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EXTERNAL DEBT CRISIS, GROSS FIXED CAPITAL FORMATION AND ECONOMIC GROWTH IN NIGERIA

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Abstract

Nigeria has witnessed a remarkable increasing trend of external debts (EXDC) and volatile gross fixed capital formation (GFCF) over the years. The overarching question here is whether the variations in the EXDC and GFCF have made significant contribution to the economic growth in the country. This study therefore investigates the dynamic relationships among economic growth, external debt crisis and gross fixed capital formation in Nigeria for the period between 1981 and 2022. The research work adopts Harrod-Domar growth theory and Solow-Swan model. The study employed Phillips-Perron unit root model to test the stationarity of the research data. Autoregressive Distributed Lag (ARDL) was used to verify the dynamic relationships between the dependent and independent variables of the research model. Pairwise granger causality test was carried out to test the causality properties of the examined variables. The study concludes a significant negative relationship between external debt crisis and economic growth in Nigeria during the observed period. A negative relationship contrary to the a priori expectation of the study was also observed between the economic growth and gross fixed capital formation in the country. Stemming from these aforementioned outcomes, the study recommends that policy makers should as a matter of urgency come up with policies that encourage prudent fiscal management for external debt reduction and conducive business environment for increased gross fixed capital formation through private investment in Nigeria.

Keywords: External Debt Crisis, Gross Fixed Capital Formation, Economic Growth, Phillips-Perron, Autoregressive Distributed Lag.

Introduction

One of the major unresolved macroeconomic challenges of less developed countries is external debt burden. Debt crisis has the tendency to reduce government spending on critical sectors such as health care, education and infrastructure. In a situation where a significant portion of government revenue is used to service debt, funds are limited for economic growth and development.

Gross fixed capital formation refers to the total value of investments made in fixed assets like buildings, equipment and machinery at a given period of time. It is an important indicator of economic growth and capacity for future development of an economy.

A major characteristic of Nigeria's development experience to date is the relatively poor economic performance with heavy debt burden. According to the press release in the "Premium Times" new paper of July 21, 2022 by the Nigeria's Minister of Finance, Budget and National planning, the Nigeria's total revenue stood at ₦1.63 trillion while the debt serving stood at ₦1.94 trillion, presenting a variance of more than ₦300 billion between January and April, 2022.

To get more insight into the current state of debt crisis in Nigeria, the review and prioritization of gross fixed capital formation in the process of improving saving and investment bases cannot be undermined in the country.

Theoretical framework

The underlying theoretical framework for this research work are the Harrod-Domar growth theory and Solow-Swan model.

Harrod-Domar theory states that one of the principal tricks necessary for economic take-off was savings' mobilization to generate sufficient investment to accelerate economic growth. The theory places importance on investment in the process of gross fixed capital formation for economic growth (Jhingan, 2008). The growth model has been used severally to support critical conclusions for economic policy making (Momodu, 2012).

For the theory:

$$Y = sc - \delta \_\_\_\_\_ 1$$

The model states that increasing savings rate "s", increasing marginal product of capital "c", or decreasing rate of depreciation "δ" will increase the growth rate of output "y" of a nation at a given period of time.

The Solow-Swan model is a neoclassical economic growth model that aims to explain long-term economic growth and accumulation of capital in an economy. The model introduced accumulation of physical capital as a driver of economic growth. Investment in new capital adds to the capital stock, leading to increased production and income.

The model provided the idea of diminishing marginal returns to capital. As the capital stock increases, the additional output gained from each additional unit of capital diminishes. There is a consideration for capital depreciation, representing the natural wear and tear of capital goods over time. This suggests that a portion of the capital stock is lost over time.

The model established the existence of a steady state where the capital stock per worker remains constant, and the economy grows at a constant rate. In this state, investment equals depreciation, and there is no further increase in the capital-output ratio.

Solow-Swan model introduced insights into how capital accumulation contributes to economic growth and the determinants of a country's steady-state level of income. It has been influential in the field of growth economics and has served as a foundation for subsequent models that incorporate additional factors such as human capital and technological progress.

Conceptual and empirical literature

Conceptually, economic growth is an increase in the production of economic goods and services in one period of time compared with a previous period. Growth in economics is commonly modeled as a function of physical capital, human capital, labour force, and technology. Simply put, increasing the quantity or quality of the working age population, the tools that they have to work with, and the recipes that they have available to combine labour, capital, and raw materials, will lead to increased economic output level.

Gross Fixed Capital Formation (GFCF) represents the net increase in physical assets like infrastructure, machinery, and buildings within an economy. Investing in GFCF contributes to sustainable development by enhancing productive capacities, promoting economic growth, and improving the overall well-being of society.

Conceptually, external debt is the portion of a nation's debt that is acquired from foreign creditors or lenders. External debt can be sourced from foreign commercial banks, International Monetary Fund (IMF), World Bank and other international financial institutions.

When a developing country accumulates a substantial amount of external debt, it often faces challenges in servicing these debts. The resources that could otherwise be directed towards domestic investment, infrastructure, and social development are diverted to meet debt obligations. This diversion can stifle the country's economic growth by limiting its ability to invest in critical areas that contribute to long-term development.

The relationship between economic growth and public debt has been the subject of debate in several empirical research studies. Sulaiman and Azeez (2012) studied the effect of public debt on growth in Nigeria economy. The study adopted Johansen co-integration test and found a positive nexus between external debt and economic progress in Nigeria.

Dey and Tarequ (2020) noted that external debt is not injurious to the economy if the country can produce higher income than the cost of borrowing. Antoine, Stanislas and Rollfe (2021) employed time series data from 1986-2015 in Congo, confirmed that external debt has a positive and significant effect on economic growth.

In the like manner, Abiodun, Uche and Umar (2022) examined external debt service and economic growth in Nigeria between 1981 and 2020. Using Auto-Regressive Distributed Lags (ARDL) and confirmed a positive but insignificant relationship between growth and external debt in Nigeria.

On the contrary, Abdulkarim and Saidatulakmal (2021) investigated the impact of external debt on growth in the Nigeria economy concluded that external public debt constituted impediment to long-run growth in the country.

Muhammad and Abdullahi (2020) estimated the relationship of external debt servicing and economic growth from 1985 to 2018 using ARDL model. Debt service was found to have

negative effect on economic growth, but statistically insignificant in the short and long-run periods.

Getinet and Ersumo (2020) using the ARDL approach and using data from 1983 to 2018 in Ethiopia suggested that there was long run relationship between external debt service stock to GDP and external debt stock to GDP. According to him, the relationship was negative significant in the short run, it was not significant in the long run.

Awan and Qasim (2020) modelled the impact of external debt and external debt services in Pakistan. Their study provided evidence that debt services and external debt have negative impacts on the Pakistani economy as a result of repayment burden in foreign currency.

Ogbonna, Ihemeje, Obioma, Hanson and Amadi (2021) employed the ARDL model to study the nexus between external debt services and growth between 1986 and 2018. The study concluded that there was a long run harmful and significant link between external debt services and economic growth in Nigeria.

Akanbi, Uwaleke and Ibrahim (2022) made use of Auto-Regressive Distributed Lags (ARDL) model to examine the relationship between external debt service and economic growth in Nigeria for a period between 2018 and 2020. The study confirmed an insignificant negative relationship between the external debt service and economic growth in the country.

Fumey, Bekoe and Imru (2022) using time series data from 1980 to 2019, employed ARDL model to analyse the impact of external debt servicing on capital formation in Ghana. The study provided evidence that the effect of external debt servicing was negative both in the short and long-run periods.

Joy and Panda (2020) opined that rational external borrowings to finance public development projects are keys to economic progress of a nation while borrowings for unproductive projects result in debt crisis of the nation.

In an emerging economy, increased Gross Fixed Capital Formation can lead to several positive outcomes. First, it can enhance the productive capacity of the economy by improving infrastructure, technology, and overall efficiency. This, in turn, may boost productivity and sustainable economic growth.

Onwioduokit and Otolorin (2021) and Abina and Mogbeyiteren (2021) analysed the impact of fixed capital formation on gross domestic product at different research periods in literature. The former used Dynamic Ordinary Least Square method while the later employed Johansen co-integration model. The two studies both concluded that gross fixed capital formation has long run negative and significant effect on growth in Nigeria.

Oyegun and Eleh (2023) employed ex-post facto research design, analysed the effect of capital formation on economic progress level and confirmed a significant positive impact of the capital formulation on growth in Nigeria.

Inspite of the decades of intensive literature on the inter-relationship between the aforementioned research variables, there has not been general consensus outcome of research findings. Studies like Abiodun, Uche and Umar (2022) observed positive influence of external debt on economic growth contrary to Abdulkarim and Saidatulakmal (2021) that confirmed negative nexus between the research variables.

In the light of the various mixed reports in literature, this research work intends to analyse the dynamic relationships among economic growth, external debt crisis and gross fixed capital formation in Nigeria.

Methodology

(a) Model Specification

In accordance with the objective of this research work, the model for the study is specified as:

The functional relation of the research model is:

$GDP = f(EXDC, GFCF, DINF)$ 2

The specified model in the regression form is:

$GDP_t = b_o + b_1EXDC_t + b_2GFCF_t + b_3DINF_t + e_t$ 3

Where:

GDP_t = Gross Domestic Product (Proxied for Economic Growth) at time t.

$EXDC_t$ = External Debt Crisis

$GFCF_t$ = Gross Fixed Capital Formation

$DINF_t$ = Domestic Inflation.

b_o, $b_1 - b_3$, e_t = Intercepts, coefficients for estimation and error term respectively.

(b) Apriori expectation

Regarding the theoretical values of the parameters of the external debt-growth models, inverse relationships are expected between Gross Domestic Product (GDP_t) and External Debt Crisis ($EXDC_t$), and Domestic Inflation ($DINF_t$).

On the contrary, Gross Domestic Product (GDP_t) is expected to have a positive relationship with Gross Fixed Capital Formation ($GFCF_t$).

Symbolically, the above identified theoretical relationships are presented as follow:

$$b_1 = \frac{\partial GDP_t}{\partial EXDC_t} < 0, \qquad b_2 = \frac{\partial GDP_t}{\partial DINF_t} < 0, \qquad b_3 = \frac{\partial GDP_t}{\partial GFCF_t} > 0.$$

(c) Estimation methods.

The research work employs the use of Phillips-Perron unit root model to test the levels of stationarity of the data used in the study. Phillip-Perron (PP) test replaces Augmented Dickey Fuller (ADF) stationarity test which has arbitrary properties.

Stationarity or otherwise of a series can strongly influence its behaviour and properties (Gujarati and Dawn, 2009). Non-Stationarity variables in model estimation might lead to spurious or nonsense regression results. Unit root test is the first and the most important in determining the stationarity of a time series.

A series Y_t is said to be stationary if it has the tendency to return to mean value equilibrium when there is disequilibrium as well as zero order of integration I(0) which is usually written as $Y_t \sim I(0)$. This implies that the series Y_t does not need to be differenced as it is stationary at levels, that is the form in which the data is presented. If the series is not stationary, then its mean is time dependent and it has an infinite (very large) variance. Differencing is required here to achieve stationarity. In general terms, if a non-stationary series, Y_t needs to be differenced d times before it becomes stationary, then the series is said to be integrated of order of "d", which can be expressed as $Y_t \sim I(d)$.

A variable is said to be stationary when the absolute value of the estimated PP test statistic is larger than its critical value at 1%, 5% or 10% level of significance. That is, when the value is more negative. The order of integration assists in determining the subsequent relationship among variables. For short run forecasting. Vector Autoregressive (VAR) estimation is confirmed if variables are not of the same order of integration. The necessary condition for Johansen co-integration technique in testing for long run relationship is valid if all variables in a research model are integrated of order one [I(1)].

However, Pesaran, Shin and Smith (2001) proposed a technique based on Autoregressive Distributed Lag (ARDL) model which validates testing for both the long run and short run relationship irrespective of whether model variables are I(0) or/and I(1). Here, testing for a unit root is only necessary to ensure that none of the variables is I(2) or beyond since the computed F-statistics are not valid in the presence of I(2) variables.

This study's objective of investigating the dynamic relationships between the economic growth (GDP) and the specified independent variables in Nigeria for the period between 1981 and 2022 was empirically analysed, using Autoregressive Distributed Lag (ARDL) technique introduced

by Pesaran, Shin and Smith (2001). Causality among research variables was also examined using Pairwise Granger causality test technique.

Research outcomes and discussion of findings

Phillips-Perron Unit Root Test Analysis

The study verifies the stationarity of the research variables, using Phillips-Perron (PP) Unit Root Test technique. A non-stationery series is of very large variance and serial correlations (Gujarati and Dawn, 2009). The PP unit root technique was employed in this research work because it uses nonparametric statistical methods to take care of serial correlation in error terms.

The null hypothesis is $H_0 : b_i = 0$ (That is, there is a unit root in each series)

The alternative hypothesis is $H_1 : b_i < 0$ (That is, the time series is stationary) Where b_i are parameters as specified in equation 3.

The decision rule of thumb is that the null hypothesis should be rejected if the PP statistic is more negative, that is lesser than the critical value at a chosen level of significance.

Table 1 below summarizes the result of the unit root test for the study, using Phillips-Perron (PP) method.

Table 1: Phillips-perron stationarity test results

Variable	Stationarity Statistics			Probability	Level of Integration
	PP Test Statistics	Critical value (1%)	Critical value (5%)		
GDP	-11.99061*	-4.211868	-3.529758	0.0000	I(1)
EXDC	-9.007766*	-4.211868	-3.529758	0.0000	I(1)
GFCF	-5.979180*	-4.211868	-3.529758	0.0001	I(1)
DINF	-10.69843*	-4.211868	-3.529758	0.0000	I(1)

Note: *indicates significant at both 1% and 5% levels.
Source: Authors' computation, 2023.

Comparing the critical values at 1% and 5% error levels with the Phillips-Perron (PP) statistical values in Table 1, it is confirmed that the estimated values of the PP test statistic are more negative, validating the stationarity of all research variables employed in the research work.

Specifically for GDP, -11.99061 < -4.211868 at 1% and -3.529758 at 5%. For EXDC, GFCF and DINF, the PP test statistics: -9.007766, -5.979180 and -10,69843 respectively are more negative than the critical values of -4.211868 (at 1%) and -3.529758 (at 5%). The decision rule of thumb states that the null hypothesis is rejected if the Phillips-Perron statistic is more negative, that is lesser than the statistical critical value at a given level of significance. Hence, from Table 1 the null hypothesis of no stationarity of time series is rejected and the series are all integrated of order one I(1). The integration report therefore fulfills the necessary condition that is required for application of the Auto-Regressive Distributed Lag (ARDL).

ARDL dynamic test analysis

To empirically investigate the dynamic relationships among external debt crisis (EXDC), gross fixed capital formation (GFCF) and economic growth (Proxied by GDP) in the study, we employed the Autoregressive Distributed Lag (ARDL) co-integration.

The first step in the ARDL bounds approach is to estimate for the existence of a long-run relationship among research variables by conducting an F-test for the joint significance of the coefficients of the variables. The second step is to estimate the coefficients of the ARDL dynamic model and determine their long-run values, followed by the estimation of the short run elasticity of the variables as indicated in the error correction mechanism (ECM) version of the ARDL model. The ECM determines the speed of adjustment of equilibrium.

Wald test result analysis

The study carried out Wald test (F-statistic) to verify the overall significance of the coefficients of the research variables.

Table 2: Wald test (f-bounds test) result.

Test Statistic	Value	1%		5%	
		Lower Bound	Upper Bound	Lower Bound	Upper Bound
F-Statistic (K=3)	6.987382	3.65	4.66	2.79	3.67

Source: Authors' Computation, 2023.

Table 2 confirms that, the calculated F-statistic of 6.987382 is higher than the upper bound critical values of 4.66 and 3.67 at 1% and 5% error levels respectively. The result confirms evidence of significant long-run relationships between GDP (economic growth) and external debt crisis (EXDC) and gross fixed capital formation (GFCF) in Nigeria during the research period. The study rejects null hypothesis of no co-integration and presents the result of the Long-run tests to verify the behaviour of the coefficients of the employed variables in the research work.

Long run ARDL result analysis

Table 3: ARDL long run estimates

Dependent Variable: GDP				
Variable	**Coefficient**	**Standard Error**	**T-ratio**	**Probability**
EXDC	-0.346104	0.130817	-2.645700	0.0134*
GFCF	-1.158324	0.624074	-1.856067	0.0744**
DINF	-0.066270	0.044279	-1.496650	0.1461
Constant	29.97766	8.041845	3.727709	0.0009

Source: Authors' Computation, 2023.
Note: *, ** indicates rejection of null hypothesis at 5% and 10% levels respectively.

Extracting from Table 3, the ARDL estimated long-run model is presented as:

GDP= 29.978 – 0.346 EXDC – 1.158 GFCF – 0.066 DINF..... 4

The result which complied with the a priori expectation indicates that a 1% increase in external debt burden (EXDC) reduces economic growth (GDP) by about 0.35% in Nigeria. The result is consistent with the outcomes of Awan and Qusim (2020) and Ogbonna et al (2021) that external debt services are harmful to economic growth. But the result is contrary to the positions of Dey and Tarequ (2020) and Antoine (2021) that external debt is not injurious to growth. The result is justified partly by the World Bank report of September, 2023 that presents the country's external debt figure at 42.7 USD. Contrary to a prior expectation, the result shows a long-run negative relationship between economic progress (GDP) and gross fixed capital formation (GFCF), and thereby confirmed a weak capital formation base in Nigeria.

The result shows that a unit increase in GFCG reduces the GDP by 1.158 units. The result agreed with the research findings of Onwioduokit and Otolorin (2021) and Abina and Mogbeyiteren (2021) that confirmed positive relationships between gross fixed capital formation and economic growth in Nigeria.

On the nexus between the economic growth and inflation, the result behaved in line with the a priori expectation, and confirmed that a unit increase in the domestic inflation (DINF) reduces the economic growth (GDP) by 0.066 unit in the country during the research period.

Short-run ARDL result analysis

Table 4: ARDL short run estimates

Dependent Variable: GDP				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(EXDC)	-0.109185	0.094256	-1.158384	0.2569
D(EXDC(-1))	0.068604	0.099077	0.692435	0.4946
D(EXDC(-2))	0.124965	0.093253	1.340056	0.1914
D(EXDC(-3))	-0.221139	0.087932	-2.514891	0.0182
D(GFCF)	-1.158324	0.486240	-2.382208	0.0245
ECM(-1)	**-0.791727**	**0.125007**	**-6.333463**	**0.0000**
S.E. of regression	2.776568		S.D.	4.539750
Sum squared resid	238.9893		AIC	5.027702
Log likelihood	-87.01249		SC	5.288932
Durbin-Watson stat	1.876315		HQC	5.119798

Source: Authors' Computation, 2023.

As shown in Table 4, the statistical value of the lagged error correction model (ECM) is -0.791727 with the p-value of 0.0000. The value is significant at 1% level with the expected negative sign. The report confirms that about 79.2% of disequilibria from the previous year's

shocks converge back to the long run equilibrium in the current year. The adjustment speed is averagely very fast and therefore confirmed the Wald test forecast as predicted in Table 2.

Causality test analysis

Granger causality regresses each variable on lagged values of itself and the others to determine whether the current and lagged values of one variable affect another. The test answers the question of whether X causes Y or Y causes X. Y is said to be granger-caused by X if X helps in the prediction of Y. The types of direction of causality in literature include: unidirectional causality from X to Y (X →Y), unidirectional causality from Y to X (Y → X), feedback or bilateral causality (X↔Y) and independence case where by the sets of X and Y coefficients are not statistically significant in either of the regressions.

Specifically, this study verifies which of the following variables: external debt crisis and gross fixed capital formation predict economic growth (GDP), or whether economic growth predicts any of them. The study verifies the forecasting nature of the variables employed, using Pairwise Granger Causality test.

Table 5: Causality test results

Null Hypothesis	Observations	F-Statistic	Probability
EXDC does not Granger Cause GFCF	39	8.83368	0.0008*
GFCF does not Granger Cause GDP	39	3.58064	0.0388**
GDP does not Granger Cause EXDC	39	5.17379	0.0109**
GFCF does not Granger Cause EXDC	39	5.14908	0.0111**

Source: Authors' Computation, 2023.

Note: *, ** denotes rejection of null hypothesis at 1% and 5% levels respectively.

The report as shown in Table 5 rejects the null hypothesis that EXDC does not granger cause GFCF in the long run in Nigeria. The result is corroborated by the ARDL test result that confirmed the existence of a weak capital formation base in the country.

Specifically from the table, the result confirmed the existence of bilateral causality between external debt crisis (EXDC) and gross fixed capital formation (GFCF). The report shows that the probability of EXDC causing GFCF is 0.0008 while the probability of GFCF causing EXDC is 0.0111. This implies that EXDC causes GFCF at 1% significance level, while GFCG causes the EXDC at 5% level.

It was also reflected from the Table 5 that the null hypothesis which states that GFCF does not granger cause GDP and that the GDP does not granger cause EXDC were rejected at 5% level on the probability of 0.0388 and 0.0109 respectively. This means that GFCF causes GDP and the GDP causes EXDC during the period under examination in the country. It is observed from the reports that EXDC was caused by the contribution of the GDP as corroborated by reflection in the ARDL result as presented in Table 3 above.

Contributions to Knowledge and Society.

The study contributes to knowledge by adding gross fixed capital formation (GFCF) variable to external debt/economic growth model, contrary to the adopted specification of the earlier literature (Abdulkarim and Saidatulakmal, 2021; Ogbonna et al, 2021; Sulaiman and Azeez, 2012).

The research work calls for the collaboration of the private sector with the government in order to enhance strong-based GFCF and reduce the external debt burden on the society and government in Nigeria.

Conclusion and Recommendations

Having searched into the dynamic nexus among economic growth, external debt crisis and gross fixed capital formation in Nigeria empirically, it is concluded that there existed Long run relationships between the research variables during the period 1981-2022. It was observed that there was a significant negative relationship between economic growth and external debt crisis in Nigeria. The result of the study was in line with the positions of Abiodun, Uche and Umar (2022) but contrary to the conclusion of Sulaiman and Azeez (2012) which predicted positive trend relationship between the research variables. The study further concluded that the burden of the external debt in the country was granger caused by insufficient gross fixed capital formation and that a negative relationship existed between the gross fixed capital formation and economic growth in the country.

Based on the aforementioned, the study recommends as follows:

Government should invest more on productive infrastructure projects in the form of gross fixed capital formation (GFCF) to provide conducive business environment and encourage the private sector to invest in industries, manufacturing and other productive activities in Nigeria. A sustained increase in the GFCF will expand the capacity of the economy to produce goods and services and boost economic growth and thereby reduce debt burden in the country.

The government should come up with the policies that ensure prudent fiscal management, diversification of oil dependence to improve revenue generation and international cooperation to find sustainable solutions to the present challenge of external debt crisis in the country.

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