External Debt and Private Investment: Evidence from Nigeria using Toda-Yamamoto Causality Approach

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Abstract

This study aims to investigate the impact of public external debt (multilateral and bilateral debt) on private investment in Nigeria, focusing on the period from 2006Q1 to 2021Q4. Secondary time series data is utilized in this study to analyze the relationship between public external debt and private investment in Nigeria. Unit root tests, Johansen co-integration test, and three prominent co-integrating regression models (Dynamic Ordinary Least Squares, Fully-modified Ordinary Least Squares, and Canonical Co-integration Regression) are employed. Additionally, the Toda-Yamamoto approach is utilized for Granger causality/block exogeneity testing. The study reveals a long-run relationship among the variables. The Dynamic Ordinary Least Squares (DOLS), Fully-modified Ordinary Least Squares (FMOLS), and Canonical Co-integration Regression (CCR) models indicate a positive and significant association between multilateral debt and private investment in Nigeria. However, public bilateral debt shows a negative but insignificant relationship with private investment at a 5 percent level of significance. The findings suggest that public external debt, particularly multilateral debt, positively influences private investment in Nigeria. However, the impact of public bilateral debt on private investment appears to be negative but insignificant. Based on these results, it is recommended that multilateral and bilateral loans should be directed towards specific sectors such as infrastructure development, social sector projects, environmental protection projects, agricultural and rural development projects, economic reform programs, disaster relief and reconstruction, as well as health, nutrition, and poverty reduction programs. Such allocation of funds can potentially enhance private investment in Nigeria.

Keywords: External Debt, Bilateral Debt, Multilateral Debt, Private Investment, Co-integrating Regression

JEL Codes H63: Debt; Debt Management

1.0 Introduction

Nigeria is a developing country that heavily relies on external borrowing to finance its developmental projects. Debt in general and external debt in particular is a necessary evil that all economies survive with (Abdullahi, Bakar & Hassan, 2016). However, the impact of external debt on private investment in Nigeria is not well understood. Private investment is a critical driver of economic growth and development, as it creates job opportunities, enhances productivity, and boosts economic output. Thus, it is essential to understand how external debt affects private investment in Nigeria to design effective policy interventions.

The issue of external debt and its impact on private investment is not unique to Nigeria. Several developing countries have borrowed heavily from foreign lenders, including multilateral institutions, bilateral creditors, and commercial banks, to finance their development projects. However, the sustainability of external debt and its impact on economic growth and development has been a subject of intense debate among policymakers and scholars. While some like Ogunjimi, (2019), Mabula and Mutasa (2019) and Akomolafe, Bosede, Emmanuel and Mark (2015) argue that external borrowing can spur economic growth and development by providing much-needed capital for investment, others like Abubakar and Mamman (2021), Mugumisi,(2021) and Adegbite, Ayadi, and Ayadi, (2008) contend that excessive debt can stifle economic growth by diverting resources away from productive activities and deter private investment.

In Nigeria, the government has used external borrowing to finance its development projects, including infrastructure, education, and healthcare. However, the country's external debt stock has been rising in recent years, raising concerns about its sustainability and its impact on private investment. According to the World Bank (2021), Nigeria's external debt stock stood at $33.3 billion in 2020 equivalent to 11.3% of its Gross Domestic Product (GDP). Currently, National Bureau of statistics (2023) report that external debt stood at N38.22 trillion (42.50 billion dollars) in Q4 2023, while domestic debt was N59.12 trillion (65.73 billion dollars). “However, the share of external debt to total public debt stood at 39.26 per cent in Q4 2023, while domestic debt was recorded at 60.74 per cent.' This high level of external debt can crowd out private investment by increasing the cost of borrowing and reducing the availability of credit to the private sector.

Theoretically, simple acceleration theory of investment argued in favor of private investment as it asserts an enhancing impact of debt on economic growth and investment zeal’s from private investors, contrarily theories like Barro-Ricardo equivalence theory is of the believe that any loan taken by the present government will shrink further investment because the citizens will repay the debt with their future tax (Barro, 1974). However, it now very clear that there exist an empirical and theoretical apprehension on whether to external debt enhance or deplete private investment. External debt are sourced from different sources among which are multilateral debt: loan provided by international financial institutions such as, The African Development Bank (AfDB), The World Bank, The Asian Development Bank (ADB), The Inter-American Development Bank (IDB), Arab Bank for Economic Development in Africa (ABEDA), The European Bank for Reconstruction and Development (EBRD), International Fund for Agricultural Development (IFAD), and the International Monetary Fund (IMF) and bilateral debt: loans from France (Agence Francaise

Development), China (Exim Bank of China), Japan (Japan International Cooperation Agency), Germany (Kreditanstalt Fur Wiederaufbua) and India (Exim Bank of India),

The research problem addressed in this study revolves around the relationship between external debt and private investment in Nigeria. Specifically, the inquiry focuses on understanding the impact of both multilateral and bilateral debt on private investment within the Nigerian context. Given the persistent need for financing to address budget deficits and the challenges faced by Nigerian private firms in a business environment perceived as unfriendly, there arises a critical question regarding the effectiveness of external debt in stimulating private sector investment. This study aims to address this gap by investigating whether and how external debt, both multilateral and bilateral, influences private investment in Nigeria. By delving into this research problem, the study seeks to provide valuable insights that can inform policy interventions aimed at fostering private sector development and promoting sustainable economic growth in Nigeria

Therefore, to examine the impact of external debt on private investment in Nigeria, the study seeks to answer the following research questions: What is the impact of multilateral debt on private investment in Nigeria? How does bilateral debt affect private investment in Nigeria? By answering these questions, the study will provide insights into the relationship between external debt and private investment in Nigeria and inform policy interventions aimed at promoting private sector development and economic growth.

However the main objective of the study is examine the impact of external debt on private investment in Nigeria, specifically, the study intend to: Investigate the impact of multilateral debt on private investment in Nigeria; and to examine the impact of bilateral debt on private investment in Nigeria.

2. LITERATURE REVIEW

Debt in general and external debt in particular is a necessary evil that all economies survive with (Abdullahi, Bakar & Hassan, 2016). So far, Public debt has no specifically fixed definition and is regarded mainly as that which an entity legally owes to another and agreed to be repaid in the future. It can also be seen as an obligation that is enforceable by legal action to make payment of money (Adofu & Abula, 2017). In the literature, authors like Arema (2013) explain total debt as debt owed by a government to people and institutions within the country (i.e. internal debt) and to foreign creditors (i.e. external debt) e.g. international monetary fund (IMF), Paris club, World Bank e.t.c. External debt can be define as the portion of a country's debt borrowed from outlandish lenders, such as commercial banks, governments or international financial institutions. (Arnone, Bandiera & Presbitero, 2015).

2.1 Theoretical Literature

Theoretically, simple acceleration theory of investment as conceived by Carver (1903) among others, before Keynesian economics, but it came into public knowledge as the Keynesian theory began to dominate the field of economics in the 20th century. Oftentimes, people confuse multiplier of Keynesian theory of investment with accelerator, both economic concepts differ. Multiplier reflects how a change in investment affect income and employment while accelerator reflects how a change in production and consumption affect investment. the theory argued in favor of private investment as it asserts an enhancing impact of debt on economic growth and investment zeal's from private investors, contrarily theories like Barro-Ricardo

equivalence theory is of the believe that any loan taken by the present government will shrink further investment because the citizens will repay the debt with their future tax (Barro, 1974).

2.2 Empirical Literature

Examining existing studies on the relationship between external debt and private investment in Nigeria reveals a mix of responses, often contradictory. For instance, Apere (2014) utilized regression analysis, instrumental variable technique, and bootstrapping to analyze public debt's impact on private investment in Nigeria from 1981 to 2012. The findings suggested a U-shaped impact of external debt on private investment, implying that funds should be sufficiently large relative to GDP and invested in productive ventures for Nigeria to benefit from government external borrowings. However, the study's findings lack specificity regarding which portion of external debt is nonlinearly and positively related to private investment.

Similarly, Akomolafe et al. (2015) investigated the effect of public borrowing on private investment in Nigeria from 1980 to 2010. Disaggregating public debt into domestic and external components, the study found that domestic debt crowds out domestic investment in both the short and long run, while external debt crowds in domestic investment in the long run. However, the relationship between external debt and private investment in the short run was not addressed. Contrarily, Ogunjimi (2019) employed an Autoregressive Distributed Lag (ARDL) study from 1981 to 2016 to examine public debt's impact on investment in Nigeria. The results indicated that external debt crowds in private investment both in the short and long run. The study recommended encouraging more external debt and implementing policies to ensure optimal utilization of public debts. However, it did not specify which portion of external debt crowds in private investment, and its recommendation on external debt may exacerbate the country's situation. Furthermore, Abubakar and Mamman (2021) utilized linear and nonlinear ARDL models to examine public debt's effect on private investment in Nigeria from 1981 to 2018. The findings indicated that increases in total debt, external debt, and debt service payment adversely affect private investment symmetrically. The study recommended curtailing excessive public borrowing and reducing the stock of public debt to enhance private investment in Nigeria.

Similarly, Mugumisi (2021) investigated the impact of public external debt on private investment in Zimbabwe between 2009 and 2017. Using Vector Error Correction Mechanism, the study found a negative relationship between Zimbabwe's external debt and private investment. The study recommended debt rescheduling to avoid penalties contributing to Zimbabwe's ballooning external debt obligations.

In a related study, Oke and Sulaiman (2012) employed Johansen co-integration and Vector Error Correction Model to examine the impact of external debt on economic growth and investment in Nigeria from 1980 to 2008. The findings suggested a positive relationship between external debt, investment, and economic growth. However, the long-run behavior of private investment towards external debt was not explored. Overall, Nigeria's external indebtedness has become unsustainable, crowding out private investment, discouraging output growth, and negatively impacting social and economic infrastructure, exacerbating poverty and inequality (Adegbite, Ayadi, and Ayadi, 2008).

Echoing a similar sentiment, Iyoha (1999) discovered that escalating external debt hampers investment through both a "disincentive" effect and a "crowding out" effect. Likewise, Madni

(2014) employed the Augmented Dickey-Fuller (ADF) and Error Correction Model (ECM) to examine the short-run dynamics of fiscal policy's impact on private investment in Pakistan from 1979 to 2012. The findings indicated that fiscal deficit, interest rates, inflation, and external debt exhibit negative associations with private investment, whereas exchange rates and exports positively influence investment. However, the study did not elaborate on how the fiscal deficit is financed. In a similar vein, Sen and Kaya (2013) investigated the impact of government spending components on private investment in Turkey. They revealed that government current transfer spending, government current spending, and government interest spending crowd out private investment, whereas government capital spending crowds in private investment. Furthermore, Mutunga (2020) utilized an Autoregressive Distributed Lag (ARDL) model to explore the relationship between Kenya's public debt and private investment from 1980 to 2019. The findings suggested that external debt crowds out private investment in the long run. The study recommended improved debt management practices as a solution to mitigate these negative effects, although specific recommendations on how to achieve this were not provided.

2.3 Literature Gap and Value Addition

Drawing from the existing literature, previous studies have often neglected to disaggregate external debt to understand the distinct contributions of its components toward either competing with or complementing private investment. Identifying this gap, the present study endeavors to fill it by investigating both the influence and the directional causality between multilateral debt, bilateral debt, and private investment in Nigeria.

3.0 Methodology

The research obtained yearly time series data spanning 16 years (equivalent to 64 quarters), ranging from the first quarter of 2006 to the fourth quarter of 2021. This data was sourced from various reputable sources including the Central Bank of Nigeria Statistical Bulletin, the debt management office, and the World Bank Development Indicators. The chosen timeframe is significant due to the post-Paris Club relief era and the increased focus of the Nigerian federal government on fostering private investment within the country.

The paper utilized the basic accelerator model to examine the correlation between external debt and private investment in Nigeria. According to the accelerator principle, an escalation in a firm's output rate necessitates a proportional augmentation in its capital stock. The simple accelerator model posits that capital investment is contingent upon output. This research builds upon the findings of Mutunga (2020), who explored the impact of public debt on private investment in Kenya. Mutunga's study scrutinized the influence of domestic debt (Dd_t), external debt (Ed_t), debt servicing (DS), and a dummy variable (DU) on private investment (PI_t) as a basis for this investigation

$$PIt = F(DDt, EDt, DSt, Dummy) \dots\dots\dots\

The enhanced rendition of Mutunga's (2020) model, as presented in Equation 3.1, is expressed in the following equation: 3.2:

$$PIt = F(Mdt, Bdt, Yt, t, Exht,) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.2$$

By taking the natural logarithms of the variables, Equation 3.2 is formulated in stochastic form as follows:

$$In\ PIt = \alpha 0 + \alpha 1 nMdt + \alpha 2\ InBdt, + \alpha 3\ InYt, , + \alpha 4\ Exht, + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.3$$

Where PI represents private investment (the dependent variable), measured as the disparity between gross fixed capital formation and total government capital expenditure. Md denotes multilateral debt, Bd denotes bilateral debt, Y_t signifies national output (inherited from the theoretical framework), and Exh represents the exchange rate (a control variable). The natural logarithms are denoted by ln, while t denotes the time series. α_0 represents the intercept, $\alpha 1$ to $\alpha 4$ denote the slopes of the coefficients of independent variables, and ε represents the error term. The a priori expectations are geometrically expressed as $\alpha_1, \alpha_2, \alpha_3 > 0$ and $\alpha_4 < 0$.

3.1 Estimation Techniques

The paper utilized both descriptive and econometric analyses, employing the Eviews 10.0 econometric package, to investigate the characteristics and dynamic relationship between external debt and private investment in Nigeria. The econometric analysis commenced with ascertaining the stationarity properties of the variables through the Augmented Dickey Fuller (ADF) test. This step was essential to prevent spurious estimates and causality results The basic test

$\Delta Y = \Gamma + \pi Y_{t-1} +$

$$\Delta Y = \Gamma + \pi Yt - 1 + \sum_{i=1}^{k} \pi \Delta Y t - 1 + \varepsilon t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.4$$

$$\Delta Yt = \Gamma + \psi t + \pi Yt - 1 + \sum_{i=1}^{k} \pi \Delta Y t - 1 + \varepsilon t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.5$$

Equations 3.4 and 3.5 represent the untrended and trended Augmented Dickey Fuller (ADF) test statistics, respectively. These equations were utilized to ascertain the order of integration of the variables. A variable is considered integrated at level or I(0) if the ADF test statistic surpasses the critical value at 5 percent; otherwise, the variable is deemed I(d), where d represents the number of times the variable is differenced until it achieves stationarity.

After establishing that all variables were integrated of order one, I(1), the paper proceeded to determine the optimal lag. Furthermore, VAR Residual Serial Correlation LM test and Inverse Roots of AR Characteristic Polynomial were employed to examine the residuals for serial correlation and dynamic stability, respectively. Additionally, the Johansen co-integration method was employed to explore the long-run relationship between external debt and private investment. The fundamental equation for the Johansen co-integration test is provided below:

$$Z_t = \sum_{i=1}^{m} At\ \ Zt - 1 + Et \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.6$$

And can be re-written as

$$\Delta Z_t = \sum_{i=1}^{m-1} \Gamma Zt - 1 + \Pi Zt - 1 + Et \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.7$$

Where Z_t comprises the n variables of the model and E_t is a vector of random errors. Γ_i and Π are expressed as-I + A1 + ...+Ai and –(I-At - …. – Am) = αβ respectively. I is a unit matrix , α and β are n X r matrix where α and β denotes adjustment matrix(also known as feedback matrix) and co-integrating matrix respectively.

The study hire the service of T-Y approach of granger causality/ block erogeneity test to determine the direction of causality between the component of external debt and private investment in Nigeria. The augmented Vector Autoregresssive Model-VAR (m+ dmax) for testing causality based on Toda-Yamamoto approach is as follows

$$Yt = \varphi o \sum_{t-1}^{m} \varphi iYt-1 + \sum_{t=m+1}^{m+dmax} \varphi 21Yt-1 + \sum_{t-1}^{m} \varphi 1iXt-1 + \sum_{i=m+1}^{m+dmax} \varphi 21Xt-1 + \varepsilon 1t \dots\dots\dots\dots\dots\dots 3.8$$

$$Xt = \psi o \sum_{t-1}^{m} \psi iXt-1 + \sum_{t=m+1}^{m+dmax} \psi 21Xt-1 + \sum_{t-1}^{m} \psi 1iYt-1 + \sum_{i=m+1}^{m+dmax} \psi 21Yt-1 + \varepsilon 2t \dots\dots\dots\dots\dots\dots 3.9$$

Moreover, the paper employed a non-stationary technique, commonly referred to as co-integration regression, to examine the association between external debt and private investment. This co-integration regression encompassed Fully Modified Ordinary Least Square (FMOLS) developed by Phillips and Hansen (1992), Canonical Co-integrating Regression (CCR) introduced by Park (1992), and Dynamic Ordinary Least Square (DOLS) proposed by Saikkonen (1992) and Stock and Watson (1993). These techniques were chosen to mitigate asymptotic bias and address issues related to endogeneity and serial correlation inherent in the Ordinary Least Square model.

4.0 RESULTS AND DISCUSSION OF FINDINGS

Table 2 Descriptive Statistics and Correlation Coefficients

(a) Descriptive Statistics					
Variable(s)	LPI	LY	LMD	LBIL	EXH
Mean	23.644	11.274	7.1299	5.1092	5.2665
Median	23.518	11.355	6.9080	5.0985	5.0866
Maximum	24.320	12.064	8.9136	7.5199	6.0210
Minimum	23.349	10.445	5.8439	2.9693	3.9022
Std. Dev.	0.2762	0.5226	0.9918	1.5711	0.4410
Skewness	1.1555	-0.2049	0.3304	0.0618	-0.0418
Kurtosis	3.2424	1.8043	1.7974	1.5236	2.8087
Jarque-Bera	14.398	4.2605	5.0209	5.8527	0.1162
Probability	0.0007	0.1188	0.0812	0.0535	0.9435
Sum	1513.2	721.56	456.31	326.98	337.05
Sum Sq. Dev.	4.8084	17.212	61.972	155.52	12.256
Observations	64	64	64	64	64
(b) Correlation Coefficients					
Variable(s)	LPI	LY	LMD	LBIL	EXH
LPI	1.0000				
LY	0.7216	1.0000			
LMD	0.7328	0.9686	1.0000		
LBIL	0.7014	0.9489	0.9672	1.0000	
EXH	0.7093	0.8879	0.9641	0.9211	1.0000

Source: Author's Computation using E-view 10

Table 2.1(a) presents the descriptive statistics, which encompass statistics describing the dependent variable, independent variables, and control variables utilized in this study. Descriptive statistics offer a summarized view of the data, including measures such as mean, median, maximum, minimum, standard deviation, skewness, and kurtosis. The Jarque-Bera statistics indicated that the natural logarithms of output (LY), Multilateral debt (LMD), Bilateral debt (LBIL), and exchange rate (EXH) exhibit normal distribution, as evidenced by probability values of 0.1188, 0.0812, 0.053, and 0.9435, respectively, thereby confirming the normality assumption.

However, Table 2.1(a) also revealed that the natural logarithm of private investment (LPI) does not follow a normal distribution, as indicated by a probability value of 0.0007 for the Jarque-Bera statistics. This suggests that while the independent variables (multilateral debt, bilateral debt, output, and exchange rate) are normally distributed and suitable for inclusion in any model, the dependent variable, private investment, deviates from normality. Hence, this necessitates further pre-estimations and diagnostic tests to ensure appropriate and optimal policy recommendations at the conclusion of the analysis.

Additionally, this paper presents the results of the correlation matrix between the dependent and independent variables. The correlation matrix offers insights into the strength, direction, and extent of the relationships between variables (Gujarati, 2004). The correlation coefficient ranges from -1 to 1, with the sign indicating the direction of the relationship (positive or negative) and the magnitude indicating the strength. Generally, the coefficient on the main diagonal is 1.000, signifying a perfect positive linear relationship with itself. The findings in Table 4.1(b) unveiled a positive and strong association between private investment (LPI) and output (LY), Multilateral debt (LMD), Bilateral debt (LBIL), and exchange rate (EXH), with correlation coefficients of 0.7216, 0.7328, 0.7014, and 0.7093, respectively. These values exceed the threshold suggested by Hair et al. (2014), indicating that correlation coefficients below 0.7 do not pose severe multicollinearity issues.

4.1 Pre-estimation Test

To examine the stationary of the all the variables, the study conducted Augmented Dickey Fuller (ADF) test, Phillip-Perron (PP) test and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root test, and the results were presented in table 4.2 below. In Table 3.2, the results of un-trended and trended ADF, PP as well as KPSS test revealed that all the variables are not stationary at level.

Table 3 Unit Root Test

	Phase I			Phase II			Phase III		
	ADF			PP			KPSS		
Variables	Level	1st diff	Order	Level	1st diff	Order	Level	1st dif	Order
InPI	0.5528	-8.0333*	I(1)	0.6611	-8.0367*	I(1)	0.6420	0.3870***	I(1)
InY	-1.6027	-0.4569***	I(1)	-0.42717	-12.3082	I(1)	1.0047	0.1287*	I(1)
InMd	1.3400	-4.4732*	I(1)	5.9730	-4.4587*	I(1)	1.0024	0.3744***	I(1)
InBil	2.5482	-6.2926*	I(1)	2.5482	-6.2877*	I(1)	0.9033	0.3580***	I(1)
Exh	0.2289	-8.6313*	I(1)	0.7519	-8.7919*	I(1)	0.9309	0.2774*	I(1)

Source: Authors Computation using E-view 10

Table 3 reveals that none of the variables were stationary at their levels initially, but they achieved stationarity after first differencing, indicating that all variables are of order one (i.e., I(1)). Therefore, the research concluded that all variables are integrated at order one. The ADF findings were corroborated by the PP test in phase II and further reaffirmed in phase III by the KPSS test.

The symbols *, **, and *** denote that the series is stationary at significance levels of 1%, 5%, and 10%, respectively. ADF, PP, and KPSS stand for Augmented Dickey Fuller, Phillips-Perron, and Kwiatkowski-Phillips-Schmidt-Shin unit root tests, respectively. The null hypothesis for ADF and PP tests is that an observable time series possesses a unit root (i.e., is not stationary), while the null hypothesis for the KPSS test is that the series is stationary.

4.2.1 Lag Selection Criterion

Prior to estimating the long-run model, the study conducted a VAR lag order selection criteria test to determine the optimal lag for the analysis. The results of the lag length selection criterion, as presented in Table 4, indicated conflicting recommendations: SC and HQ suggested 1 as the optimal lag, while LR, FPE, and AIC suggested 5. To pinpoint the most appropriate lag length, further testing was warranted to ascertain the exact optimal lag for the variables in Model One.
Subsequently, the study conducted a residual-based autocorrelation LM test to determine the true optimal lag. The results of the VAR autocorrelation LM test, shown in Table 5, revealed that a lag order of 3 strongly indicated that we cannot reject the null hypothesis of no serial correlation. Consequently, the study concluded that lag 3 is the optimal lag for this analysis

Table 4 Optimal lag selection Criteria

VAR Lag Order Selection Criteria						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-289.826	NA	0.015067	9.994098	10.17016	10.06283
1	30.07810	574.7428	6.89e-07	-0.00265	1.053728*	0.409719*
2	41.17313	18.05293	1.12e-06	0.468707	2.405395	1.224712
3	79.16586	55.37923	7.59e-07	0.028276	2.845276	1.127919
4	120.9975	53.88478	4.71e-07	-0.54229	3.155025	0.900994
5	168.4381	53.06916*	2.58e-07*	-1.302986*	3.274639	0.483934
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level), HQ: Hannan-Quinn information criterion						
FPE: Final prediction error SC: Schwarz information criterion AIC: Akaike information criterion						

Source: Authors Computation using E-view 10

Table 5 ***VAR Residual Serial Correlation LM Tests***

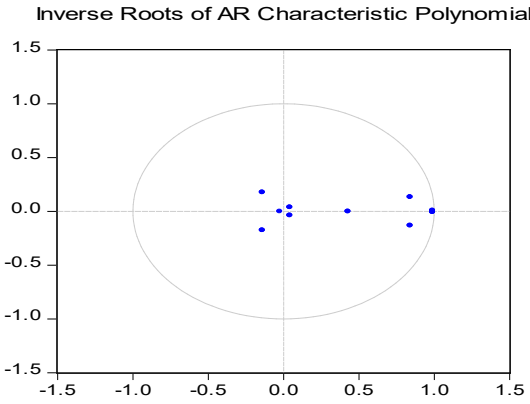
Null hypothesis: No serial correlation at lag h						
Sample: 2006Q1 2021Q4						
Included observations: 62						
Lag	LRE* stat	Df	Prob.	Rao F-stat	Df	Prob.
1	35.21687	25	0.0844	1.459613	(25, 157.5)	0.0856
2	49.36975	25	0.0025	2.137410	(25, 157.5)	0.0026
3	19.12932	25	0.7909	0.755032	(25, 157.5)	0.7923

Source: Authors Computation using E-view 10

Figure 1 Inverse Roots of AR Characteristic Polynomial

Null hypothesis: No serial correlation at lag h						
Sample: 2006Q1 2021Q4						
Included observations: 62						
Lag	LRE* stat	Df	Prob.	Rao F-stat	Df	Prob.
1	35.21687	25	0.0844	1.459613	(25, 157.5)	0.0856
2	49.36975	25	0.0025	2.137410	(25, 157.5)	0.0026
3	19.12932	25	0.7909	0.755032	(25, 157.5)	0.7923

Source: Authors Computation using E-view 10



Nevertheless, the study examined the stability of the variables in Model One by plotting the inverse root of the AR characteristic polynomial. Figure 1 illustrates that the model is dynamically stable, as all the roots fall within the unit circle. This indicates that there are no outliers present in the variables under study.

4.2.2 Co-integration Results

Based on the results of the stability test of the AR characteristic polynomial plot and the VAR residual serial correlation LM tests, which aimed to pinpoint the optimal lag length amidst concerns raised by lag length criteria, strong correlations identified in the correlation analysis among the variables in Model One, and unit root tests revealing that all variables are long-run variables, the study proceeded to estimate the Johansen co-integration test. This test is known for providing superior long-run coefficient estimates compared to Engle-Granger-based co-integration tests.

The results of the Johansen co-integration test, presented in Table 4.5, reject the null hypothesis of no co-integration, up to certain levels ($r = 0$, $r \leq 1$, $r \leq 2$, $r \leq 3$, and $r \leq 4$), based on both the trace and maximum eigenvalue statistics. Specifically, the values of the trace statistics exceed their critical values at $r = 0$, $r \leq 1$, and $r \leq 2$. However, for $r \leq 3$ and $r \leq 4$, the trace statistics fall below their critical values, with p-values greater than 5%. Consequently, the trace statistics conclude that there exist 3 co-integrating equations at a significance level of 5%.

Similarly, the values of the maximum eigenvalue statistics surpass their critical values at $r = 0$ and $r \leq 2$. However, for $r \leq 1$, $r \leq 3$, and $r \leq 4$, the maximum eigenvalue statistics are below their critical values, with p-values greater than 5%. Hence, the maximum eigenvalue statistics indicate that there exist 2 co-integrating equations at a significance level of 5%

Table 5 Johansen Co-integration

Sample (adjusted): 2007Q1 2021Q4 Included observations: 60 after adjustments								
Trend assumption: Linear deterministic trend; Series: LPI LY LMD LBIL EXH ; Lags interval (in first diff): 1 to 3								
	Unrestricted Co-integRank Test (Trace)				Unrestricted Co-int Rank Test (Max Eigenvalue)			
Hypothesized	Trace	0.05		Remarks	Max-Eigen	0.05		Remarks
No. of	Statistic	Critical	Prob.**		Statistic	Critical	Prob.**	

CE(s)		Value				Value		
None *	128.67	69.818	0.0000	cointegrated	70.904	33.876	0.0000	cointegrated
At most 1 *	57.770	47.856	0.0045	cointegrated	26.387	27.584	0.0705	Not cointeg
At most 2 *	31.382	29.797	0.0326	cointegrated	22.037	21.131	0.0372	cointegrated
At most 3	9.3458	15.494	0.3344	Not cointegr	9.2780	14.264	0.2637	Not cointeg
At most 4	0.0677	3.8414	0.7947	Not cointeg	0.0677	3.8414	0.7947	Not cointeg
	Trace test indicates 3 cointegrating eqn(s) at the 0.05 level				Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level			

Source: Authors Computation using E-view 10

Note: optimal lag length was chosen based on Akaike Information Criterion (AIC), Schwarz Information Criterion (SC) and Hannan-Quinn Information Criterion (HQ). Trace and Maximum-Eigen value test indicate the presence of co-integrating equations at 5% level

4.2.2 Co-integration Regression Results

Having established the log-run association between the component of external debt (Multilateral debt and bilateral debt) and private investment, the study estimated the long-run impact of external debt on private investment in Nigeria.

Table 7 Co-integration Regression Results

Dependent Variable: LPI									
	DOLS			FMOLS			CCR		
Variable	Coeff.	t-Stat.	Prob.	Coeff.	t-Stat.	Prob.	Coeff.	t-Stat.	Prob.
LMD	0.7587	2.1422	0.0377	0.5281	2.0549	0.0444	0.579757	2.090455	0.041
LBIL	-0.069	-0.4877	0.6282	-0.0874	-0.8008	0.4265	-0.07252	-0.68519	0.496
LY	0.0392	0.0871	0.931	0.0414	0.1225	0.9029	-0.01443	-0.04244	0.966
EXH	-1.044	-2.0051	0.0511	-0.4535	-1.5695	0.122	-0.56172	-1.57856	0.119
C	23.774	5.5166	0.0000	22.241	7.3152	0.0000	22.99822	7.362441	0.0000
R-square	0.656			0.5326			0.5185		

Source: Authors Computation using E-view 10

The study employed Dynamic Ordinary Least Square (DOLS), Fully-Modified Ordinary Least Square (FMOLS), and Canonical Co-integrating Regression (CCR) to address research questions 1 and 2 simultaneously. Results presented in Table 7 indicate that the three techniques yielded very similar results for each variable, with slight differences observed in the estimates of DOLS.

In response to the first research question, the DOLS results suggest that multilateral debt has a significant positive effect on private investment in Nigeria. This implies that a one percent increase in multilateral debt promotes private investment by 0.75 percent, holding other variables constant. Therefore, multilateral debt significantly enhances private investment in Nigeria at a 5 percent significance level. This finding aligns with the a priori expectation and is supported by Apere (2014), Akomolafe et al. (2015), Ogunjimi (2019), and Mabula and Mutasa (2019), who argued that external debt stimulates private sector investment. This finding contrasts with Madni (2013), Mutunga (2020), Mugumisi (2021), and Abubakar and Mamman (2021), who suggested that external debt diminishes private investment. Similar results were obtained through FMOLS and CCR techniques.

Conversely, in response to the second research question, within the DOLS technique, bilateral debt exhibits a negative but insignificant relationship with private investment at a 5 percent level of significance. This implies that a 1 percent increase in bilateral debt reduces private investment

by 0.069 percent in Nigeria, holding other variables constant. This finding contradicts theoretical predictions and the findings of Apere (2014), Akomolafe et al. (2015), Ogunjimi (2019), and Mabula and Mutasa (2019), who reported a positive relationship between external debt and private investment. However, it confirms the arguments of Iyoha (1999), Oke and Sulaiman (2012), Madni (2013), Mutunga (2020), Mugumisi (2021), and Abubakar and Mamman (2021), who suggested that external debt discourages private sector investment in Nigeria. Consistent results were obtained through FMOLS and CCR techniques.

Furthermore, the DOLS results indicate that output positively affects private investment in Nigeria, although the impact is small and statistically insignificant at a 5 percent level. This finding aligns with theoretical predictions and is consistent with the outcomes of FMOLS techniques but contradicts the results of CCR techniques. In contrast, the DOLS results show a negative and statistically insignificant influence of the exchange rate on private investment in Nigeria at a 5 percent level. This finding is consistent with the outcomes of FMOLS and CCR.

The adjusted R-squared results for DOLS suggest that the covariates explain a significant portion of the variation in private investment in Nigeria. This indicates that the explanatory variables (multilateral debt, bilateral debt, output, and exchange rate) in the models explain approximately 65%, 53%, and 51% of the variation in private investment in the DOLS, FMOLS, and CCR techniques, respectively, while the remaining portion is attributed to stochastic factors.

4.2.3 Causality Results

Table 8 Toda-Yamamoto Causality Test

Null Hypothesis	X^2	Degree of freedom	Probability	Decision
Md Vs Pi	9.4434	2	0.0089*	Unidirectional Causaity
Pi Vs Md	2.4158	2	0.2988	
Bil Vs Pi	5.3501	2	0.0689***	Unidirectional Causality
Pi Vs Bil	1.7876	2	0.4091	
Y Vs Pi	0.01809	2	0.991	No Causality
Pi Vs Y	0.7156	2	0.6992	
Exh Vs Pi	12.304	2	0.0021**	Unidirectional Causality
Pi Vs Exh	1.5395	2	0.4631	

Source: Author's Computation using E-view 10

To ascertain the direction of causality between private investment and multilateral debt, bilateral debt, output, and exchange rate, the study employed the Toda-Yamamoto VAR Granger causality/Block Exogeneity Wald test, which follows an asymptotic chi-square distribution. The empirical results of the Toda-Yamamoto Causality test in Table 8 indicate a unidirectional causality between multilateral debt and private investment in Nigeria. Specifically, the results show that multilateral debt Granger causes private investment in Nigeria at a 1 percent significance level, while private investment does not Granger cause multilateral debt at a 5 percent significance level. Similarly, the outcome of the causality test reveals a direction of causality from bilateral debt to private investment in Nigeria at a 10 percent significance level. This suggests a unidirectional causality, as private investment does not Granger cause bilateral debt.

Furthermore, Table 8 demonstrates no evidence of causality between output and private investment in Nigeria. In conclusion, the test indicates a unidirectional causality from exchange rate to private investment in Nigeria. Exchange rate Granger causes private investment at a 5 percent significance level, while private investment does not Granger cause the exchange rate

5. Conclusion

Based on the outcomes of the Dynamic Ordinary Least Square (DOLS), Fully Modified Ordinary Least Square (FMOLS), and Canonical Co-integrating Equation (CCR) models regarding the relationship between external debt and private investment in Nigeria from 2006Q1 to 2021Q4, the study concludes the following: Multilateral debt has a significant positive effect on private investment in Nigeria. Bilateral debt has a negative and statistically insignificant impact on private investment in Nigeria. Given these key findings, the study recommends that Nigeria should allocate both multilateral and bilateral loans towards the following areas to enhance private investment: Infrastructure development, Social sector projects, Environmental protection projects, Agricultural and rural development projects, Economic reform programs, Disaster relief and reconstruction, Health and nutrition programs, Poverty reduction programs By directing loans towards these sectors, Nigeria can stimulate private investment and foster sustainable economic growth and development.

References

Abubakar, A. B., & Mamman, S. O. (2021). Effect of Public Debt on Private Investment in Nigeria: Evidence from an Asymmetric Dynamic Model. Central Bank of Nigeria Economic and Financial Review, 59(3), September 2021.

Abdullahi M.M , Bakar N.B & Hassan B.S (2016) Debt overhang versus crowding out effects: Understanding the impact of external debts on capital formation in theory *International Journal of Economics and Financial Issues Vol 6 • Issue 1 • 2016 271*

Adegbite, E. O., Ayadi, F. S., & Ayadi, F. O. (2008). The Impact of Nigeria's External Debt on Economic Development. International Journal of Emerging Markets, 3(3), 285-301. DOI: 10.1108/17468800810883693.

Adofu, I. & Abula, M. (2017). Domestic Debt and the Nigerian Economy. *Current Research Journal of Economic Theory, 2(1): 22-26.*

Akomolafe, K. J., Bosede, O., Emmanuel, O., & Mark, A. (2015). Public Debt and Private Investment in Nigeria. American Journal of Economics, 5(5), 501-507.

Alfred, M. I. (1914). The Credit Theory of Money. The Banking Law Journal, 31.

Apere, T. O. (2014). The Impact of Public Debt On Private Investment In Nigeria: Evidence From A Nonlinear Model. International Journal of Research In Social Sciences, 4(2).

Arnone, M, Bandiera, L. & Presbiteno, A. (2005). External Debt Sustainability: Theory and Empirical Evidence, *Retrieved from http://www.unicatt.it/dipartimenti/DISES /allegati/arnoneBandierapresbite ro.pdf*

Arema B.I (2013). Concise Economics. Kaduna*: Iskovic Human Resource Enterprise*

Barro, R. J. (1974). Are Government Bonds Net Wealth? Journal of Political Economy, 82(6), 1095-1117.

Carver, T. N. (1903). A Suggestion for a theory of industrial depression. The Quarterly Journal of Economics, May 1903, p.497.

Damian, K. U., & Chukwunonso, S. E. (2014). Domestic Debt and Private Investment in Nigeria. International Journal of Scientific Research and Education, 2(8), 1533-1540.

Emad, M. A., & Abdullatif, B. (2006). Crowding-Out and Crowding-in Effects of Government Bonds Market on Private Sector Investment in Japanese. (Discussion Paper in Institution of Developing Economic No.74.2006.10). Retrieved from http:/hdl.handle.net/2344/314.

Fredrick, O. A., & Okeke, I. C. (2013). The Crowding Out Effect of Budget Deficit on Private Investment in Nigeria. European Journal of Business Management, 20(14), 161-165.

Iyoha, M. A. (1999). External Debt and Economic Growth in Sub-Saharan African Countries: An Econometrics Study. AERC Research Paper, Nairobi.

Mabula, S., & Mutasa, F. (2019). The Effect of Public Debt on Private Investment in Tanzania. African Journal of Economic Review, Volume VII (I), 109-135.

Madni, G. R. (2014). Role of fiscal policy for private investment in Pakistan. International Journal of Business and Economic Sciences Applied Research (IJBESAR), 7(2), 139 152.

Mugumisi, N. (2021). The impact of public external debt on private investment: Evidence from Zimbabwe under the multi-currency system 2009-2017. Journal of Economic Info, 8(1).

Mutunga, P. M. (2020). Does public debt affect private investment in Kenya? ARDL Approach. International Journal of Research and Innovation in Social Science (IJRISS), IV(VII).

National Bureau of Statistics. (2023). Retrieved on 22/01/2024 from https://nigerianstat. gov.ng/elibrary/read/1241479.

Ogunjimi, J. A. (2019). The Impact of Public Debt on Investment: Evidence from Nigeria. Development Bank of Nigeria (DBN) Journal of Economics and Sustainable Growth.

Oke, M., & Sulaiman, L. A. (2012). External Debt, Economic Growth and Investment in Nigeria. European Journal of Business and Management, 4(11), 67-75.

Park, J. Y. (1992). Canonical Co-integrating Regressions. Econometrica, 60, 119-143.

Paiko, I. I. (2012). Deficit financing and its implication on private sector investment: the Nigerian experience. Arabian Journal of Business and Management Review (OMAN Chapter), 1(10), May 2012.

Phillips, P. C. B., & Hansen, B. E. (1990). Statistical Inference in Instrumental Variables Regression with I(1) Processes. Review of Economics Studies, 57, 99-125.

Saikkonen, P. (1992). Estimation and Testing of Cointegrated Systems by an Autoregressive Approximation. Econometric Theory, 8, 1-27.

Stock, J. H., & Watson, M. (1993)

. A Simple Estimator of Cointegrating Vectors In Higher Order Integrated Systems. Econometrica, 61, 783-820.