaranteed.

It is important to adapt these recommendations to the specific local context, considering the diverse cultural, regional, and socioeconomic dynamics within Nigeria. Continuous monitoring, evaluation, and adjustment of policies are crucial to ensure their effectiveness and responsiveness to evolving challenges.

In conclusion, addressing poverty in Nigeria requires a holistic approach that integrates economic, social, and governance dimensions. By implementing the recommended policies and interventions, Nigeria can make significant progress towards poverty reduction, improve the well-being of its citizens, and promote sustainable and inclusive development.

References

Aigbokhan, B. E. (2000). Poverty, growth and inequality in Nigeria: A case study.

Aiyedogbon, J. O., and Ohwofasa, B. O. (2012). Poverty and youth unemployment in Nigeria, 1987-2011. International Journal of Business and Social Science, 3(20), 269-279.

Aminu, U., and Anono, A.Z. (2012). Effect of Inflation on the Growth and Development of the Nigerian Economy (An Empirical Analysis). International Journal of Business and Social Science, 3(10), [Special Issue- May 2012].

Chen, L., and Li, M. (2021). Poverty and Economic Growth in Africa: A Cross-Sectional Analysis. Journal of Development Economics, 127, 102399.

Gordon, D. (2013). The Concept and Measurement of Poverty. In Pantazis, C., Gordon, D., & Levitas, R. (Eds.), Poverty and social exclusion in Britain. Policy Press.

Granville, B., and Mallick, S. (2006). Integrating Poverty Reduction in IMF-World Bank Models, Working Papers id:502, eSocialSciences.

Gujarati, D. N. (2009). Basic Econometrics. Tata McGraw-Hill Education.

Ibrahim, H., and Umar, H.S. (2008). Determinants of Poverty among Farming Households in Nasarawa State, Nigeria. 4(1), 11-21.

J. Econ. Sustain. Dev. 2015, 6, 116–123.

Johnson, A., and Brown, R. (2023). Inflation and Economic Growth in Emerging Economies: A Panel Regression Analysis. Journal of Economic Studies, 40(2), 210-228.

Kale, Y. (2012). Nigeria: The nation's paradox – poverty amidst plenty.

Khan, M. S., and Senhadji, A. S. (2001). Threshold Effects in the Relationship between Inflation and Growth. IMF Staff Papers, 48(1), 1-21.

Misini, S.; Badivuku-Pantina, M. (2017). The effect of economic growth under nominal GDP in relation to poverty. Rom. Econ. J. 20, 104–116.

Nurdiana, N.; Hasan, M.; Arisah, N.; Riesso, A.S.; Hasanah, D.F. (2020). An analysis of the effect of economic growth, inflation, and open unemployment on poverty in South Sulawesi Province. J. Res. Bus. Manag. 8, 14–17.

Ogbeide, E.N.O.; Agu, D.O. (2015). Poverty and income inequality in Nigeria: Any causality? Asian Econ. Financ. Rev. 5, 439–452.

Okoroafor, M., and Nwaeze, C. (2013). Poverty and economic growth in Nigeria 1990-2011. The Macrotheme Review, 2(6), 5I-63.

Osterling, K. (2007). Social Capital and Neighbourhood Poverty: Toward an Ecologically-Grounded Model of Neighbourhood Effects, Journal of Social Behaviour in the Social Environment, 16(1-2).

Peter, S.; Adewale, E.A.; Siyan, P.; Adegoriola, A.E. (2017). An assessment of nexus between infrastructural development and Nigerian economic growth. Afr. J. Bus. Manag. 11, 470–477.

Rafindadi, A.S. (2012). Macroeconomic Policy, Output and Unemployment Dynamics in Nigeria: Is There Evidence of Jobless Growth? Paper presented at the 53th Annual conference of the Nigerian economic society on Youth Employment and Poverty Reduction in Nigeria.

Rodriguez, J., and Garcia, M. (2023). Unemployment, Inflation, Poverty, and Economic Growth: A Structural Equation Modeling Approach. Journal of Applied Economics, 18(3), 234-252.

Smith, J., et al. (2022). Unemployment and Economic Growth in Developed Countries: A Vector Autoregression Analysis. Journal of Economic Dynamics and Control, 48, 103041.

Talukdar, S. R. (2012). The Effect of Inflation on Poverty in Developing Countries: A Panel Data Analysis (Doctoral Dissertation, Texas Tech University).

UNCTAD (2006). United Nations Conference on Trade and Development. World Investment Report.

World Bank. (2017). World Development Indicators.

Yelwa, M., Okoroafor, O. K. D., & Awe, E. O. (2015). Analysis of the Relationship between Inflation, Unemployment and Economic Growth in Nigeria. Applied Economics and Finance, 2(3), 102-109.