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External Debt Accumulation and Poverty Rate in Nigeria: An Error Correction Approach

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Abstract: Owing to the increasing debt-to-GDP ratio and the attendant high multidimensional poverty in Nigeria, this study set out to examine the role of external debt on poverty alleviation in Nigeria. The model constructed for the study proxies final consumption expenditure as the endogenous variable measuring poverty rate as a function of external debt and external debt service. Annual time series data was gathered from the World Bank's World Development Indicator (WDI) from 1981 to 2021. The econometric techniques of the Autoregressive Distributed Lag (ARDL) model, Augmented Dickey-Fuller (ADF) Unit Root test, Bound Co-integration test, and Error Correction Model (ECM) were engaged in the empirical analysis. The co-integration test shows that a long-run equilibrium relationship exists among the variables. The findings from the long-run result show that external debt has a significant positive impact on the poverty rate in Nigeria. The study gives some policy recommendations based on the findings.
JEL Classification: F21, F34, I32, O47
Keywords: External debt; poverty rate; ARDL; ECM; Nigeria

1. Introduction:

The study of poverty has been a topic of interest for many years and has been a subject of research and policy discussions globally. Poverty is a complex phenomenon affecting individuals, families, and entire communities, with significant economic, social, and political implications. Extreme poverty poses a danger to a nation's human capital and security worldwide. The idea of poverty has evolved throughout the history of economic theory, with many periods of transformation beginning in the 18th century, according to Ogwumike (2001). With the end of the colonial era and a heightened awareness of the causes of poverty in developing countries, the second phase in the formation of the term poverty got underway. The anti-poverty strategies developed in Europe during the 19th and 20th centuries were deliberately transferred from the North to the South during the post-colonial period. One of the toughest issues confronting many governments, particularly developing ones, is the difficulty of containing persistently high rates of poverty.

Every year on October 17, people celebrate the "International Year of Poverty Eradication," which raises awareness of the problem of poverty worldwide. As the first of its eight-millennium goals, poverty reduction was put out by the UN as a challenge to the world to be accomplished by the year 2015. It should come as no surprise that the number of people living in poverty has decreased significantly across the majority of the world's extreme poverty-level countries, from 43% in 1990 to 21% in 2010, in just 20 years. For instance, the rate decreased in China, where a major fraction of the population—77%—lived on less than $1 per day in 1980. By 2008, the rate had significantly decreased to 14%. India, a country with a sizable population and a high prevalence of poverty, has likewise seen significant improvement in the decline of poverty. Despite the enormous progress, inequality and poverty remain major global challenges. Only 5% of the world's revenue is still made up by the bottom 40% of the population.

The picture of poverty in Sub-Saharan Africa is considerably more striking, with a rate of 77% (UNCTAD, 2021)—possibly the only place in the world where this rate is rising. Nigeria, the country with the largest black population worldwide, played a role in this phenomenon. Ogwunike (2001) claims that the rate of poverty in

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Nigeria has been rising continuously. Based on the authors' statistics, it increased from 27% to 46% between 1980 and 1985, then to 67% in 1996, and finally to over 70% by 1999. The northeast and northwest of Nigeria are home to the majority of the country's poorest states, including Gombe, Sokoto, Yobe, Katsina, Jigawa, Zamfara, Borno, Niger, Taraba, and Adamawa, according to the 2021 Human Development Index (CBN Report, 2021). According to the executive summary, only 18.04% of Nigeria's urban residents are considered to be poor, compared to 52.1% of the country's rural residents. The Nigeria Bureau of Statistics executive summary (2020) states that on average, 4 out of 10 Nigerians spend less than N137,430 ($376.5) per day in actual per capita income expenditures. The World Poverty Clock Report (2021) states that Nigeria's increasing population will cause problems both now and in 2030 and 2050. According to their analysis, 90 individuals must escape poverty every minute to end it worldwide. According to the World Poverty Clock Report of 2021, 57 individuals in Africa and at least 12 in Nigeria must be pulled out of poverty every minute.

Figure 1: Bar Charts Showing Poverty Rates in Different Nigerian States

Source: Authors, using data from CBN, 2021

The contrary has been true since Nigeria's outplay. In Nigeria, seven individuals fall into extreme poverty on average every minute (Macro Trends, 2021). Nigeria's unfavorable condition stems from the fact that the nation's population is expanding more quickly than its GDP. Nigeria's population rose by 81% between 1990 and 2013, and if the aforementioned trend continues, Nigeria will rank third in the world's population by 2050, according to the United Nations (2021).

There are many factors that increase poverty rate in external debt has been identified as one of those factors that can impact poverty rates globally. However, the link between external debt and poverty is complex and can vary depending on the specific context and circumstances. External debt is a term used to describe the total amount of money that a country owes to foreign creditors or lenders. The concept of external debt has been around for centuries, as countries have borrowed money from one another for various reasons. However, it wasn't until the 20th century that the study of external debt became more formalized, as more and more countries began to borrow heavily from foreign lenders. In the 1970s, there was a significant increase in external debt among developing countries, as many of these countries took out loans to finance large-scale development projects. However, in the 1980s, a debt crisis emerged, as many developing countries were unable to meet their debt obligations, leading to widespread economic instability and hardship. Since then, the study of external debt has become even more important, as countries continue to borrow money from foreign lenders, and the global economy becomes increasingly interconnected (Karagöl, 2002).

Nigeria's economy is recognised as being heavily indebted to foreign countries, and this debt is only becoming worse (NBS, 2020). This has stymied several attempts at sustained economic growth using a variety of policies and programmes. The 1970s oil crisis is when the nation's mounting external debt first began to emerge. The economy developed a relatively unhealthful and long-lasting habit of debt as a result of the spikes in oil prices and overreliance on imports during that time. Prior to this, Nigeria had a few minor debts from the Italian government in the Paris Club debtor nations in 1964 with a loan of US$13.1 million for the construction of the Niger dam, and from the World Bank in 1958 with a credit of US$28 million for the construction of railroads. The first significant loan made by the International Capital Market (ICM) in 1978 was the $1 billion "Jumbo

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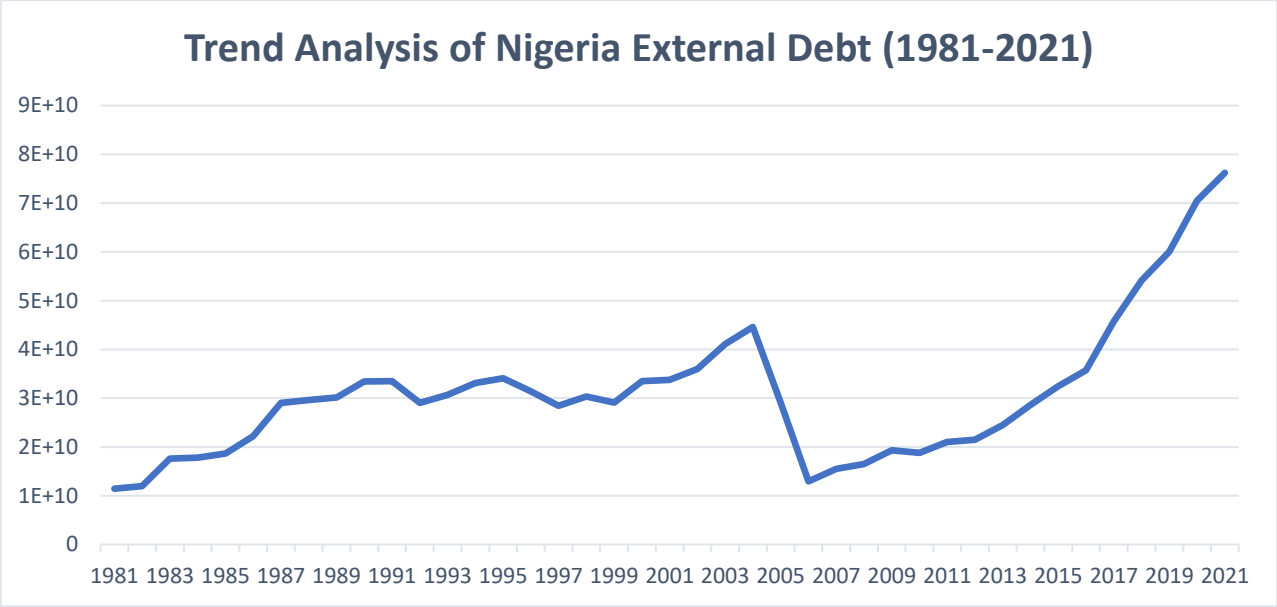
loan" (Adesola, 2009). In the first three months of 2017, the nation's total public debt rose by 4.52%, according to the Debt Management Office (DMO). The national debt increased from 21.73 trillion ($71 billion) in December 2017 to 22.71 trillion ($74.28 billion) by the end of the first quarter of 2018. From January 2015 to December 2020, Nigeria's external debt profile increased from $9.7 billion to $27 billion. Furthermore, Nairametrics estimates that Nigeria's external debt profile is $33 billion as of 2021.

Figure 2: Line Trend Showing Nigeria External Debt from the Year 1981-2021



Source: Authors, using data from WDI (2022)

The above graph shows the trend of Nigeria's external debt. The x-axis represents the years (from 1981 to 2021) corresponding with its total observations (41), while the trend line shows the external debt. External debt increased at a decreasing rate from 1981 to 2003, witnessing a sharp decrease in 2005 afterward, it maintained a relatively steady rise up to 2021. In recent years, Nigeria's external debt has continued to rise, with the country borrowing heavily from international lenders to finance its infrastructure projects. As of 2021, Nigeria's external debt stood at over $33 billion, with a debt-to-GDP ratio of 22.5% (NBS, 2020). The effects of external debt on Nigeria have been significant and far-reaching, including debt servicing costs, dependency on foreign creditors, exchange rate instability, and a negative impact on credit rating.

Nigeria is a country that has struggled with high poverty rates despite its vast natural resources and potential. One of the factors that have been identified as contributing to this issue is the country's high level of external debt. Despite this debt burden, poverty rates in Nigeria have remained stubbornly high. Nigeria has one of the highest external debt levels in Africa. In 2020, the country's external debt stock was estimated to be $31.98 billion while in 2021 it is estimated to be US$33.46 (NBS, 2020). This debt is owed to various creditors, including multilateral organizations such as the World Bank and the African Development Bank, as well as bilateral creditors such as China and the United States. The country has had to borrow heavily to finance its budget deficits and to fund various projects and initiatives aimed at promoting economic growth and development. However, despite these efforts, poverty rates in Nigeria have remained high, with the latest estimates indicating that over 40% of the population lives below the poverty line (NBS, 2020). Based on the foregoing, the broad objective of this study is to examine how the accumulation and management of external debt in Nigeria influence the poverty rate within the country.

2. Literature Review

2.1 Conceptual Literature

The concept of poverty is complex and multidimensional in nature with no exact agreement on the definition, as well as having several perspectives from different scholars and researchers. Poverty is the inability to access chances and choices, which is a violation of human dignity, according to the United Nations (2021). It indicates

a fundamental incapacity to make a significant contribution to society. It means not having enough money to support a family's food and clothing, not having access to healthcare or education, not being able to get loans, and not owning enough property to grow their business. It implies ambiguity, powerlessness, and the isolation of individuals, residences, and societies. It usually signifies living in a poor or unstable environment without access to sanitary facilities and is a sign of vulnerability to violence.

The World Bank (2016) defines poverty as the deprivation of one's well-being, either by an individual or a group. It is made up of people whose meager pay keeps them from being able to afford the things they need to survive and prosper. Poverty is defined as having poor health, a low literacy rate, limited access to safe spaces and clean water, inadequate security, and few opportunities to improve one's life. Poverty is the deprivation experienced as a result of not having the necessary resources to satisfy even the most basic levels of human needs. Food, healthcare, housing, education, employment, and participation are only a few of these necessities (ILO, 1976). According to the income/consumption perspective, someone is considered poor if and only if their income is less than a predetermined threshold, such as $1 or $2 per day (Ogwumike, 2001). However, for this study, poverty is defined as the denial of effective involvement in society due to a lack of fundamental and vital human requirements, as well as the inability to access facilities or money to sustain a living standard.

On the other hand, a country's total debt to foreign creditors, commonly known as its foreign debt, is augmented by its internal debt, which is owed to domestic lenders. The debt includes money owed to international financial institutions including the IMF and the World Bank as well as private commercial banks, foreign governments, and other private parties (Mustapha & Prizzon, 2015). Debts are a result of borrowing and can be local or global in scope.

According to Ayadi and Ayadi (2008), external debt is the portion of a nation's debt that originates from international companies, governments, or financial institutions. The country's debt grows along with the deficit, forcing it to borrow ever-larger amounts to stay afloat. The International Monetary Fund defines gross external debt as the sum of disbursed and unpaid contractual obligations of citizens of a nation to citizens of other nations to repay principal, with or without interest, or to pay interest, with or without principal, at any given time.

The African Union often refers to foreign debt as a collection of past-due financial obligations. This means that the central government or a public body has contracted the commitments, the central government has guaranteed the commitments, or the private sector has contracted the commitments. Researchers have defined external debt as amounts borrowed by the national economy for periods longer than a year, where the borrower is required to repay the debt in foreign currency or by selling the borrower goods and services, to address the aforementioned concerns (Sachs, 2002). In this study, "external debt" is defined as funds obtained by a nation from foreign lenders, such as commercial banks, governments, or international financial institutions, and often repaid with interest in the same currency as the loan.

2.2 Theoretical Literature

Several models, theorizations, and counter-theorizations have consciously emerged in a bid to address some explanations for the problems of poverty and external debt. The theory of spatial disparities is one of these theories. This theory looks at poverty from a geographic perspective, highlighting the fact that certain individuals, places, and cultures do not have access to opportunities for wealth creation. Examples of this type of poverty include ghetto poverty, southern poverty, urban poverty, third-world poverty, and so on. This theory is related to the economic agglomeration theory, which describes how the localization of businesses and industries draws in additional markets, development, and supportive services, all of which draw in more businesses and industries. In contrast, impoverished communities draw in more residents, which exacerbates poverty. Community development can be used to combat this kind of poverty in low-income communities where it is common (Bracking, 2004).

Applying this theory to the Nigerian setting, where the prevalence of poverty is felt in most geographic regions, including slums, rural areas, and areas vulnerable to natural disasters; low levels of economic activity and industry localization lead to high unemployment rates and other poverty-multiplier effects. There is now a significant developmental divide between the populations of rural and urban areas as a result of the government administrations' complete disregard for rural areas' needs in terms of empowering possibilities and basic infrastructure, which has created issues with rural-urban migration. These regions have high rates of poverty because successive levels of government have failed to recognize and take use of the potential and resources there to improve the well-being of the local populace. Therefore, despite Nigeria's abundant resources,

those living in underprivileged areas continue to live in substandard conditions, suffer from poverty, and have little possibility to escape it.

Conversely, the neoclassical growth theory of external debt suggests that external borrowing can have both positive and negative effects on economic growth in developing countries. According to this theory, external debt can be a useful tool for financing investment and boosting economic growth in the short run, but it can also lead to negative long-term consequences if not managed properly. The theory is based on the idea that external debt allows developing countries to increase their investment in physical and human capital, which can lead to higher levels of economic growth and development. This is because external debt can provide developing countries with access to funds that they may not otherwise have, which can be used to finance investment projects such as infrastructure development, education, and healthcare.

More so, the debt sustainability theory is a key concept in the field of international economics that is concerned with the ability of countries to manage their external debt obligations without defaulting or experiencing significant economic and financial disruptions. The theory suggests that a country's ability to repay its external debt depends on various factors, including its economic performance, policies, and external economic environment. The main idea behind debt sustainability theory is that a country's external debt should be manageable and not impose an undue burden on the economy or the population. If a country's external debt is too large or unsustainable, it can lead to several negative consequences, including default, financial crises, currency devaluation, inflation, and economic stagnation. Therefore, it is essential to ensure that a country's external debt is sustainable and manageable over the long term (Omotoye et al., 2006).

One of the key determinants of debt sustainability is a country's overall economic performance. A country with a strong and growing economy is likely to be able to service its external debt obligations more easily than a country with a weak or stagnant economy. Economic growth generates income and tax revenue that can be used to service debt, and it also increases a country's ability to borrow in the future if necessary. Conversely, if a country's economy is in a recession or experiencing slow growth, it may struggle to meet its debt obligations. Omotoye et al. (2006) assert that to assess the sustainability of a country's external debt, economists use a variety of measures and indicators. One common measure is the debt-to-GDP ratio, which compares a country's external debt to its overall economic output. A high debt-to-GDP ratio may indicate that a country is taking on too much debt relative to its economic performance and could lead to debt sustainability concerns. Other measures may include the debt service-to-revenue ratio, which compares a country's debt service payments to its tax revenue, or the external debt-to-exports ratio, which compares a country's external debt to its export earnings.

2.3 Empirical Literature

Poverty - external debt nexus has spurred diverse arguments over the years, but a more controversial issue is the responses of poverty to an increase or decrease in the external debt of a nation. One of the earliest studies examining the effect of external debt on poverty was conducted by Ghura and Grennes (1993). They looked at how external debt affected Sub-Saharan Africa's efforts to reduce poverty. Through the use of panel data analysis, they discovered a negative link between foreign debt and the decline of poverty, meaning that higher levels of external debt were linked to higher rates of poverty. Additionally, they discovered that nations with lower levels of human capital were more affected by external debt in terms of reducing poverty.

Easterly (2002) looked at how a sample of 64 developing nations' foreign debt affected their efforts to reduce poverty. He discovered that external debt had a detrimental effect on economic growth, which in turn had a detrimental effect on the fight against poverty through a panel data study. Likewise, Karogol (2002) examined the relationship between Turkey's external debt service and economic growth from 1956 to 1996, both in the long and short terms. The study examined a common production function model using multivariate co-integration analysis. There is just one co-integration equation, according to the estimations from the vector autoregression. It also showed that, over time, debt service had a detrimental effect on economic growth. Clements, Bhattacharya, and Nguyen (2003) examined how growth in low-income countries is impacted by external debt. Their results indicate that a large decrease in the highly indebted poor countries (HIPC) stock of expected external debt would directly boost per capita income growth by about 1% per year. Reductions in the cost of repaying foreign debt might also benefit public investment, which would hence indirectly boost growth. In 42 African nations, Asongu's (2020) study looked at the connection between decreasing levels of poverty and external debt. By employing a panel data analysis, he discovered a negative correlation between external debt

and the decrease in poverty, meaning that greater levels of external debt were linked to greater rates of poverty. Additionally, he discovered that debt relief contributed to a decrease in poverty. Arshed, Nasir, and Saeed (2022) examined the impact of long-term and short-term external debt on the standard of living in 23 Asian countries with high levels of debt between 1980 and 2020. With the use of the Two-Step Panel Quantile ARDL model, the quadratic effects of external debt are evaluated. According to this study, external debt has decreasing returns, meaning that after a certain point, it will start to negatively affect people's quality of life. The estimated model also suggests the advantages of efficient, modest debt-based policy actions.

Using more current data, from 1981 to 2020, Akanbi et al. (2022) carried out a quantitative analysis of the relationship between Nigeria's economic growth and the service of its external debt. The results of the Auto-Regressive Distributed Lags (ARDL) model estimation on selected data brought more evidence to the discussion suggesting a negative association between foreign debt service and growth, citing a resource depletion effect of external debt service on economic growth. Although not statistically significant, there is a positive correlation between growth and the stock of foreign debt.

Furthermore, Ismail and Zaria (2023) used quantile regression to examine the effect of external debt on poverty reduction in Nigeria. The result of quantile regression reveals that external debt is significant and positive. There is the existence of an average short, medium, and long term relationship between foreign debt and poverty reduction. At the same time, foreign debt has a negative and significant average effect on poverty reduction in the short term. Nimvyap et al. (2023) evaluated the impact of foreign, internal, and debt servicing in Nigeria and looked at how public debt affected the country's efforts to reduce poverty. The study collected secondary time series data during a twenty-one-year period (2000–2021). Error Correction Mechanism (ECM), correlational matrix, and descriptive statistics were utilized to estimate the data used in the study. Findings from the analysis showed that whereas domestic debt and debt servicing had an inverse and significant link with poverty reduction in Nigeria, external debt had a positive and substantial effect on poverty alleviation in that country. Empirical data indicates that public debt and the reduction of poverty in Nigeria are positively correlated. In a similar spirit, Odey, Owan, and Owan (2023) used the econometric analytical technique to examine the effect of Nigeria's foreign debt load on economic growth. The Statistical Bulletin of the Central Bank of Nigeria served as the source of annual time series data. GDP was used to quantify economic growth, and debt service payments and the stock of external debt were used to indicate the burden of external debt. The research was conducted using the Autoregressive Distributed Lag model estimate technique and bound testing. The study discovered that Nigeria's economic growth is significantly and negatively impacted by external debt and debt service payments. More recently, Agunuwa and Proso (2024) examined the relationship between Nigeria's standard of living and external debt. The study's time frame was from 1994 to 2021. The results showed that foreign indebtedness had a positive and significant effect on per capita income using the co-integration paradigm. Additionally, paying off debt has a large and detrimental effect on Nigeria's per capita income.

Studies by Fasoranti and Adebayo (2016); Mbah, Agu and Umunna (2016); Ayoola and Olanrewaju (2017); Onakoya and Ogunade (2017); Ndubuisi (2017); Akpan and Udoka (2019); Ojewumi and Aremu (2021) all indicated that external debt has contributed in either retarding growth or increasing poverty in Nigeria. However, other studies have argued that external debt could positively impact poverty reduction efforts in Nigeria (e.g., Sulaiman & Azeez, 2012; Ijirshar, Joseph & Godoo, 2016; Aremu & Adedeji, 2019). For instance, Aremu and Adedeji (2019) suggested that external debt could increase investment in infrastructure, which may create job opportunities and stimulate economic growth. The study used data obtained from Nigeria Bureau of Statistics (NBS) and Central Bank of Nigeria (CBN) as well as from the Nigeria Living Standards Survey (NLSS). The study suggested that debt could increase access to credit, which may enable households and small businesses to invest in income-generating activities. Additionally, Nanfa et al. (2023) evaluated the impact of foreign, internal, and debt servicing in Nigeria and looked at how public debt affected the country's efforts to reduce poverty. Findings from the analysis showed that whereas domestic debt and debt servicing had an inverse and significant link with poverty reduction in Nigeria, external debt had a positive and substantial effect on poverty alleviation in that country. Empirical data indicates that governmental debt and the reduction of poverty in Nigeria are positively correlated.

Broadly speaking, while there is some variation in the findings, most of the studies suggest that external debt has a significant impact on poverty in Nigeria, with some studies finding a negative impact and others finding a positive impact. Economic growth, government expenditure, education, and health are identified as important factors in poverty reduction in Nigeria. From a broad spectrum, many scholars have contributed to the study of external debt and poverty rates. The most significant gap in the literature is that domestically, that is in the

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Nigerian context, only a few literature have empirically investigated simultaneously, the responses of poverty to External debt. Therefore, within the socio-economic scope of Nigeria, this study will be in existing domestic literature. More so, because the consensus is unclear, further investigation becomes imperative.
More so, from the previous several literature reviewed, most researchers like Ayoola and Olanrewaju (2017), Nanfa et al. (2023), Odey, Owan, and Owen (2023), and Agunuwa and Proso (2024) amongst others, made use of some external debt proxies (that is, external debt stock and service) which this study will also adopt, however, poverty proxy (i.e., Gross Domestic Product Per Capita) was adopted by some studies but for this research work, final consumption expenditure (% of GDP) will be used to proxy poverty rates. This is because, according to the Nigeria Bureau of Statistics (2019) Report, consumption expenditures—rather than income—are used to define poverty in Nigeria. The rationale for this is that consumption expenditures more accurately represent a household's attainment of a given degree of welfare (utility). Additionally, these previous studies failed to factor in appreciably, some control variables sufficient enough to explain the core variables, thus signifying the existence of a measurement problem. These control variables include gross domestic product, per capita income, and exchange rate. Hence, this study will be carried out to estimate the impact of external debt on the poverty rate. In addition, there is a gap of uncertainty about how external debt will influence poverty rates in the long run. To this end, this study will investigate such gaps by considering the dynamic model relationship which exists between them.

3. Methodology

3.1 Theoretical Framework

This empirical study is hinged on the principle of debt sustainability theory. The theory suggests that a country's ability to repay its external debt depends on various factors, including its economic performance, policies, and external economic environment. The main idea behind debt sustainability theory is that a country's external debt should be manageable and not impose an undue burden on the economy or the population. Suppose a country's external debt is too large or unsustainable. In that case, it can lead to several negative consequences, including default, financial crises, currency devaluation, inflation, economic stagnation and most importantly poverty. Therefore, it is essential to ensure that a country's external debt is sustainable and manageable over the long term. Insight of this theory, we can specify the model below:

$$P = f(EXTD, GDP, \psi) \quad (1)$$

Where;
P = poverty
EXTD = external debt
GDP = real gross domestic product to measure economic growth
Ψ= for other factors that affect poverty such as interest rate and exchange rate that will be included in the model. The selection of control variables is informed by the extant literature.

3.2 Model Specification

Occam's theory holds that a model should be specified parsimoniously to avoid specification bias or specification error. To this end, this study in line with Gujarati's (2013) forms of model specification will appropriately specify the models according to the objectives of the study. The models are specified based on three forms as follows:

Specification of Model 1

a) **Functional Form:**

$$LCEXP = F(LEXTD, LEXTS, LGDP, INT, \text{and } LEXCH) \quad (2)$$

b) **Deterministic form:**

$$LCEXP_t = \alpha 0 + \beta 1 LEXTD_t + \beta 2\, LEXTS_t + \beta 3 LGDP_t + \beta 4 INT_t + \beta 5 LEXCH_t \quad (3)$$

c) **The Econometric Form: Equation (3) is transformed into:**

$$LCEXP_t = \alpha 0 + \beta 1 LEXTD_t + \beta 2 LEXTS_t + \beta 3 LGDP_t + \beta 4 INT_t + \beta 5 LEXCH_t + \mu t \quad (4)$$

Where:

L =	Natural logarithm of a particular variable
LCEXP =	Final Consumption Expenditure
LEXTD =	External debt stock
LEXTS =	External debt service
LGDP =	Gross domestic product
INT =	Interest rate
LEXCH =	Exchange rate
$\alpha 0$ =	The intercept.
μt =	The error term
$\beta 1, \ldots \beta 5$ =	The Regression parameters

In Equ. (5), we present the generalized ARDL (p, q) model as:

$$Y_t = \alpha_{0j} + \sum_{i=1}^{p} \psi_{1i} Y_{t-i} + \sum_{i=0}^{q} \psi_{2i} X_{t-i} + \omega_t \quad (5)$$

p =optimum lag length for the predicted parameter.
q =optimum lag length for the predictors

ARDL Bounds Test Model for Objectives I and II

This model depicts the objective of establishing the presence of any long-run connection between the poverty rate and external debt in Nigeria. The model is expressed thus;

$$\Delta LCEXP_t = \alpha_0 + \sum_{i=1}^{p} \phi_i \Delta LCEXP_{t-I} + \sum_{i=0}^{p} \theta_i \Delta LEXTD_{t-I} + \sum_{i=0}^{p} \mu_i \Delta LEXTS_{t-I} + \sum_{i=0}^{p} \Psi_i \Delta LGDP_{t-I} + \sum_{i=0}^{p} \Omega_i \Delta INT_{t-I} + \sum_{i=0}^{p} \varphi_i \Delta LEXCH_{t-I} + \delta_1 LEXTD_{t-1} + \delta_2 LEXTS_{t-1} + \delta_3 LGDP_{t-1} + \delta_4 INT_{t-1} + \delta_5 LEXCH_{t-1} + \varpi_t \quad (6)$$

Where;
Δ = 1st diff. operator.
$\alpha 1 - \alpha 5$ = short-run relationship parameters
$\beta 1 - \beta 5$ = long-run relationship parameters
(t – i) = Lagged term of respective variables
Σ = Sum
ϖi = error term
All other variables are as defined above.
Justification for using the ARDL Model
Because it can analyze co-integrating relationships regardless of the series' integration order and because it uses a single reduce form equation to estimate the model's long- and short-term parameters simultaneously and to allow for variables with different optimal lags—a feature not possible with other methods—the Autoregressive Distributed Lagged (ARDL) estimation technique is widely used (Abu, 2017). More so, the ARDL belongs to the dynamic model's family which has generally been found to be more robust than static models.

The Model for Granger Causality for Objective III

This model captures the objective of ascertaining the causal relationship between poverty rate and external debt. Since correlation does not imply causation, the model is framed upon Cliver Granger's causality test of 1969. The Granger's Causality test determines whether a time series is useful in forecasting another. Granger causality exists in any of three major relationships: a) X affects Y = Unidirectional b) Y affects X = Unidirectional c) X and Y affect each other = bidirectional.
Hence, Granger causality for two models is specified thus:
a). Functional forms of the models:

$$LCEX \longleftrightarrow LEXT \quad (7)$$

$$LCEXP \longleftrightarrow TEXTS \quad (8)$$

b). The Mathematical or Deterministic forms

Equations (7) and (8) can respectively be re-written as:

$$LCEXP_t = \alpha_0 + \alpha_i \sum_{i=1}^{m} LCEXP_{t-i} + \beta_j \sum^{n_j=1} LEXTD_{t-j} \quad (9)$$

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$$LEXTDt = \lambda 0 + \lambda j \sum nj=1 LEXTDt-j + \sigma i \sum ni=1 LCEXPt-i \quad (10)$$

And

$$LCEXPt = \theta 0 + \theta i \sum vi=1 LCEXPt-i + \phi j \sum wj=1 LEXTSt-j \quad (11)$$

$$LEXTSt = \gamma 0 + \gamma j \sum wj=1 LEXTSt-j + ¥i \sum vi=1 LCEXPt-i \quad (12)$$

c). The Econometric forms of the models

$$LCEXP_t = \alpha_0 + \alpha_i \sum_{i=1}^{m} LCEXP_{t-i} + \beta_j \sum^{n}_{j=1} LEXTD_{t-j} + \mu_{1t} \quad (13)$$

$$LCEXPt = \theta 0 + \theta i \sum vi=1 LCEXPt-i + \phi j \sum wj =1 LEXTSt-j + \omega 1t \quad (15)$$

$$LEXTSt = \gamma 0 + \gamma j \sum wj=1 LEXTSt-j + ¥i \sum vi =1 LCEXPt-i + \omega 2t \quad (16)$$

Where:

LCEXP, LEXTD, LEXTS = Same as earlier defined.
(t – I and t – j) = Lagged terms on respective variables.
$\sum$ *and* (μ_{1t}, μ_{2t}, ω_{1t}, ω_{2t}) = Summation operator and error terms of respective equations.
m, n, v, and w = Maximum lag lengths
α_0, λ_0, θ_0 and γ_0 = Constant parameters of respective equations
α_i, β_j, λ_j, σ_i, θ_i, ϕ_j, γ_j, and ¥$_i$ = Parameters/Slopes of respective variables.

4. Results

4.1 Descriptive Statistics

Table 1: Descriptive Statistics of the Variables

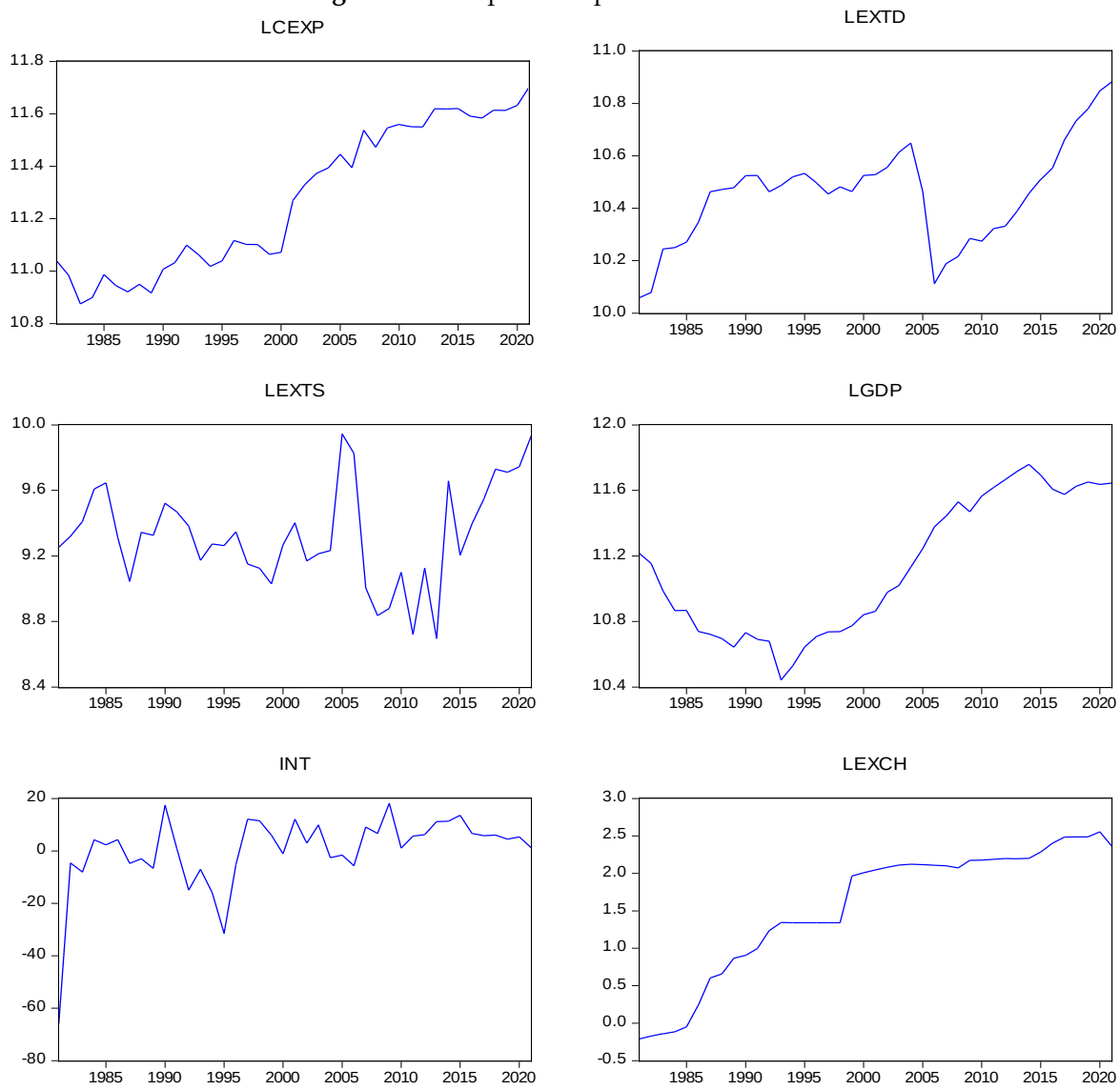
	CEXP	EXTD	EXTS	GDP	INT	EXCH
Mean	11.27438	10.4511	9.325404	11.12741	2.453578	1.556235
Median	11.26924	10.47165	9.311913	11.02011	4.310292	2.046227
Maximum	11.70243	10.88204	9.944834	11.75905	18.18000	2.554866
Minimum	10.87475	10.05863	8.694972	10.4433	-65.8571	-0.20922
Std. Dev.	0.276921	0.190724	0.301903	0.418936	14.25917	0.865637
Skewness	0.072302	0.02712	0.086953	0.125432	-2.71748	-0.82723
Kurtosis	1.35725	2.951684	2.715145	1.446942	12.91102	2.395806
Jarque-Bera	4.64588	0.009014	0.190283	4.22799	218.2688	5.299708
Probability	0.097985	0.995503	0.909244	0.120755	0.00700	0.070662
Sum	462.2494	428.4949	382.3415	456.2237	18.5967	63.80565
Sum Sq. Dev.	3.067401	1.455028	3.645818	7.020309	8132.955	29.9731
Observations	41	41	41	41	41	41

Source: Authors

A summary of the variables' descriptive statistics that were employed in the models can be found in Table 1. They display the data's dispersion and central tendency measures. The variables are displayed in the table based on their face value. For every variable, there are 41 observations. Except for interest rate, all variables have mean values that are bigger than the standard deviation, suggesting that more time series data are clustered toward

the mean. In terms of skewness, LCEXP, LEXTD, LEXTS, and LGDP are all greater than zero (0) which means that they are positively skewed. Also, variables like INT and LEXCH are less than zero (0) and it implies that they are negatively skewed. The Jarque-Bera probability values for LCEXP, LEXTD, LEXTS, LGDP, and LEXCH are greater than a 5% level of significance as well as their kurtosis value less than three (3) show that the error term of all the variables are normally distributed, while that of INT is not normally distributed because it Jarque-Bera probability values are less than 5%.

Figure 3: Descriptive Graphs of the Variables



Source: Authors

In the panel above, we can see the movement/fluctuations exhibited by each variable that will be used in our study. Goss's domestic product shows on average an upward movement, as shown in the table. We can also see final consumption expenditure used as a proxy for the poverty rate is exhibiting a jerk-like movement.

4.2 Pre-Estimation Test Results

4.2.1 Unit Root Test

The unit root test is used to examine the stationarity qualities or the way the variables behave over time. The test's hypothesis and judgment criteria are listed below.

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Table 2: Unit Root Result

VARIABLE	LEVEL FORM @ 5%			FIRST DIFFERENCE @ 5%			ORDER OF STATIONARITY
	ADF tstatistic	Critical Value	P-Value	ADF t-statistic	Critical Value	P-Value	
LCEXP	-3.3763	-3.5266	0.0690	-6.8251	-3.5298	0.0000	I(1)
LEXTD	-1.4500	-3.5266	0.8300	-4.5993	-3.5300	0.0037	I(1)
LEXTS	-3.2832	-3.5266	0.0837	-8.4262	-3.5398	0.0000	I(1)
LGDP	-1.8872	-3.5442	0.6397	-3.8883	-3.4260	0.0221	I(1)
INT	-7.5881	-3.5266	0.0000				I(0)
LEXCH	-0.9763	-3.5260	0.9361	-5.7058	-3.5300	0.0002	I(1)

Source: Authors

In Table 2, aside from interest rate (INT) that is stationary at levels form, other variables became stationary after being differenced once. This possibly suggests co-integration and a dynamic relationship among the variables. According to Pesaran and Shin (1999), a mix of order of integration is one of the fundamental conditions for the employing of an ARDL model. Also, in line with Pesaran, Shin, and Smith (2001) who ascertained in their study that ARDL is suitable if the order of integration or stationarity is higher than one. Hence, the observation of the order of stationarity in Table 2 meets the requirement upon which this study is conducted.

4.2.2 Optimum Lag-length Selection

As earlier stated, the ARDL model requires a selection of the maximum lag length of variables according to different selection criteria.

Decision Rule: Choose the lag length that has the least asterisked value among the various information requirements. The model's error is best minimized by the lowest value.

Table 3: Lag-Length Estimation Result

Lag	LogL	LR	FPE	AIC	SC	HQ
0	58.70226	NA	0.003401	-2.848771	-2.587541	-2.756675
1	63.56561	7.886512*	0.002765*	-3.05760*	-2.752832*	-2.950155*
2	63.56576	0.000238	0.002925	-3.003555	-2.655248	-2.88076
3	63.90923	0.519839	0.00304	-2.968066	-2.576221	-2.829923
4	63.91045	0.001785	0.003221	-2.914078	-2.478695	-2.760585

Source: Authors

From Table 3, the AIC (Akaike Information Criterion) yields the least asterisked value. It suggests an optimum lag length of 1. Hence, this study uses a maximum lag length of one. The AIC is advantageous over most another criterion in that it enables accurate model selection.

4.2.3 Bounds Test for Co-integration

Gujarati (2013) states that if two or more variables have an equilibrium or long-term relationship, they are said to be co-integrated. A co-integration test is used to determine whether two or more variables that are not stationary at their level form have a long-term relationship.

Table 4: Bounds Test for Co-Integration Result

T-Statistic	Value	Sig.	I(0)	I(1)	Outcome
F-statistic	4.0693	10%	2.26	3.35	

		5%	2.62	3.79	**Co-Integrated**
		2.50%	2.96	4.18	
		1%	3.41	4.68	

Source: Authors

The Wald test's f-statistic is bigger (>) than the lower and upper critical bounds at the 5% level of significance, as indicated in Table 4. As a result, we reject the null hypothesis and conclude that the variables used in this investigation are co-integrated. In other words, there is a solid, lasting partnership. So both the long-run and short-run models are estimated in this study. An ECM model is also predicted to take a specified time of adjustment into account.

4.3 Presentation of Estimation Results and Discussion

Table 5: Long Run Regression Results

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
LEXTD	-0.27533	0.090897	0.632945	0.0431
LEXTS	0.10589	0.056435	0.813286	0.4223
LGDP	0.32341	0.053755	6.016414	0.0000
INT	-0.13262	0.001727	1.519719	0.1387
LEXCH	0.17066	0.026689	6.394471	0.0000
Constant	6.404115	1.09532	5.846796	0.0000
R-squared = 0.9800		F-statistic = 190		Durbin-Watson Stat = 2.0185
Adjusted R-squared = 0.9749		Prob(F-statistic)=0.000000		

Source: Authors

Table 6: Short Run and ECM Regression Results

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(LEXTD)	0.10418	0.054758	0.624365	0.0337
D(LEXTS)	0.12932	0.031078	-0.416121	0.6802
D(LGDP)	0.19218	0.067069	2.865503	0.0074
D(INT)	0.00155	0.000872	1.78797	0.0236
D(LEXCH)	-0.06422	0.063411	-1.012902	0.3189
CointEq(-1)	-0.59424	0.13793	-3.308307	0.0001

Source: Authors

From Table 5, the results show that external debt hurts final consumption expenditure in Nigeria. This implies that external debt increases the poverty rate in Nigeria and this conforms to a-priori expectation. This result supports our theoretical postulation which suggests that Nigeria's external debt is not sustainable, thus leading to a significant debt burden. By rational expectation, external debt burden can lead to increased debt service payment which can reduce the amount of money available for government spending on social services and other public goods. This can in turn lead to reduced household income and consumption, which contributes to an increase in the poverty rate. Also, a country with a high external debt stock may struggle to pay back its creditors, which can lead to a debt crisis. This can have severe economic consequences, such as inflation, currency devaluation, and a decrease in foreign investment. These consequences can affect a country's ability to provide essential services, such as education and healthcare, which can have a significant impact on poverty reduction and this is evident in Nigeria and most other African countries with high dept burden like Congo Republic, Sierra Leone, Ghana, Malawi, and Angola. This finding is consistent with that of Akanbi et al. (2022), who discovered that external debt negatively affects Nigerian households' ultimate consumption expenditures. Yusuf et al. (2021) discovered in another study that household consumption expenditures are negatively impacted by external debt, which consequently raises the poverty rate. Therefore, this study rejects the first null

hypothesis based on empiricism and concludes that there is a statistically significant relationship between external debt and Nigeria's poverty rate.

Asongu (2020) have also found a similar result where he examined the relationship between external debt and poverty reduction in 42 African countries and found that external debt was negatively associated with poverty reduction, indicating that higher levels of external debt were associated with higher poverty rates. Going further, our findings is also in line with the work of Arshed, Nasir, and Saeed (2022) who looked at the effects of both long-term and short-term external debt on the standard of living in 23 high-debt Asian nations from 1980 to 2020. With the use of the Two-Step Panel Quantile ARDL model, the quadratic effects of external debt are evaluated. According to their study, external debt has decreasing returns, meaning that after a certain point, it will start to negatively affect people's quality of life. This conclusion was further supported by the observation that servicing high levels of debt may directly shift budgetary funds away from investments required to spur economic growth. Due to the uncertainty surrounding the government's activities in servicing the substantial external debt, high levels of debt deter private sector-led investment, employment, and therefore growth.

The bounds co-integration test accounts for the long-run relationship between both variables. The result earlier presented in Table 4 shows that the model is co-integrated and that it will adjust by about 59.42% towards its equilibrium against any exogenous shock in the next year. Hence, the study rejects the second null hypothesis and concludes that there is a long-run relationship between external debt and poverty rate. Previous studies such as that conducted by Karogol (2002) have shown that there exists a long-run relationship between external debt and poverty rate.

The log of external debt service has a long-run coefficient of 0.1059 based on the control variables. Therefore, an increase in the external debt stock as a percentage will increase final consumption expenditure by 10.59%, holding other factors constant. This is contrary to a-priori assumptions. Furthermore, the log of the gross domestic product has a long-run coefficient of 0.3234. Therefore, a percentage rise in GDP will result in a 32.34% increase in final consumer spending, leaving other factors constant. This is consistent with prior expectations.

This can be interpreted as a positive development for poverty reduction efforts, as it indicates that economic growth may be contributing to an improvement in the living standards of households. This is in line with the findings of Nwabueze (2009) who found that GDP growth was positively associated with household consumption expenditure in Nigeria between 1985 and 2015.

Furthermore, the long-run coefficient of interest rate is 0.1326. This indicates that holding other variables constant, a percentage increase in interest rate will decrease final consumption expenditure by 13.26% and this conforms to a-priori expectations. This indicates that when interest rates are high, borrowing becomes more expensive, investors may be less inclined to borrow, and this may hamper domestic production, thereby leading to a reduction in employment, income, and final consumption expenditure, then leading to poverty. Also, the long-run coefficient of the exchange rate is 0.17066. This implies that holding other variables constant, a percentage increase in the exchange rate will increase final consumption expenditure by 17.07% and this conforms to a-priori expectations. This implies that when the exchange rate increases, households have more purchasing power to buy goods and services, including those that are imported. Studies in Nigeria have shown that an increase in the exchange rate leads to cheaper imports and an increase in the consumption of domestically produced good, both of which boost household consumption expenditure. Examples of such studies can be seen in the research work of Gnangnon (2021.

Going further, the error correction component which co-integrates the long and short-run effects, with a negative sign, shows conformity with economic expectation, such that it suggests a possibility of adjusting the lags or disequilibrium in the long run. The Error correction model has a coefficient of -0.5942. This means 59.42% of the model's disequilibrium will be corrected or rectified within the next period.

The Appendix contains the findings of the ARDL model's diagnostic tests. All of the requirements, including normality, autocorrelation, and heteroscedasticity, are satisfied by the model residuals. As a result, the model can be used to draw inferences (Dada, Olomola, & Adedokun, 2021). Additionally, the R-squared and modified R-squared values are quite high, and the models' overall importance is demonstrated by the substantial F-statistic. To verify the stability of the model parameters, Persan and Pesaran (1997) introduced the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares (CUSUMsq) of the residuals based on the Schwarz Bayesian Criterion. The plot of the CUSUM and CUSUMsq remained within the limits of the 5% significant level, as seen in the figures. In light of the stability noted in the CUSUM and CUSUMsq, the study's conclusion about the stability of the variables is that the variables are stable.

Figure 4: Cusum Plots for Stability Test

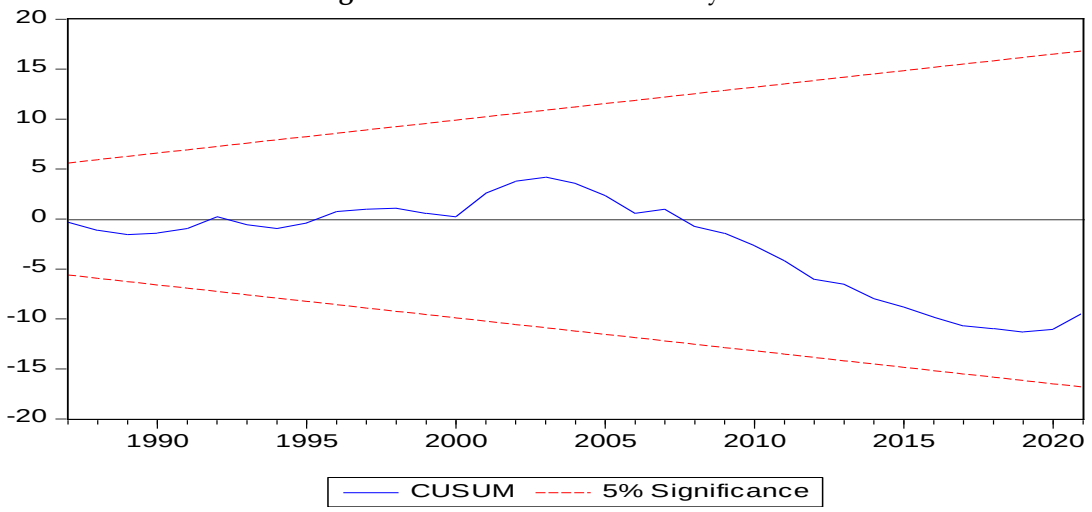
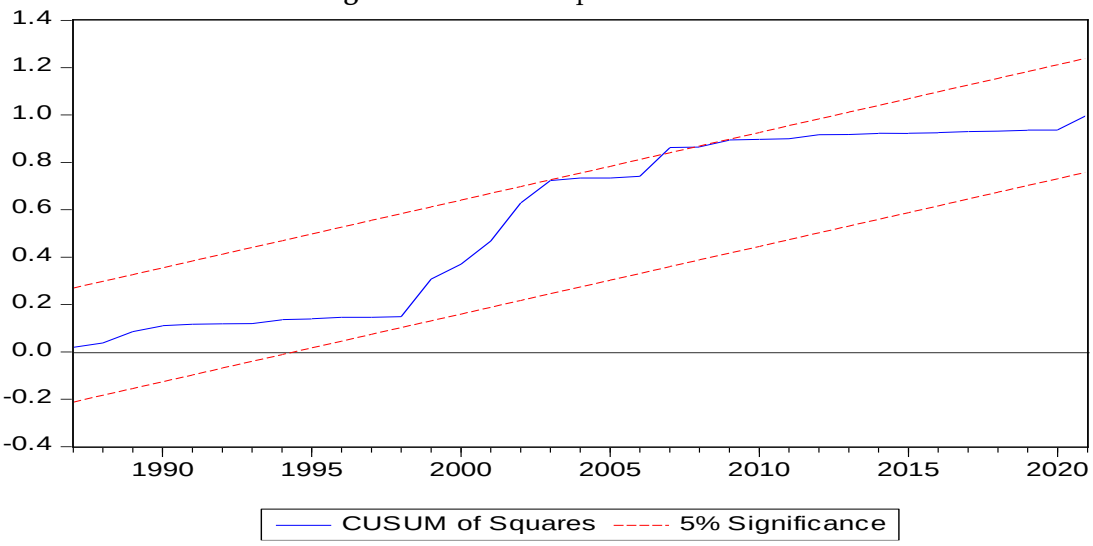


Figure 5: Cusum of Squared Residuals



4.4 Granger Causality Test

The third hypothesis of this study is captured in the second model of this study as presented in Table 7. The result of the model estimation shows that no causal connection exists among the variables used in the study. Hence, upon the establishment of no causal relationship between external debt and poverty rate, this study fails to reject its third null hypothesis and concludes that there is no causal relationship between external debt and poverty rate. This means that changes in external debt do not have a significant or direct impact on the poverty rate in Nigeria. This result however negates our a priori expectation. The uniqueness of Nigerian data could be one of the reasons for this result. Hence, if the goal is to reduce the poverty rate in Nigeria, policymakers may need to focus more on factors that directly affect household consumption expenditure and poverty rate such as improving access to employment, education, and social welfare, among others.

Table 7: Granger Causality Test Result

Null Hypothesis	F-Statistic	P-Value	Outcome
External Debt Does Not Granger Cause Poverty Rate			
EXTD does not granger cause CEXP	1.8326	0.1840	No Causation
EXTS does not granger cause CEXP	0.4407	0.5109	No Causation
Poverty Rate Does Not Granger Cause External Debt			
CEXP does not granger cause EXTD	0.1695	0.6829	No causation

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CEXP does not granger cause EXTS	0.0837	0.7739	No Causation

Source: Authors

5. Conclusion

The overall goal of this study is to use econometric, statistical, and economic approaches to investigate how Nigeria's foreign debt affects the country's poverty rate. This work's overarching goal is to determine how Nigeria's external debt affected the country's poverty rate from 1981 to 2021. This was broken down into three (3) distinct goals, which are as follows: (1) assess how Nigeria's external debt affects the country's poverty rate; (2) find out if there is a long-term correlation between external debt and poverty rate in Nigeria; and (3) ascertain whether there is a causal relationship between poverty and external debt in Nigeria. To accomplish these objectives, a model was formulated, and estimated, using the Autoregressive distributed lag (ARDL) model under some respective research hypotheses. An econometric methodology was then employed to test the stated hypotheses. The results indicate that external debt is a major cause of poverty in Nigeria, which means that Nigeria's external debt burden can lead to an increased poverty rate due to high interest paid to service such debt and this may divert resources from the productive sectors of the economy, may also lead to decline in economic growth. The results further indicate that other macroeconomic variables impacting positively and significantly on the poverty rate (proxied by final consumption expenditure) in Nigeria are gross domestic product (GDP) and Exchange rate while interest rate has a negative but insignificant impact.

Following the findings of this study, while external debt negatively impacts final consumption expenditure used to proxy poverty in Nigeria, the government needs to adopt prudent debt management practices. This involves borrowing only when necessary, ensuring that borrowed funds are used for productive purposes, and developing strategies to manage debt effectively. Effective debt management can prevent debt overhang and ensure that future generations are not burdened by debt obligations. The government should develop a comprehensive debt management strategy that outlines borrowing policies, debt management procedures, and risk management strategies. The government should also establish a debt management office that is responsible for managing external debt, negotiating loan agreements, and monitoring debt service payments. Additionally, the government should prioritize transparency and accountability in debt management, including disclosing debt information to the public and establishing an independent debt audit mechanism. While external debt can help finance development projects and stimulate economic growth, it is important to ensure that borrowing is sustainable. Over-borrowing can lead to debt distress, which can undermine economic growth and exacerbate poverty. The government should develop a debt sustainability framework that guides borrowing decisions and promotes responsible borrowing. This framework should take into account the country's debt capacity, the impact of borrowing on economic growth, and the ability to service debt. The government should also prioritize concessional borrowing, which has lower interest rates and longer repayment periods, and avoid taking on excessive commercial debt. These debt management strategies have been carefully adopted by most developed countries of the world and Nigeria can borrow a new leaf from them.

Given that external debt has a direct impact on GDP in Nigeria, there is a need to enhance domestic resource mobilization. The government should focus on improving the efficiency and effectiveness of tax collection to increase domestic revenue. This can be achieved by increasing the tax base, improving tax administration, and reducing tax evasion. The government should implement policies that support domestic resource mobilization, such as expanding the tax base to include more sectors of the economy, introducing new taxes, and increasing tax compliance through the use of technology. Additionally, the government can invest in building capacity in tax administration agencies and exploring alternative sources of revenue generation, such as natural resource royalties and excise taxes of labor-intensive industries such as agriculture, construction, and manufacturing.

Finally, this research will act as a benchmark for further studies. This is because in addition to the gap this paper fills, there are still other topics left out of this study due to its scope and context. It will be interesting to examine the role of governance institutions in the relationship between foreign debt and the poverty rate in Nigeria. The result of such a study will form a good basis for policy recommendations as regards the quality of institutions in Nigeria.

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