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Nexus among Inflation, Unemployment and Poverty in Nigeria: Empirical Evidence

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

Despite Nigeria's enormous growth, living standards for the majority of its citizens have been steadily getting worst, with falling real wages and a complete dearth of jobs. The association among inflation, unemployment and poverty in Nigeria was examined in this study from 1981 to 2023. Using the ARDL model, findings reveals that a long-run relationship does not exist among the variables over the period under study. The short-run regression result revealed that unemployment, inflation and income inequality exerted a positive relationship with poverty. Furthermore, the causality results showed the presence of bidirectional causality between income inequality and poverty while a unidirectional causality runs from inflation to poverty without a feedback effect in Nigeria. However, there is no causal link between unemployment and poverty. The study, therefore, concludes that the alarming rate of poverty in Nigeria is majorly caused by inequality in income. Consequently, it suggests that the policymakers of the government should design and implement redistributive fiscal policies and efficiency improving programmes (like higher spending on key

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public services such as education, health and social protection) that will improve access of the low-income families to essential goods and services, as this would reduce income inequality and as well reduce the number of poor people in the long-run.

Keywords: Poverty; inflation; unemployment; income inequality; ARDL; Nigeria.

JEL Classification: I3; E31; E24; I14.

1. INTRODUCTION

In recent years, the rising rate of poverty has been a serious threat to the Nigerian economy and indeed, a scourge that has thrown her citizens into uncertainty and penury. Adam Smith submitted that poverty is the inability to purchase necessities required by nature [1]. It is also seen as a situation where a person's material resources are insufficient to meet his/her basic needs at a conventional minimum level for a healthy living. Nigeria has one of the largest economies in Africa with economic growth of over 3%in 2023 according to the Nigerian Gross Domestic Product (GDP) report released in February 2024 by the National Bureau of Statistics (NBS). Also, with a huge population of over 200 million which was supposed to support commerce, poverty still remains significant with 133 million extremely poor people representing 63% of the nation's population [2]. Little wonder the country was declared the world poverty capital on United Nations Development Programme (UNDP) recently released 2022 Human Development Index.

It is evident that Inflation and unemployment are major macroeconomic variables that intensify the problem of poverty in the country. As disclosed by the National Bureau of Statistics (NBS) report of October 2023 on Nigeria poverty assessment, rising levels of inflation and unemployment were cited as key drivers for the rising number of poor people in the country. Moghalu and ude [3] affirms that the persistent rise in prices of commodities erodes the value of real wages and saving, leading to a slump in the purchasing power of Nigerians. These effects are mostly felt by fixed salary earners in the sense that incessant escalation in the prices of basic food items and other necessities reduces their real wages/disposable income, resulting to decreases in demand for goods and services which generates social welfare lost. Paul and Sharma [4] opined that the genesis of the relationship between inflation and poverty lies in the theory that wages are sticky and takes time to move while prices fluctuate at a greater speed. The above assertion gained support from Talukdar cited in Isiaka and Olayiwola [5] that nominal salaries were unable to keep up with the rate of rising inflation in the country which has a negative impact on poverty directly via purchasing power reduction. More so, cost-push inflation makes businesses unprofitable, as demands for the products and services decreases leading to business closures, which results to unemployment and invariably exacerbates poverty.

An examination of the inflationary trend in Nigeria shows the alarming rates of inflation in the country. It was 11.40% in 2019, showing a 0.7% decrease from 2018. It rose to 15.75% in 2020 and dropped to 15.63% in 2021. In 2022 and 2023, it rose again to 21.34% and 28.92% respectively and soared to 31.7% in the first quarter of 2024 [6,7]. Consequently, this surge in inflationary pressure aggravated the prevalence of poverty in the country, as poverty rate in Nigeria increased from 40% in 2018 to 46% in 2023, showing an increase in the number of poor people from 79 million to 104 million indicating that additional 24 million people were pushed below the international poverty line of $1.90 per day [8]. The report also revealed an increase in the number of poor people in rural areas to 84 million from 67 million and that of the urban areas to 20 million from 13 million within the same period, hence ranking Nigeria as 47th poorest country in the world after Cambodia. The above scenario was mainly due to the effects of oil subsidy removal, devaluation of the naira, high exchange rate differentials leading to a rise in importation cost, worsening security issues, particularly rampant banditry and herdsmen in farming regions of the country causing disruption to supply-chain, hence pushing up domestic food prices beyond the reach of the poor, and flooding in most states of the country.

Rising rate of unemployment is yet another key factor that contributes to the exacerbation of poverty in Nigeria. Adelowokan, Maku, Babasanya and Adesoye [9] contended that as Nigerian labour force grows alongside her

growing number of graduates, the labour market is inadequate to absorb the rising number of unemployed youths, thus, resulting to poverty. Available evidence from National Bureau of Statistics (NBS) report October 2021 revealed that between 2016 and 2018, Nigeria's unemployment rate has been rising consistently. In 2016, 2017 and 2018, it rose to 14.4%, 20.42% and 23.1% respectively. However, in 2019, it dropped to 17.6% and further rose to 33.2% in 2020 as a result of the COVID-19 pandemic which led to the closure of many companies that left so many people unemployed and poor. It further rose to 37.7% in 2023.

Over the last decade, Nigeria's double-digit inflation and unemployment rates have continued to disrupt the economic well-being of many households in the country. United Nations (UN) report, 2013, affirms that this situation has led to human denial of choices and opportunities for living a tolerable life. Apparently, the number of the poor in Nigeria keeps increasing as the gap between the rich and the poor keep widening. It is on this note therefore, that this study re-investigates the linkages and inter-dependencies among inflation, unemployment and poverty in Nigeria between the periods of 1981 to 2023.

The other parts of this paper are organized as follows: Section 2 discuses the theoretical views and empirical review, while the methodology for the study is explained in Section 3. Section 4 presents the results and discussion of findings, while the conclusion and recommendations are shown in Section 5.

2.LITERATURE REVIEW

2.1Theoretical Views

Over the years, some theoretical views have been raised concerning the link between inflation, unemployment and poverty in developed and developing countries. Basically, unemployment breeds poverty. Some scholars, such as Egunjobi [10]; Siyan, Adegoriola and Adolphus [11]; Murjani [12]; Muhammad and David [13];Gamba, Maijamaa and Goyilla [14] and Ekpeyong [15], have noted that a positive relationship exist between poverty and unemployment. The authors contended that under the liberal view, the paramount importance assigned to unemployment as a primary source of poverty is based on the logic that if individuals are unable to earn income by engaging in productive ventures, they are more likely to be deprived of providing for themselves and their families the basic needs, which thus implies poverty. Unarguably, when people are unemployed, the adverse effect is a decline in living standard and productivity, hindrance to economic growth, increase in the government fiscal burden, limited investment and consumption, rise in poverty and income inequality. From the views of Reinstadle rand Ray [16], "unemployment rate can have a direct and indirect impact on poverty. The direct effect is on unemployment rate such that a higher aggregate unemployment rate increases the probability of individual unemployment while the indirect effect is on the negative impact of the unemployment rate on the wage bargaining power of the employed, who are at higher risk (since they face higher competition) of being fired or receiving a lower wage when the aggregate unemployment rate rises".

Inflation is another macroeconomic factor that can trigger poverty in a society. Inflation rate positively correlates with poverty incidence. For instance, higher inflationary tendencies leads to an increase in the general price level of commodities, making the basic commodities unaffordable by the people because their wages do not increase with the rising prices, hence, reducing their purchasing power and consequently leading to poverty. As observed by Yolanda (2017), inflation via its negative impact on public finances, lowers people's purchasing power which adversely affects living standard of the people, hence exacerbate poverty. This case is more likely to occur when the cost of food and other necessities rises. Furthermore, Talukdar [17] supports the assertion that inflation rate increases the incidence of poverty. He maintained that with high rate of inflation, nominal wages on which low earners depend are unable to keep up with the rate of rising inflation in the economy.

Income inequality has equally been noted as a causal factor of poverty. As noted by Gries and Redlin [18]; Ogbeide-Osaretin [19]; Farayibi and Owuru [20]; Ewubara and Okpani [21] and Obayelu and Edewor [22], a positive relationship exist between poverty and income inequality. Burtless and Smeeding [23] and Ogbeide and Agu [24] assert that the existence of one often implies the existence of the other. The link between inequality and poverty can be direct or indirect. The direct link is based on the inequitable distribution of resources in the society, which negatively affects the citizens thereby making them unable to provide for

themselves and their families the basic needs of life. Ogbeide and Agu [24] noted that the indirect link between inequality and poverty is through growth which is based on the Kuznets inverted 'U' hypothesis. The theory states that income inequality increases at the early period of economic growth when the economy is growing. Nevertheless, this negative impact of growth on income inequality also leads to an increase in poverty. In another direction, Pemberton, Sutton and Fahmy [25] have noted that permanently low paid work engendered by the capitalist system can cause poverty through an indirect channel. The explanation is that low income earners are more likely to develop poor health which in turn, erodes their human capital and hence, their possibilities of escaping poverty.

2.2 Empirical Literature

Several studies have employed distinct datasets and methodologies to examine the relationship between inflation, unemployment and poverty for numerous developing and developed nations. However, the findings of these studies have been conflicting and contrasting. Some of these empirical studies are:

Khan and Sehadji [26] employed data from 1960-1998 and a structural vector autoregressive (SVAR) econometric techniques to test the existence of threshold effects in the relationship between inflation, unemployment and poverty in 140 developed and developing countries. The result revealed an apex level of inflation at which the increase in both inflation and unemployment significantly increases poverty rate at 1 to 3 percent for developed economies and 11 to 12 percent for developing countries. Utilizing a consumption-based technique and panel data in its analysis over the period of 2000 to 2012, Osterling [27] investigated the relationship between inflation and the consumption poverty rate in eight West African countries. The finding revealed a positive relationship between inflation and the consumption poverty rate. Other researchers such as Powers argue that inflation affects the poor directly by reducing the purchasing power of their nominal income in the short-run.

Gries and Redlin [18] in another study "used the generalized method of moments (GMM) methodology, an error correction model (ECM) and panel data from 1981 to 2005 to examine the dynamics of growth, inequality and poverty in 114 developing countries. The results showed the presence of a short and long-run equilibrium relationship among the variables. Furthermore, the result of the Granger causality test revealed a positive bidirectional relationship from growth to inequality as well as from inequality to poverty; and a negative bidirectional relationship from growth to poverty". Likewise, Ahmed and Mortaza [28] "utilized cointegration and an error correction model (ECM) to explore the present relationship between inflation, poverty and economic growth in Bangladesh using annual time series data over the period of 1980 to 2009. The result revealed a negative and significant long-run relationship between inflation, poverty rate and economic growth. The estimated threshold model denoted a 6 percent benchmark level of inflation, above which inflation has an adverse effect on economic growth and subsequently increases poverty incidence".

Using a panel dataset comprising of 115 developing countries over the period of 1981 to 2008. Talukdar [17] studied "the effect of inflation on poverty in all the countries combined on the one hand and separately in low income countries, lower meddle income countries and upper middle income countries on the other hand. The regression results revealed a positive and significant relationship between inflation and poverty in all emerging countries while income, educational attainment and quality of governance showed a negative relationship with poverty. In addition, the study observed that under certain specification, the relationship between inflation and poverty was negative and insignificant in the case of low income countries". In a study for Nigeria, Egunjobi [10] "investigated the nature of the relationship between poverty and unemployment using annual data from 1977 to 2010 employing co-integration, Granger causality and error correction modeling (ECM) techniques. The result of the test of co-integration showed the presence of a long-run relationship between poverty and the explanatory variables. The findings revealed that unemployment had a positive influence on poverty while government investment on infrastructures and human investment had a negative influence on poverty".

Ogbeide and Agu [19] "in another study for Nigeria used co-integration, Granger causality test methodology and annual data from 1980 to 2010 to analyse the causal relationship between poverty and inequality. The study found a strong evidence of co-integrating relationship between poverty and the explanatory variables. The results of the Granger causality test found a direct line of causality between poverty and

inequality as well as indirect channels through unemployment and low life expectancy on inequality which exacerbates poverty. Using annual time series data from 1980 to 2014, the Vector Auto-Regressive (VAR) model and the Granger causality test". Siyan et al. [11] "in a similar study examined the implication of unemployment and inflation on poverty level in Nigeria. The findings of the Granger causality test showed that whereas a bi-causality was found between inflation and poverty and between unemployment rate and poverty, a one-way causality between unemployment rate and inflation rate was found. Furthermore, evidences from the various econometric analyses in the study showed that unemployment and inflation rate had a statistically significant impact on poverty level in Nigeria".

Employing multiple linear regression model and data from 1997 to 2016, Yoland (2017) explored the influence of inflation on poverty and the human development index in Indonesia. Findings based on the linear model showed that inflation had a positive and significant influence on poverty in Indonesia. Furthermore, Ewubara and Okpani [21] "used the ordinary least square technique (OLS), error correction mechanism (ECM), the Granger causality test and data from 1980-2017 to determine how poverty, unemployment, life expectancy at birth affects inequality in Nigeria. The results revealed that both the national poverty index and unemployment rate were positively related to inequality though statistically insignificant at level. This findings implies that as poverty and unemployment rate increased, inequality increased correspondingly, inferring close links among the variables. Furthermore, the Granger causality test revealed bidirectional causality between poverty and inequality over the period of the study".

In the same vein, Ogbeide-Osaretin [19] "utilized data from 1985-2010 and VECM Granger causality test technique to investigate the poverty-growth-inequality linkage so as to ascertain the existence and direction of causality in Nigeria as well as the possibility of a long-run relationship. The findings revealed that a long-run relationship between poverty growth and inequality existed. The results of the Granger causality test found a long-run bidirectional causality between growth and inequality, whereas no evidence of causality between growth and poverty was found. The findings indicated that widening growth in the country increases inequality gap, hence, raising the incidence of poverty". Ajibola, Lota and Ehilolobo [29] "in another similar study utilized the OLS, Johansen co-integration, Granger causality test techniques and data from 1980 to 2013 to examine poverty and inequality in Nigeria with respect to its implications to inclusive growth. The results of co-integration test revealed that a long-run relationship exists among the variables. The finding revealed that inequality had a negative impact on poverty". Utilizing descriptive statistics and logistics regression model, Muhammad and David [13] "as well investigated the relationship between poverty and unemployment in Niger State, Nigeria. The findings revealed that a proportionate relationship existed between poverty and unemployment".

Time series data from 1976-2017 was used by Murjani [12] to assess the impact of inflation, unemployment and economic growth on poverty in Indonesia. Utilizing the ARDL technique, the findings revealed that inflation, unemployment and economic growth had a significant impact on poverty in the long-run but in the short-run, only inflation and economic growth had a major impact on poverty. Equally, Paul and Sharma [4] examined the effect of inflation rate on poverty in Indian in two distinct periods. It was revealed that the poor were badly hurt with rate of inflation in the economy. Adeleye, Gershon, Ogundipe, Owolabi, Ogunrinola and Adediran [30] utilized data from 2000-2015, pooled ordinary least square, fixed effects and system generalized method of moment technique to investigate comparatively the growth-poverty-inequality trilemma in sub-Saharan Africa, Latin America and Caribbean countries. They discovered that inequality in the growth rate increases poverty while economic growth reduces poverty hence, concluded that income inequality is the major determinate of poverty.

Finally, annual data from 1986-2019, OLS regression technique and Granger causality test was employed by Gamba et al. [14] to examine the effect of unemployment on poverty in Nigeria. The results revealed that unemployment and income inequality had a positive and significant effect on poverty while inflation had a negative and insignificant effect on poverty. Also, it was found that a bidirectional causality exist between inflation and unemployment while a one-way causation run from inflation to income inequality. In an evaluation of the relationship between economic inequality and poverty dynamics in

Nigeria, Obayelu and Edewor [22] established that poverty dynamics is mainly ascribed to the unbalanced spreading of resources. This implies that poverty persists because of the presence of inequality. Similar view was shared by Isiaka and Olayiwola [5] which employed multiple linear regression and annual data from 1981-2020 to re-examine the relationship between Nigeria's inflation rate and poverty incidence and affirmed that inflation rate positively correlates with poverty incidence in Nigeria. However, lending rate played a substantial role in moderating the positive effect of inflation rate on poverty rate in the country. Also, the work of Ekpeyong [15] contradicts the opinion of Murjani as he disclosed that inflation and unemployment significantly influence poverty rates in the short-run in Nigeria.

Evidence from the plethora of literature from developed and developing economies is flooded with contradictory results contingent on the country, stage of development, models, period of estimation and the techniques of the estimation utilized for investigation. While some empirical studies provided evidence of a positive and significant influence of inflation and unemployment on poverty [26,27,18,10,19,11], [Yoland, 2017]; [12,4,14,5,15], others revealed a negative impact of inflation and inequality on poverty level [28,17,29]. Furthermore, Adeleye et al. [28] and Obayelu and Edewor [22] were of the view that poverty persists because of the presence of inequality in income. This seeming mixed and inconclusive evidence in the empirical literature regarding the nexus between inflation, unemployment and poverty calls for further studies.

In addition to the foregoing, the majority of the previous studies in Nigeria utilized the bivariate Granger causality test to establish the direction of causality between inflation, unemployment, income inequality and poverty which showed mixed outcomes. Studies such asEgunjobi [10], Ogbeide and Agu [19], Farayibi and Owuru [20], Siyan et al. [11] and Ewubara and Okpani [21] agreed on bi-directional causality between inflation, unemployment, income inequality and poverty. Others, Isiaka and Olayiwola [5] put forward a uni-directional flow of causality between inflation and poverty. At the extreme,Chukwuone, Amaechina, Enebeli-Uzor, Iyokoand Okpukpara [31]; Iyoko [32]; Egunjobi [10] and Ogbeide and Agu [24] were of the view that no causality exist between unemployment and poverty. However, the conventional Granger causality test as we all know is based on F-statistics which follows a standard normal distribution. This means that when variables are integrated, the Granger causality test becomes fragile and may not be able to generate robust results since the resulting test statistic do not follow a standard normal distribution. Therefore, given the methodological defects of the aforementioned studies on the direction of causality between inflation, unemployment, income inequality and poverty level in Nigeria, the results could lead to wrong conclusions hence, unreliable. What is needed to address the problem inherent in the bivariate Granger causality technique for testing causality is the use of a modified granger causality technique that helps in overcoming the problem of asymptotic critical values when causality tests are done in the incidence of non stationary or no co-integration. Hence, this study employs the Toda and Yamamoto's Multivariate Causality Test to establish the direction of causality among the variables. This technique is appropriate despite the order of integration and co-integration properties of the variables.

3. METHODOLOGY

This study utilized the technique of the autoregressive distributed lag (ARDL) model to investigate the relationship between inflation, unemployment and poverty in Nigeria. The choice of the model is based on the advantage that it can be employed irrespective of whether the underlying regressors are integrated of order 1(1), zero 1(0), or a mixture of both. Before estimating the poverty growth equation, the unit root test, such as the augmented Dickey Fuller [33] and Philips-Perron [34] tests were employed to check the time series properties of the data for stationarity. Also, the existence of a cointegrating relationship among the variables was investigated using the Bound test. After identifying the cointegrating relationship, the short-run impact of inflation, unemployment and income inequality on poverty were then investigated. Furthermore, the Toda and Yamamoto [35] causality test was employed to determine the direction of causality among the variables. The specification was finally subjected to diagnostic and stability tests to ascertain the goodness of fit and model adequacy after establishing the directional relationship amongst the variables.

3.1 Empirical Model Specification

With respect to the theoretical views that link inflation, unemployment and income inequality as

causal factors of poverty, this study specifies a functional relationship between these aforementioned variables in Equation 1 as follows:

$$POV = f(UNE, INFL, INEQ) \quad 1$$

Equation 1 is transformed in econometric form as:

$$POV_t = b_0 + b_1 UNE_t + b_2 INFL_t + b_3 INEQ_t + U_t \quad 2$$

Where POV_t = poverty rate at time t, UNE_t = unemployment rate at time t, $INEQ_t$ = income inequality at time t, U_t = error term.

The theoretical expectation of the above equation is as follows: $b_1, b_2, b_3 > 0$

Equation 2 is represented in an ARDL form in line with the framework of Pesaran, Smith and Shin [36] as follows:

$$\Delta POV_t = b_0 + \sum_{i=1}^{n} b_{1,i} \Delta UNE_{t-1} + \sum_{i=1}^{n} b_{2,i} \Delta INFL_{t-1} + \sum_{i=1}^{n} b_{3,i} \Delta INEQ_{t-1} + b_4 POV_{t-1} + b_5 UNE_{t-1} + b_6 INEQ_{t-1} + \varepsilon_t \quad 3$$

Where n, Δ, b_0, ε_t, $b_1 - b_3$ and $b_4 - b_6$ denote the lag length, difference operator, the drift, disturbance term, parameters of the short-run dynamics and the parameters of the long-run relationship respectively. The decision concerning the existence of cointegration is guided by the following hypotheses:

$H_0 : b_4 = b_5 = b_6 = 0$ (absence of cointegration among the variables)

$H_A : b_4 \neq b_5 \neq b_6 \neq 0$ (presence of cointegration among the variables)

As the series proved not to be cointegrated, the study estimated only the short-run coefficients by constructing an error correction model as depicted in Equation 4.

$$\Delta POV_t = b_0 + \sum_{i=1}^{n} b_{1,i} \Delta UNE_{t-1} + \sum_{i=1}^{n} b_{2,i} \Delta INFL_{t-1} + \sum_{i=1}^{n} b_{3,i} \Delta INEQ_{t-1} + \Psi ECM_{t-1} + \varepsilon_t \quad 4$$

Where: Ψ is the coefficient of the error correction model and ECM_{t-1} is the error correction term which shows how disequilibrium in output can be adjusted in the short-run. Other variables are as defined earlier.

Having estimated the short-run impact of inflation, unemployment and income inequality on poverty, the study investigated the direction of causality among the variables using the Toda and Yamamoto test for Granger non-causality. The following TY multivariate model guided this study:

$$POV_t = \alpha_1 + \sum_{i=1}^{k+d\max} \beta_{1i} POV_{t-1} + \sum_{i=1}^{k+d\max} \beta_{1i} UNE_{t-1} + \sum_{i=1}^{k+d\max} \beta_{1i} INFL_{t-1} + \sum_{i=1}^{k+d\max} \beta_{1i} INEQ_{t-1} + \varepsilon_{1t} \quad 5$$

$$UNE_t = \alpha_2 + \sum_{i=1}^{k+d\max} \beta_{2i} POV_{t-1} + \sum_{i=1}^{k+d\max} \beta_{2i} UNE_{t-1} + \sum_{i=1}^{k+d\max} \beta_{2i} INFL_{t-1} + \sum_{i=1}^{k+d\max} \beta_{2i} INEQ_{t-1} + \varepsilon_{2t} \quad 6$$

$$INFL_t = \alpha_3 + \sum_{i=1}^{k+d\max} \beta_{3i} POV_{t-1} + \sum_{i=1}^{k+d\max} \beta_{3i} UNE_{t-1} + \sum_{i=1}^{k+d\max} \beta_{3i} INFL_{t-1} + \sum_{i=1}^{k+d\max} \beta_{3i} INEQ_{t-1} + \varepsilon_{3t} \quad 7$$

$$INEQ_t = \alpha_4 + \sum_{i=1}^{k+d\max} \beta_{4i} POV_{t-1} + \sum_{i=1}^{k+d\max} \beta_{4i} UNE_{t-1} + \sum_{i=1}^{k+d\max} \beta_{4i} INFL_{t-1} + \sum_{i=1}^{k+d\max} \beta_{4i} INEQ_{t-1} + \varepsilon_{4t} \quad (8)$$

3.2 Data and their Sources

Annual time series data covering 1981 to 2023 were used to estimate the model. All the data were sourced from the World Bank's (WB), World Development Indicators (WDI) database, except the data on unemployment, which was sourced from the National Bureau of Statistics (NBS). The poverty rate is measured as percentage of the population living below $1.90 a day, based on 2011 Purchasing Power Parity, inflation is proxied by the consumer prices measured in annual percentage, unemployment rate is measured as the ratio of unemployed labour force to total labour force in the country, and income inequality was captured using the Gini Coefficient which shows how material resources are distributed across the entire society. It ranges between 0 denoting complete equality and 1 denoting complete inequality.

4. RESULTS AND DISCUSION OF FINDINGS

The descriptive statistics results in Table 1show that poverty rate (POV) has the highest annual average of 54.16% and a median value of 54.43%. The maximum value of 71.00 indicates that the highest annual poverty was 71% and this was recorded in 2020, implying that the COVID-19 crisis compounded the already high levels of poverty as food and job insecurities increased. Specifically, there were 17 million more people living below the poverty line during the lockdown period. However, unemployment rate record the lowest mean and median values of 12.40% and 11.90% respectively. Inflation rate was found to exhibit the highest volatility as its range is the highest. The results equally show that the mean and median of income inequality (INEQ) is very close, indicating that the variable has high tendency to be normally distributed.

The tests for the stationarity of the variables were done employing the techniques of Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) unit root tests. The results in Table 2 clearly show that the variables were either 1(1) or 1(0). The variables (POV, UNE, and INEQ) were integrated at first difference 1(1), while INFL was integrated at the level 1(0).

Thus, the unit root test results of an admixture of 1(1) and 1(0) exhibited by the variables support the choice of an ARDL model. However, before proceeding to estimate the ARDL model, the study first determined the optimal lag length before carrying out a cointegration test to see if there exists any relationship among the variables in the long-run. As indicated in Table 3, thefour different information criterion namely: Akaike information criterion (AIC), Hannan-Quinn information criterion (HQ), Final prediction error (FPE) and Sequential modified LR test statistic suggests 1 as the optimal lag length for the model. Therefore, the study goes with AIC, SC, HQ, FPE and LR selected optimal lag criteria.

Table 1. Results of descriptive statistics of the indicators

Statistics	POV	UNE	INFL	INEQ
Mean	54.16	12.40	18.95	43.59
Median	54.43	11.90	12.88	42.90
Maximum	71.00	33.28	72.84	56.00
Minimum	32.00	1.90	5.39	35.10
Std. Dev.	9.62	8.55	16.66	5.56
Skewness	-0.21	0.52	1.85	0.51
Kurtosis	2.39	2.18	5.31	2.51
Jarque-Bera	0.94	3.00	32.58	2.17
Probability	0.63	0.22	0.00	0.34
Sum	2220.49	508.40	776.91	1787.34
Sum Sq. Dev.	3702.35	2923.45	11101.36	1238.70
Observations	41	41	41	41

Source: Researchers' Compilation (2024) using E-Views 9

Table 2. ADF and PP unit root test results

Variable	Augmented Dickey-Fuller (ADF)				Philip-Perron (PP)			
	At level	1st Difference	5% critical value	1(d)	At level	1st Difference	5% critical value	1(d)
POV	-1.8930	-5.5090**	-2.93691	(1)	-1.9777	-5.4988**	-2.93691	(1)
UNE	-1.6351	-7.9176**	-2.93691	(1)	-1.6351	-8.1946**	-2.9369	1(1)
INFL	-3.0091**	-	-2.93691	(0)	-3.6056**	-	-2.9369	1(0)
INEQ	-2.4337	-3.6839**	-2.93891	(1)	-1.7465	-3.5437**	-2.9369	1(1)

*Note: ** implies significance at 5% level; Source: Researcher's Computation (2024) using data sourced*

Table 3. Lag Length Selection

Lag length	LogL	LR	FPE	AIC	SC	HQ
0	-533.3122	NA	22479827	28.27959	28.45197	28.34092
1	-441.7220	159.0777*	423279.1*	24.30116*	25.16304*	24.60781*
2	-426.1052	23.83607	445294.1	24.32133	25.87273	24.87330
3	-412.7226	17.60879	552678.0	24.45908	26.69999	25.25638

*Note: * indicates lag selection by the criteria; Source: Researcher's Computation (2024) using data sourced*

Consequent upon the determination of the optimal lag length, the bound test for co-integration is employed to examine the existence of cointegration among the variables and the result as presented in Table 4 show that the calculated F-statistics (2.283198) is less than the upper (4.35) critical value bound at the 5% significance level. Therefore, the null hypothesis of no cointegration between POV and the explanatory variables in the model cannot be rejected. The acceptance of the null hypothesis shows that a long-run relationship does not exist among the variables employed in the model. Hence, the study estimates only the short-run coefficients of the growth equation.

The short-run results of the ARDL estimate in Table 5 reveal that unemployment had a positive and significant relationship with poverty rate as expected. A rise in the rate of unemployment by one unit raises poverty by 0.15%. The implication of this result is that unemployment breeds poverty in Nigeria, thus revealing that, as more citizens are unemployed and are unable to earn income by engaging in productive ventures, they are therefore, deprived of providing for themselves and their families the basic needs. This result is in line with the submissions of Khan and Senhadji [26]; Egunjobi [10]; Siyan et al. [11]; Murjani [12]; Muhammad and David [13]; Gamba et al. [14] and Ekpeyong [15]. The findings equally revealed that inflation had a positive and significant relationship with poverty rate in line with the a priori expectation. A one unit rise in inflation rate increases the rate of poverty by 0.02%. This suggests that high rate of inflation reduces real wages/disposable income thereby resulting to decreases in demand for goods and services which invariably leads to social welfare lost. This result concurs with the studies of Khan and Senhadji [26]; Osterling [27]; Talukdar [17]; Siyan et al. [11]; Yolanda (2017); Mahua and Pooja (2019); Murjani [12]; Isiaka and Olayiwola [5] and Ekpeyong [15]. On the other, it violates the results of Ahmed and Mortaza [28] and Gamba et al. [14].

Also, income inequality had a positive and insignificant relationship with poverty rate. The positive sign of the variable implies that polarization in the distribution of income contributes to poverty in Nigeria. Put differently, the basic cause of poverty is greater income disparity. For instance, there is usually inequality in access to employment opportunities, probably, due to variations in academic qualification. Hence, this leads to high rate of unemployment which further results to inequality in income and higher rates of poverty in the society. This result implies that a one unit increase in income inequality raises poverty by 0.14%. This finding finds an advocate in Gries and Redlin [18]; Ogbeide and Agu [24]; Ogbeide-Osaretin [19]; Farayibi and Owuru [20]; Ewubara and Okpani [21]; Adeleye et al. [30] and Obayelu and Edewor [22] but disagrees with Ajibola et al. [29]. The F-statistic value of 53.98641, which measures the joint significance of the explanatory variables, is found to be statistically significant at 5% level as indicated by the corresponding probability value of 0.000000. This implies that the three explanatory variables taking jointly are significantly responsible for the rising poverty profile in Nigeria in the short-run. The coefficient of determination (R^2) value of 0.871682 simply indicates that about 87.1% of the changes in poverty rate are explained by the changes in unemployment, inflation and income inequality. The remaining 12.9% changes are explained by the error term.

The study goes further by using the Toda and Yamamoto causality test to examine the causal relationship between unemployment, inflation, income inequality and poverty. The TY estimation results depicted in Table 6 revealed the existence of a bidirectional Granger-causality between income inequality and poverty for Nigeria. This means that these variables reinforce the other. This conforms to the submissions of Gries and Redlin [18]; Ogbeide and Agu [24]; Farayibi and Owuru [20] and Ewubara and Okpani [21]. In addition, the results showed the existence of a uni-directional causality from inflation to poverty. It is apparent that fluctuations in petroleum prices are the major factor responsible for the rising prices of goods and services in Nigeria rather than increases in wages and salaries. The indication is that the recent removal of petroleum subsidies in the country has increased the cost of living; making basic commodities and services less accessible to the poor due to increased production and transportation cost resulting in a reduction in real income of many citizens.

Similarly, a uni-directional causality between unemployment and income inequality was found. This is in line with studies carried out by Siyan et al. [11] for Nigeria on the causation direction between unemployment and poverty. Surprisingly, the results further revealed no causality between unemployment and poverty. This affirms the submissions of Chukwuone et al.

[31]; Iyoko [32]; Egunjobi [10] and Ogbeide and Agu [24] that unemployment does not granger cause poverty in Nigeria. It is evident that even though some people are officially unemployed, they sometimes depend on better-off members of the family and as well engages in small scale jobs which tend to lift them out of poverty. The arrows indicating the direction of causality between the variables is depicted in Table 7.

Table 4. Bounds tests results

Test Statistic	Value	Significance level	Bound critical values	
			Lower Bound	Upper Bound
F-statistic	2.283198		I(0)	I(1)
		1%	**4.29**	**5.61**
		5%	**3.23**	**4.35**
		10%	**2.72**	**3.77**

Note: Lower and UpperBounds critical values for the F-statistic at 5% significance level were taken from Narayan [37] and Pesaranet al. [36]; Source: Researcher's Computation (2024) using data sourced

Table 5. Estimated short-run relationship results

Dependent variable: POV				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(UNE)	0.145992	0.085274	1.712036	0.0960**
D(INFL)	0.021089	0.040419	0.521745	0.0233*
D(INEQ)	0.144413	0.111823	1.291441	0.6052
C	3.852982	24.676883	0.156137	0.8768
R-square = 0.888133				
Adjusted R-square = 0.871682				
F-statistic = 53.98641				
Prob(F-statistic) = 0.000000				

*Note * and ** denotes significance at the 5% and 10% levels, respectively; Source: Researcher's Computation (2024) using data sourced*

Table 6. Results of the granger causality test (TY Augmented Lags Methods)

Dependent Variable	Sources of Causation			
	POV X^2	**UNE** X^2	**INFL** X^2	**INEQ** X^2
POV	-	1.290964 (0.2559)	0.003555 (0.9525)	2.289010 (0.0303)**
UNE	0.001879 (0.9654)	-	0.017386 (0.8951)	1.008539 (0.0153)***
INFL	2.891773 (0.0890)*	0.121671 (0.7272)	-	0.368415 (0.5439)
NEQ	3.031698 (0.0817)*	0.343111 (0.5580)	0.113054 (0.7367)	-

*Note ***, ** and * indicate significance at the 1%, 5% and 10% levels, respectively. The figures outside bracket and those in bracket are the* X^2 *-statistic with their respective p-values*

Table 7. The causality results among unemployment, inflation, income inequality and poverty

POV	⟷	**INEQ**
UNE	—	POV
UNE	→	INEQ
INFL	→	POV

Note: Arrows indicate the direction of Granger Causality between the variables

Table 8. Diagnostic results for ARDL model

Test	Test statistic	P-value	Null hypothesis	Decision
Jarque-Bera normality test	33.42581	0.00000	H_o: Normaldistribution	Cannot reject H_o
Heteroskedasticity Test: ARCH	0.042924	0.8370	H_o: Homoskedasticity	Cannot reject H_o
Ramsey RESET test	0.092080	0.7635	H_o: Correctly specified	Cannot reject H_o
Breusch-Godfrey LM test	0.099293	0.7547	H_o: No serial correlation	Cannot reject H_o

In this study, the diagnostic tests used to certify that the parameter estimates were consistent and capable of being utilized in making economic deductions were evaluated and the results for the ARDL model was depicted in Table 8. The Jarque-Bera normality test was utilized to test for normal distribution of the residuals. However, normal distribution of the errors was not sustained because the probability value of 0.00000 was less than the proposed 5% level of significance. This results in the rejection of the null hypothesis of normal distribution. In the ARCH test, a probability value of 0.8370 showed that the errors were homoskedastic and independent of the explanatory variables. Hence, the null hypothesis of homoskedasticity cannot be rejected at the obtained P-value. The probability value of 0.7635 against the Ramsey Regression Equation Specification Error Test (RESET) was greater than the proposed 5% level of significance. Thus, the null hypothesis that the model was correctly specified was sustained. Again, it was observed that the probability value of 0.7547 against the serial correlation LM test was greater than the proposed 5% level of significance. As a result, the null hypothesis of no serial correlation was accepted. Thus, concluding that the model does not suffer from serial correlation.

5. CONCLUSION AND RECOMMENDATIONS

This study examined the short and long-run relationship among unemployment, inflation, income inequality and poverty in Nigeria using data obtained from World Bank, World Development Indicator (WB, WDI) and National Bureau of Statistics (NBS) [2] for the period of 1981 to 2023.Under the framework of the ARDL Bounds testing approach to cointegration, the result clearly showed that there exists no long-run relationship among the variables employed in the model. Based on the short-run result, unemployment, inflation and income inequality exerted a positive relationship with poverty. This is glaring that rising unemployment, high inflation rate and increasing inequality undermine welfare and living conditions which in turn aggravate poverty.

Based on the Granger causality results, whereas bidirectional causality exists between income inequality and poverty in Nigeria, a uni-directional causality runs from inflation to poverty. However, no causality between unemployment and poverty was noted. A key revelation from this study is that poverty is largely ascribed to unequal distribution of income, and inequality in income is also responsible for the alarming rate of poverty in Nigeria. Another major conclusion from this study is that high rate of unemployment which can be linked to unequal access to employment opportunities due to variations in academic qualifications is the major cause of inequality in income and rising poverty profile in the society. The recommendations that can be derived from these findings are as follows: The policymakers of the government should design and implement redistributive fiscal policies and efficiency improving programmes (like higher spending on key public services such as education, health and social protection) that will improve access of the low income families to essential goods and services, as this would reduce income inequality and as well reduce the number of poor people in the long-run. Government should come up with effective initiatives (such as mentorship and apprenticeship programs, access to finance schemes, business development training and strengthen public-private partnership) aimed at encouraging entrepreneurial mindset among the citizens. These initiatives are expected to create new job opportunities for the teaming youth, resulting in the reduction of the rising challenge of unemployment that could lead to poverty in Nigeria. There is also need for the Central Bank of Nigeria (CBN) and government to prescribe sound macroeconomic policies like removal of charges on savings accounts, outright removal of petroleum subsidy and provision of palliatives to households and businesses to stimulate consumption via effective demand and supply which will help keep inflation low and enable them plan.

6. LIMITATIONS TO THE STUDY

In this study, data on unemployment rate from 1981-20234 was sourced from the National Bureau of Statistics which may be subject to some level of irregularities and so the information obtained may not be completely accurate. Also, other variables such as institutional quality of governance (like bureaucratic quality, government stability, corruption index etc) were missing in the model. Hence, the unavailability of the aforementioned variables prevented the researcher from expanding the model beyond the variables used in the study.

7. SUGGESTIONS FOR FUTURE RESEARCH

The study recommends that future research should focus on assessing the role of governance on poverty level. This is to identify if the institutional qualities of governance such as political stability, rule of law, government effectiveness, regulatory quality and control of corruption have been effective in improving/exacerbating poverty.

Future studies should also consider the role of income equality in regulating high rate of unemployment. It has been observed in Nigeria and other developing countries that unequal access to employment opportunities due to variations in academic qualifications is the major cause of inequality in income and rising poverty profile in the society.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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