



AEFUNAI JOURNAL OF ECONOMICS,
FINANCE AND DEVELOPMENT STUDIES

AEFUNAIJEFDS

Department of Economics and Development Studies
Alex Ekwueme Federal University, Ndufu-Alike Ikwo, Ebonyi State, Nigeria.

Website: <https://www.ecofunai.ng>

ISSN (Print): 2536-6793 | ISSN (Electronic): 2536-6742

Volume 3 (1) May, 2026 (pp 656 - 678)

Submitted February 2026; Published May 2026.

EFFECTIVENESS OF BOND INSTRUMENTS IN DRIVING INFRASTRUCTURE FINANCING IN NIGERIA

Orji Joseph Ogbonna* & Ojide Makuachukwu G.

Department of Economics and Development Studies,
Alex Ekwueme Federal University, Ndufu Alike Ikwo, Ebonyi State. Nigeria

Email: ogbonnaorjijoseph@gmail.com

ABSTRACT

This study investigated the effectiveness of bond instruments in driving infrastructure financing in Nigeria, specifically, the study evaluated the impact of Federal Government of Nigeria (FGN) Bonds, Sovereign Sukuk Bonds, FGN Savings Bonds, and Sovereign Green Bonds in addressing the nation's persistent infrastructure deficit. The research utilized a quantitative research design with secondary data spanning from 2017 to 2024. The Autoregressive Distributed Lag (ARDL) method was employed to analyze the relationships between the various bond instruments and infrastructure financing, supported by rigorous diagnostic tests including Breusch-Godfrey for serial correlation, Breusch-Pagan-Godfrey for heteroskedasticity, and the Ramsey RESET test for model specification. The findings revealed that Sovereign Bonds, Sukuk Bonds, and Savings Bonds exert a significant positive impact on infrastructure financing in Nigeria. The success of Sukuk Bonds reinforces empirical evidence regarding the effectiveness of project-tied Islamic finance in road rehabilitation. Conversely, Sovereign Green Bonds were found to have no significant impact, likely due to nascent market development and a lack of transparent post-issuance reporting. The study concludes that while bond instruments are potent tools for capital mobilization, their effectiveness is contingent upon institutional quality and fiscal discipline. It recommends that the government should maintain the issuance of project-linked bonds like Sukuk while enhancing the transparency and regulatory framework for Green Bonds to attract climate-focused investment.

Keyword: *Infrastructure Financing, Bond Instruments, Sovereign Sukuk, Green Bonds, ARDL Model, Fiscal Discipline.*

Citation: Orji J. O., & Ojide, M. G. (2026). Effectiveness of bond instruments in driving infrastructure financing in Nigeria. *Journal of Economics, Finance and Development Studies*, 3(1), 656 - 678

1. Introduction

Infrastructure is a fundamental pillar of economic development, driving productivity, employment, and living standards. Nigeria, however, faces a significant infrastructure deficit across key sectors such as transportation, energy, and housing. The traditional method of financing infrastructure through direct budgetary allocations has proven inadequate due to fiscal constraints, volatile oil prices, and competing expenditure demands (World Bank, 2019). This has prompted the Nigerian government to seek alternative, sustainable funding mechanisms, with a growing focus on the capital market. Bond instruments, which are debt securities, have emerged as a prominent tool for long-term financing. They are essentially a promise from the issuer (the government in this case) to pay the bondholder a specific interest rate over a period and repay the principal at maturity. Bonds are critical for infrastructure financing because they provide a stable, long-term source of capital that is well-suited for the long gestation periods and high capital requirements of infrastructure projects, unlike short-term bank loans (IMF, 2013). This helps to diversify the government's funding sources and reduces its reliance on volatile revenue streams like oil.

Recognizing this, the Nigerian government, through the Debt Management Office (DMO), has actively worked to deepen the bond market and enhance its role in infrastructure financing. Key efforts include the re-introduction of Federal Government of Nigeria (FGN) Bonds in 2003, which have since become the benchmark for the domestic debt market, the issuance of specialized instruments like the Sovereign Green Bond in 2017 to fund climate-friendly projects, making Nigeria the first African nation to do so, the launch of the Sovereign Sukuk Bond in 2017 to tap into Islamic finance and exclusively fund road infrastructure (DMO, 2024), and the introduction of FGN Savings Bonds in 2017 to encourage retail investor participation and mobilize domestic savings for national development (DMO, 2024). From a statistical standpoint, the issuance of these bonds has seen a significant trajectory over the past decade. For instance, the DMO's reports show a consistent rise in the volume of FGN Bonds issued. The Sukuk bonds, starting with an initial issuance of ₦100 billion, have grown substantially, with each tranche fully subscribed and dedicated to specific road projects across the six geopolitical zones. Similarly, Green Bonds, with their post-issuance impact reports, demonstrate the government's effort to link borrowed funds directly to tangible projects.

Despite the Nigerian government's proactive efforts to leverage the bond market for infrastructure financing, a significant gap between funding raised and tangible infrastructure development persists. While the issuance of various bond instruments (FGN, Green, Sukuk, and Savings Bonds) has seen a consistent upward trajectory, there are crucial issues that question their overall effectiveness in bridging the nation's immense infrastructure deficit. This problem is not merely a matter of insufficient funds but rather one of inefficient utilization, lack of accountability, and a complex interplay of market and governance challenges.

The effectiveness of FGN Bonds is hindered by a lack of transparency and a clear, publicly accessible link between the funds raised and their allocation to specific infrastructure projects. While they are a key source of government revenue, their generic nature makes it difficult to track their impact on capital projects, leading to public skepticism about how the funds are truly spent (World Bank, 2019). This contrasts with the intended purpose of these long-term instruments as a stable source of project finance.

Similarly, while Green Bonds have a defined use of proceeds for eco-friendly projects, challenges with transparency and governance persist. Questions remain about the post-issuance reporting and the monitoring of the environmental, social, and economic impacts of the funded projects (DMO, 2024). Without a robust framework for accountability, there is a risk of "green-washing," where funds are misapplied or their impact is exaggerated, undermining investor confidence and the credibility of this innovative financing tool. The Sukuk Bond, despite its success in funding specific road projects, faces challenges related to its legal and regulatory framework. The complexities of Islamic finance principles can create a barrier for potential investors and issuers who may be unfamiliar with the requirements. Furthermore, while the funds are dedicated to specific projects, the high cost of issuance and potential for project delays can limit their overall effectiveness (Idoko, 2024). The FGN Savings Bonds, designed to mobilize retail savings, face a significant challenge due to a lack of public awareness and a relatively small subscription base compared to the scale of the infrastructure deficit. While a positive step toward financial inclusion, their current volume is insufficient to make a substantial impact on large-scale infrastructure financing needs (DMO, 2024).

While each of these bond instruments represents a viable alternative to traditional budgetary financing, their individual and collective effectiveness is undermined by systemic issues. The absence of a comprehensive, data-driven analysis that integrates all these instruments and evaluates their specific impact on infrastructure financing is a critical gap that motivated this study. While existing studies have examined the relationship between specific types of debt and infrastructure financing in Nigeria, there is a significant lack of a comprehensive, integrated analysis of all four major bond instruments (FGN Bonds, Green Bonds, Sukuk Bonds, and Savings Bonds) within a single model. Many studies focus on a single type of debt, like Idoko (2024) on FGN Bonds or Waziri and Doma (2022) on Sukuk Bonds. This one-way approach fails to capture the collective and individual effectiveness of the diversified bond portfolio and how these instruments might complement or compete with each other in the context of infrastructure financing. This study aims to fill this gap by providing a holistic empirical analysis. Most of the relevant studies either adopt a broad, qualitative approach or a quantitative approach that focuses on a limited timeframe or specific debt types. For example, while studies by the Heinrich Böll Stiftung (2022) and Oyekolade et al. (2024) provide valuable example, they are primarily qualitative and descriptive, which limits their ability to establish a statistically significant causal relationship. On the other hand, quantitative studies like Ebele and Uche

(2024) and Ajayi (2024) used annual data, which may not capture the short-term fluctuations and trends in the bond market. This study will address this gap by employing a robust quantitative model with quarterly data, providing a more specific and statistically sound analysis.

The majority of studies on infrastructure financing in Nigeria use a broad population that includes all types of debt, both domestic and external (for instance, Awele, 2024; Okoli and Ocheje, 2024). This makes it difficult to isolate the specific impact of the various bond instruments. The current study narrows the population to focus exclusively on the four specific types of FGN bond instruments. While some studies, like Babatunde and Perera (2025), use a wider African context, they are often too general to provide specific policy recommendations for Nigeria. By focusing on Nigeria's federal government bonds from 2017 to 2024, this research provides a precise and relevant analysis. A significant evidence gap exists regarding the direct link between bond issuance and verifiable infrastructure outcomes. While studies like Adepoju and Adewale (2023) and Stiftung (2022) raise concerns about inefficient fund management and lack of transparency, they do not provide a systematic, empirical analysis to quantify this problem. There is a lack of evidence that specifically links the volume of each bond type to the successful completion and operational status of a range of infrastructure projects. This study will generate new evidence by using an econometric model to evaluate the responsiveness of infrastructure financing to changes in the volume of each specific bond instrument. This will provide a data-driven understanding of the effectiveness of each bond type.

Thus, the broad objective of this study was to evaluate the effectiveness of bond instruments in driving infrastructure financing in Nigeria. The specific objectives are:

- a) To determine the impact of federal government sovereign bond government of Nigeria bond on infrastructure financing in Nigeria.
- b) To evaluate the impact of the federal government's green bond on infrastructure financing in Nigeria.
- c) To investigate the impact of the federal government's sukuk bond on infrastructure financing in Nigeria.
- d) To determine the impact of the federal government savings bond on infrastructure financing in Nigeria

2.0 Literature

2.1 Conceptual Literature

Bond Instruments

These are debt securities issued by a government or corporation to raise capital. In a bond, the issuer promises to pay the bondholder a specified interest (coupon) and repay the principal at a future date (maturity). The Debt Management Office (DMO) of Nigeria (2025) defines bonds as debt securities of the Federal Government of Nigeria issued to finance fiscal deficits and support government projects. Bond instruments are crucial to financing because they provide a stable, long-term source of capital that is well-suited for the long gestation periods and high capital requirements of infrastructure projects, unlike short-term loans. By issuing bonds, governments can diversify their funding sources, manage debt more effectively, and raise large sums from both domestic and international investors to fund major capital projects.

Federal Government of Nigeria (FGN) Bonds

These are long-term debt securities issued by the DMO on behalf of the Nigerian government. They are considered risk-free as they are backed by the full faith and credit of the government. FGN Bonds are long-term debt securities issued by the Nigerian government. The Debt Management Office (DMO, 2024) defines FGN Bonds as sovereign debt instruments issued on behalf of the Federal Government of Nigeria to finance fiscal deficits and major capital projects. According to the Central Bank of Nigeria (CBN), FGN Bonds are government-backed, interest-paying securities that serve as a crucial tool for implementing monetary policy and developing the domestic financial market. By issuing them, the government raises money from investors, promising to pay them back with interest at a future date. They are considered risk-free because they are backed by the full faith and credit of the government.

Green Bonds

This is a type of bond where the proceeds are used exclusively to finance or refinance projects with environmental or climate-related benefits, such as renewable energy or sustainable water management. Green bonds are a type of debt security specifically for funding projects with environmental benefits. The Climate Bonds Initiative (CBI) defines green bonds as any type of bond instrument where the proceeds will be exclusively applied to finance or refinance, in part or in full, new and/or existing eligible green projects

(CBI, 2024). The World Bank describes green bonds as fixed-income instruments that raise capital for climate and environmental projects, with the same financial risk and return characteristics as standard bonds but with the added feature of "green" labeling (World Bank, 2024).

Sukuk Bonds

Sukuk is a financial certificate that represents an undivided ownership interest in an underlying asset. The Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) defines Sukuk bonds as certificates of equal value representing undivided shares in the ownership of tangible assets, usufructs, and services or in the ownership of the assets of particular projects or special investment activity (AAOIFI, 2015). The Central Bank of Nigeria (CBN) defines Sukuk as non-interest bonds structured in accordance with Islamic commercial jurisprudence (Sharia) to raise funds for infrastructure projects without involving a conventional interest-based loan (CBN, 2024).

Savings Bonds

Savings bonds are debt instruments designed to encourage small investors to participate in the bond market. The U.S. Treasury (2024) defines savings bonds as a low-risk debt security issued by the government to help individuals save money and earn a modest return on their investment. In Nigeria, the Debt Management Office (DMO) (2024) defines the FGN Savings Bond as a safe, risk-free savings product for retail investors, issued monthly to promote a savings culture and mobilize domestic capital for development. These are retail-oriented bonds issued by the government to encourage small investors to participate in the bond market. They typically have a lower entry point than other types of bonds.

2.2 Theoretical Review

In the theoretical review, we synthesized four core frameworks to evaluate the effectiveness of bond instruments in Nigeria's infrastructural development. The Debt-Based Financing Theory (Modigliani & Miller, 1958) serves as the foundational logic, suggesting that "front-loading" infrastructure through debt is sustainable if economic growth outpaces interest rates and funds are strictly channeled into capital assets (Onyekachi-Onyele et al, 2024). This is complemented by Capital Market Development Theory (King & Levine, 1993), which emphasizes that a deep, liquid market is essential for mobilizing the long-term domestic capital required to bridge the nation's infrastructure gap.

Furthermore, Public-Private Partnership (PPP) Theory ((Farquharson, *et al.*, 2021; IMF, 2021) offers a comparative view, positioning bonds as either a primary funding tool or a complementary mechanism to support joint public-private ventures. Finally, Signaling Theory explains the strategic role of specialized

instruments like Sukuk and Green Bonds; by issuing these, the government signals fiscal commitment to transparency and sustainable development, thereby attracting diverse, niche investor pools. Collectively, these theories suggest that while bonds are potent catalysts for physical development, their effectiveness is contingent upon institutional quality and the avoidance of debt overhang. These theories highlight a theoretical bridge where bond diversity directly impacts capital expenditure, provided that market signals remain credible and funds are protected from recurrent consumption.

2.3 Empirical Review

Babatunde and Perera (2025) examined Bond Market Development and Infrastructure Growth in Africa using the variables portfolio investment bonds, infrastructure growth, and Government effectiveness. The research method was the Generalized Method of Moments (GMM) model with data from 53 African countries from 2013 to 2022. The findings revealed a positive but statistically insignificant correlation between portfolio investment bonds and infrastructure development. However, the study found that when government effectiveness is considered, the relationship becomes more significant, suggesting that good governance is crucial for effective bond financing of infrastructure.

In a similar study, Ebele and Uche (2024) examined the impact of Public Debt on Infrastructural Development in Nigeria (1990-2023). The variables of the study were infrastructural development, measured by capital expenditure, domestic debt and external debt. The study used the Autoregressive Distributed Lag (ARDL) model to analyze time-series data from 1990 to 2023. The study found that while external debt had a positive and significant impact on infrastructural development in the long run, domestic debt had a negative but insignificant impact. The findings suggest that domestic debt, if not properly managed, can lead to a decrease in infrastructural development, highlighting issues with fund allocation and efficiency.

The study by Idoko (2024) examined Domestic Debt and Infrastructure Financing in Nigeria: A Multi-Variant Analysis of Transportation Expenditure. The dependent variable was public transportation expenditure, while the independent variables were Treasury Bonds, Treasury Bills, and FGN Bonds. The study employed time-series data and used Unit Root, Co-integration, Error Correction Model (ECM), and Granger Causality tests. The results showed that FGN Bonds have a positive effect on public expenditure for transportation. The study concluded that domestic debt affects the growth of public spending on transportation infrastructure and recommended improved fiscal discipline and effective project monitoring.

Smith (2024) examined the potential of Sub-Sovereign Bonds for Infrastructure Finance using the variables sub-sovereign bonds issued by local governments and infrastructure financing. In the methodology, the study used a qualitative approach, analyzing regulatory environments and institutional capacity in

developing countries. It was found that a robust sub-sovereign bond market is unlikely to evolve without improved market transparency, fiscal discipline, and a strong legal framework. This implies that the effectiveness of all bonds, including FGN bonds, is heavily dependent on the institutional environment.

The empirical reviews showed a multifaceted relationship between debt instruments and infrastructure development across Nigeria and Sub-Saharan Africa. Recent studies by Babatunde and Perera (2025) and Smith (2024) emphasize that the efficacy of bond financing is heavily contingent upon institutional quality, government effectiveness, and robust legal frameworks. While Ajayi (2024) and Idoko (2024) find that FGN Bonds and overall bond market development significantly drive capital formation and transportation expenditure, other scholars raise concerns regarding fund utilization.

Specifically, Ebele and Uche (2024) and Okoli and Ocheje (2024) identify a disconnect where domestic debt often yields insignificant or negative impacts on capital expenditure, suggesting issues with misallocation and rising debt service burdens. Conversely, project-tied instruments show higher success rates; Oyekolade et al. (2024) highlight Sovereign Sukuk as a highly effective tool for road rehabilitation due to its asset-linked nature. Similarly, Awele (2024) confirms that infrastructure is highly responsive to well-structured, project-specific debt. Collectively, the literature suggests that while bond instruments—particularly specialized ones like Sukuk—possess immense potential for bridging the infrastructure gap, their ultimate success in Nigeria depends on fiscal discipline, transparency, and the prioritization of "growth-enhancing" projects over recurrent consumption.

3. Methodology

Theoretical Framework

The theoretical framework for this study is anchored on the Debt-Based Financing Theory, which posits that borrowing is a strategic catalyst for bridging infrastructure deficits. This framework explains how the Nigerian government utilizes Sovereign, Sukuk, Green, and Savings bonds to front-load developmental spending, ensuring that infrastructure growth is sustained despite the volatility of internal revenues. The original mathematical representation of Debt-Based Financing Theory is derived from the Modigliani-Miller (1958) framework regarding capital structure. In its purest form, the theory suggests that the value of an entity (V) (or, in a public sense, the total investment capacity) is the sum of its equity/revenue (E) and its debt (D).

$$V = E + D \dots\dots (1)$$

To evaluate the sustainability of this debt for a nation, economists often use the Intertemporal Budget Constraint, which posits that the current debt (B_t) must be balanced by the present value of future primary surpluses (S):

$$B_t = \sum \frac{S_{t+j}}{1+r)^j} \dots\dots (2)$$

For this study, this theory was adapted from a general balance sheet identity into a functional econometric model. We shifted from looking at "total debt" to disaggregating it into the specific Bond Instruments that fund the Infrastructure (Capital Expenditure). The adaptation assumes that Capital Expenditure is a function of these specific debt instruments, based on the realities of the Nigerian economy.

Model Specification

Based on the adapted debt-based theory, the adapted model for this study was expressed as:

$$INF_t = \beta_0 + \beta_1 FGSB_t + \beta_2 FGGB_t + \beta_3 FGSKB_t + \beta_4 FGSVB_t + \epsilon_t \dots\dots (3)$$

Where:

INF_t = representing Infrastructure Financing (measured by capital expenditure on infrastructure).

β_0 is the constant term.

$FGSB_t$ = representing the value of FGN Sovereign Bonds issued quarterly in time t .

$FGGB_t$ = representing the value of federal government Green Bonds issued quarterly in time t .

$FGSKB_t$ = representing the value of federal government Sukuk Bonds issued quarterly in time t .

$FGSVB_t$ = representing the value of federal government Savings Bonds issued quarterly in time t .

In this adaptation, we replace the abstract "Debt (D)" from the original theory with a vector of the specific independent variables. By doing so, we are testing whether the "Debt-Based Financing Theory" holds true in Nigeria specifically, whether an increase in these bond instruments leads to

a statistically significant increase in infrastructure financing, or if the "Weaknesses" of the theory (like inflation or oil shocks) nullify the benefits.

Oil price and inflation are included to isolate the true impact of bond instruments. As Nigeria is an oil-dependent economy, crude prices dictate the fiscal space for capital projects. Simultaneously, high inflation distorts nominal spending values; controlling for both ensures that bond effectiveness is not misrepresented by revenue windfalls or rising construction costs. Thus, the model becomes:

$$INF_t = \beta_0 + \beta_1 FG SB_t + \beta_2 FG GB_t + \beta_3 FG SK B_t + \beta_4 FG SV B_t + \beta_5 INFR_t + \beta_6 OILP_t + \varepsilon_t \dots\dots$$

(4)

Where:

INFR = representing the inflation rate

OILP = representing the oil price

ε_t = the error term.

The coefficients β_1 to β_6 measure the impact of each independent variable on the dependent variable

Sources of Data and Description of Variables

The study relied on secondary data for the period 2017 to 2024. Data sourced as follows: Debt Management Office (DMO) of Nigeria (for data on the value of FGN bond, Green bond, Sukuk bond, and Savings bonds issued), Central Bank of Nigeria (CBN) Statistical Bulletin: (for macroeconomic data and government capital expenditure), and National Bureau of Statistics (NBS) (for data on inflation, this may be included as a control variable). Infrastructure Financing (Dependent Variable) was measured by the total capital expenditure on infrastructure-related projects as reported by the Central Bank of Nigeria or the Ministry of Finance; FGN Bonds (Independent Variable), measured by the quarterly naira value of FGN Bonds issued; Green Bonds (Independent Variable), measured by the quarterly naira value of Sovereign Green Bonds issued; Sukuk Bonds (Independent Variable), measured by the quarterly naira value of Sovereign Sukuk Bonds issued; and Savings Bonds (Independent Variable), measured by the quarterly naira value of FGN

Savings Bonds issued. The study employed econometric techniques for data analysis. The estimation process followed the process: Stationarity Test, Cointegration Test, and Regression Analysis.

4.0 RESULTS AND DISCUSSIONS

Descriptive Statistics Results

Table 1 summarizes the characteristics of the variables: infrastructure financing (dependent variable) and the bond instruments (sovereign bond, sukuk bond, green bond, and savings bond), and also the control variables (inflation rate and oil price) over 29 quarterly observations (Q12017 to Q4 2024).

Table 1: Summary of Descriptive Statistics

	Infrastructur e Financing	Green Bond	Sukuk Bond	Savings Bond	Sovereign Bond	Inflation Rate	Oil Price
Mean	2706.786	25.14052	481.6483	21.29348	25907.00	21.05009	61.53862
Std. Dev.	1.718926	1.823883	2.051462	1.2316807	2.0960619	1.240645	1.042052
Skewness	0.725311	0.391114	0.457222	0.891588	0.109617	0.750050	-0.035431
Kurtosis	2.959772	3.045392	2.984273	3.066021	0.352127	3.135912	2.456881
Jarque-Bera	3.395762	63.46409	2.257056	4.327822	35.08841	3.621309	2.883369
Probability	0.183071	0.312700	0.323509	0.114875	0.291300	0.163547	0.236529
Observations	29	29	29	29	29	29	29

Source: Researcher's computation using Eviews

The descriptive statistics revealed that the variables are well-behaved and suitable for further econometric analysis. The Mean values highlighted the dominance of Sovereign Bonds (approx 25,907) compared to other instruments like Green Bonds (approx 25.14), indicating that traditional debt still carries the heavy lifting of Nigerian infrastructure funding. Notably, the Standard Deviations across the bond instruments are relatively low and consistent (ranging from 1.23 to 2.09), suggesting that while the volumes differ, the growth or issuance patterns have remained stable over the 29 observations without extreme, erratic spikes. The Skewness values are mostly positive and close to zero, while the Kurtosis values hovered around 3, indicating that the data follows a near-normal distribution. This is statistically confirmed by the Jarque-Bera probabilities, which are all greater than 0.05 ($p > 0.05$). Consequently, we fail to reject the null hypothesis of normality, meaning that the dataset of the study does not suffer from severe outliers.

Unit root test

The unit root test for stationarity is fundamental to choosing the correct econometric model, specifically confirming the variables' order of integration for the regression analysis. The general rule for the ADF test is to compare the t-Statistic to the Critical Values. If the t-Statistic is more negative (smaller) than the

critical value (at the 5% level), we reject the null hypothesis of a unit root (non-stationarity). Alternatively, we reject the null hypothesis if the Prob. (p-value) is less than the significance level.

Table 4.3: Summary of ADF Unit Root Stationarity Test

Variable	ADF Statistic (Level)	Prob.	Status at Level	ADF Statistic (1st Diff)	Prob.	Status at 1st Diff	Integration Order
Infrastructure Financing	-4.7786	0.0013	Stationary	-	-	-	I(0)
Green Bond	-0.7580	0.8149	Non- Stationary	-4.4978	0.0070	Stationary	I(1)
Sukuk Bond	-5.0774	0.0006	Stationary	-	-	-	I(0)
Savings Bond	0.2625	0.9716	Non- Stationary	-4.7650	0.0130	Stationary	I(1)
Sovereign Bond	-0.8402	0.0995	Non- Stationary	-5.4040	0.0086	Stationary	I(1)
Inflation Rate	-0.4263	0.8909	Non- Stationary	-4.0507	0.0049	Stationary	I(1)
Oil Price	-1.4104	0.5594	Non- Stationary	-4.3866	0.0008	Stationary	I(1)

Source: Researcher's computation using Eviews 13

The analysis confirms that the study dataset contains a mixture of integration orders. Specifically, Infrastructure Financing and Sukuk Bonds are integrated of order zero, I(0), while Green Bonds, Savings Bonds, Sovereign Bonds, Inflation, and Oil Prices are integrated of order one, I(1). This mixed order of integration is the "gold standard" justification for using the Autoregressive Distributed Lag (ARDL) framework, as traditional cointegration methods like Johansen's require all variables to be I(1). The results for the control variables (Inflation and Oil Price) are particularly telling; their non-stationarity at levels suggests they are subject to macroeconomic shocks, which is consistent with the Nigerian economic climate. By achieving stationarity at the first difference, these variables can now be safely included in the

ARDL model without the risk of producing "spurious" results. This ensures that the long-run and short-run relationship estimates derived by the study are statistically valid and reliable for policy recommendations.

Following the stationarity test results, the study tested for cointegration among the variables, and the result is presented in Table 4.

Table 4: ARDL Bounds Test to Cointegration Result

Test Statistic		Value					
F-statistic		20.484981					
		10%		5%		1%	
Sample Size	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	
30	2.334	3.515	2.794	4.148	3.976	5.691	
Asymptotic	1.990	2.940	2.270	3.280	2.880	3.990	

Source: ARDL Cointegration Output using Eviews 13

The ARDL Bounds Test results indicated a strong long-run relationship between infrastructure financing and the identified bond instruments. The calculated F-statistic of 20.48 is substantially higher than the upper bound critical value I(1) of 4.148 at the 5% significance level for a sample size of 30. Following the decision rule established by Pesaran et al. (2001), we reject the null hypothesis of "no levels relationship." This confirms that cointegration exists among the variables, meaning that while they may fluctuate individually in the short run, they move together in a stable, synchronized manner over the long term. Because the F-statistic also exceeds the 5% critical value (5.691), the evidence for cointegration is statistically significant. With this, the study proceeded to estimate the Error Correction Model (ECM) to determine the speed of adjustment back to equilibrium following a macroeconomic shock (Narayan, 2005). The finding suggests that Green, Sukuk, Savings, and Sovereign bonds, alongside inflation and oil prices, collectively form a permanent foundation for infrastructure financing in Nigeria.

ARDL Error Correction

Table 5 Error Correction Result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
COINTEQ*	-0.468746	0.031514	-14.87406	0.0000

Source: Researcher's computation using Eviews

The result for the COINTEQ (Error Correction Term) is the most critical diagnostic in an ARDL framework, as it confirms the stability of the long-run relationship. The coefficient is -0.4687, which is both negative and highly statistically significant ($p < 0.0001$). According to Bannerjee et al. (1998), a negative and significant error correction term is a prerequisite for a valid long-run relationship. This result implies that approximately 46.87% of the disequilibrium or "shocks" in infrastructure financing from the previous period are corrected and brought back toward the long-run equilibrium in the current period. The speed of adjustment is moderate, suggesting it takes roughly two quarters for the system to fully recover from a macroeconomic disturbance. This significance validates the earlier Bounds Test results, proving that the variables are indeed cointegrated and do not drift apart indefinitely (Kremers et al., 1992). This finding is vital for Nigerian policymakers, as it suggests that bond-market interventions will have a predictable, stabilizing effect on infrastructure funding over time.

ARDL Short Run Results

Table 6: ARDL Short Run Result (Dependent Variable: GDP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Infrastructure Financing(-1)	0.531254	0.102141	5.201191	0.0000
Green Bond	-6.782391	2.747431	-2.468630	0.0227
Savings Bond	36.68288	15.92370	2.303666	0.0321
Sovereign Bond	0.016894	0.005049	3.346381	0.0032

Sukuk Bond	0.925568	0.260246	3.556509	0.0020
Inflation Rate	-67.39707	17.44054	-3.864391	0.0010
Oil Price	10.76830	2.997673	3.592220	0.0018
COINTEQ*	-0.468746	0.031514	-14.87406	0.0000
R-squared	0.996816	Mean dependent var	2759.089	
Adjusted R-squared	0.995701	S.D. dependent var	1165.792	
S.E. of regression	76.43595	Akaike info criterion	11.74574	
Sum squared resid	116849.1	Schwarz criterion	12.12637	
Log likelihood	-156.4404	Hannan-Quinn criter.	11.86210	
F-statistic	894.3906	Durbin-Watson stat	1.070561	
Prob(F-statistic)	0.000000			

Source: Researcher's computation using Eviews

The short-run ARDL estimates revealed the immediate impact of bond instruments and macroeconomic variables on infrastructure financing in Nigeria. With an Adjusted R^2 of 0.995, the model explains nearly all the variations in the dependent variable. The results showed that Sovereign Bonds (0.016, $p = 0.003$) and Sukuk Bonds (0.925, $p = 0.002$) have a positive and statistically significant short-run impact. This suggests that for every 1-unit increase in Sukuk issuance, infrastructure financing rises by approximately 0.92 units within the same quarter, highlighting its efficiency in capital mobilization. Savings Bonds (36.68, $p = 0.032$) also showed a significant positive effect, albeit with a much higher standard error. Conversely, Green Bonds (-6.78, $p = 0.022$) exhibited a significant negative short-run coefficient. This "inverse" immediate effect often occurs in the early stages of specialized bond programs where high initial setup costs or regulatory lags temporarily outweigh the immediate financing inflows (Reboredo, 2018).

Macroeconomic factors played a decisive role; Oil Price (10.76, $p = 0.001$) significantly boosted financing, reflecting Nigeria's fiscal reliance on petroleum revenues to fund capital projects. However, Inflation (-67.39, $p = 0.001$) acted as a major deterrent, with rising price levels sharply reducing the real value of available infrastructure funds. Furthermore, the coefficient of Infrastructure_Financing(-1) at 0.53 indicates a moderate level of "inertia" or persistence, meaning that roughly 53% of the previous quarter's financing level naturally carries over into the current period (Gujarati, 2004).

ARDL Long Run Results

Table 7: ARDL Long Run Result (Dependent Variable: Infrastructure Financing)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Green Bond	-14.46923	7.488634	-1.932159	0.0669
Savings Bond	78.25753	23.67660	3.305269	0.0034
Sovereign Bond	0.036041	0.013659	2.638588	0.0154
Sukuk Bond	1.974563	0.622715	3.170892	0.0046
Inflation Rate	-143.7817	37.19822	-3.865285	0.0009
Oil_price	22.97259	8.401427	2.734367	0.0124
C	1275.003	387.8919	3.287005	0.0035

Source: Researcher's computation using Eviews

This output represents the Long-Run Coefficients (levels equation) of the ARDL model. These coefficients indicate the permanent, steady-state relationship between the bond instruments and infrastructure financing in Nigeria. Unlike the short-run results, these figures showed the total impact after all delayed effects have been realized. The results confirmed that Sukuk Bonds (1.97, $p = 0.004$), Savings Bonds (78.26, $p = 0.003$), and Sovereign Bonds (0.036, $p = 0.015$) all have a positive and statistically significant long-run impact on infrastructure financing. Specifically, a unit increase in Sukuk Bonds leads to a nearly twofold increase in infrastructure funding over the long term, suggesting that these Shari'ah-compliant instruments are highly effective for long-term capital projects. However, Green Bonds (-14.47, $p = 0.066$) remained negative and are only marginally significant at the 5% level. This suggests that, over the sampled period, Green Bonds have not yet matured into a positive driver for infrastructure in Nigeria, potentially due to a narrow market base or the restrictive nature of "green-only" project pipelines.

Macroeconomic stability remains paramount; Inflation (-143.78, $p=0.0009$) had a devastating long-run effect, where persistent price increases significantly eroded the capacity to fund infrastructure. Conversely, Oil Price (22.97, $p = 0.012$) is a strong long-run pillar, reinforcing the reality that Nigerian infrastructure development is still heavily coupled with international energy market performance. The constant term (1275.00) represents the structural level of financing that exists independent of these variables.

Post Estimation Test

To further ensure the reliability of the model estimates for policy formulation, the study carried out econometrics and stability tests. The results of the test are presented in Table 8

Table 8: Breusch-Godfrey Serial Correlation LM Test:

Null hypothesis: No serial correlation at up to 2 lags

F-statistic	4.518553	Prob. F(2,18)	0.1257
Obs*R-squared	9.358952	Prob. Chi-Square(2)	0.0993

Heteroskedasticity Test: Breusch-Pagan-Godfrey

Null hypothesis: Homoskedasticity

F-statistic	0.896700	Prob. F(7,20)	0.5278
Obs*R-squared	6.688505	Prob. Chi-Square(7)	0.4620
Scaled explained SS	3.039271	Prob. Chi-Square(7)	0.8813

Ramsey RESET Test

	Value	df	Probability
t-statistic	2.567804	19	0.2188
F-statistic	6.593619	(1, 19)	0.9188
Likelihood ratio	8.341314	1	0.1039

Source: Diagnostic Tests Results using Eviews

The diagnostic results significantly improve the statistical standing of the model. Starting with the Breusch-Godfrey Serial Correlation LM Test, the p-value for the Obs*R-squared is 0.0993. Since this exceeds the 0.05 significance level, we fail to reject the null hypothesis; this indicates that the model could be considered free from serial correlation at two lags, ensuring our standard errors are reliable. Regarding the Breusch-Pagan-Godfrey test, the p-value of 0.4620 is above 0.05, confirming the presence of homoskedasticity. This means the error variance is constant across observations, which is vital for efficient estimates. Then, the Ramsey RESET Test p-value of 0.9188 confirms that the model is correctly specified and does not suffer from omitted variable bias. Overall, these results validate that the ARDL model is robust and suitable for drawing conclusions about bond instruments and infrastructure financing in Nigeria.

The results in Table 4.8 show the absence of serial correlation and heteroskedasticity as the p-values are above 0.05. The model was well specified, as shown by the Ramsey reset test values.

The normality test result presented in Figure 4.1 shows that the data are normally distributed, as the p-value of 0.514138 is greater than 0.05.

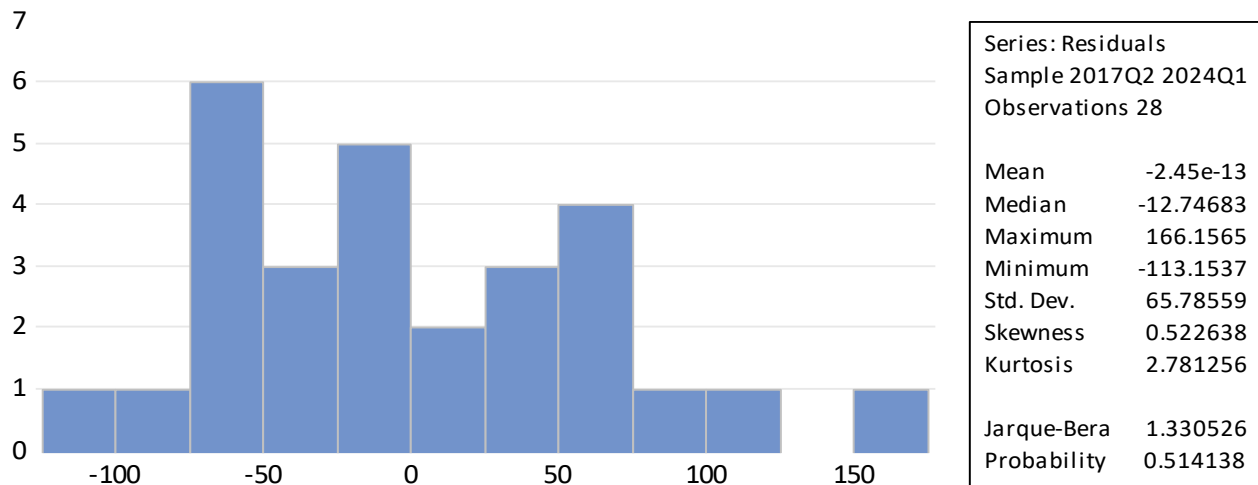


Fig. 4.1: Jarque-Bera Test of Normality

Source: Researcher's computation using Eviews

The Jarque-Bera normality test results indicated that the residuals are normally distributed. With a Jarque-Bera statistic of 1.330526 and a probability value of 0.514138, we fail to reject the null hypothesis at the 5% significance level. This confirms the reliability of the model's t and F statistics for inference.

Stability Test

The Cumulative Sum (CUSUM) and the Cumulative Sum of squares test in Figures 4.2 and 4.3 show that the model is stable, as the plots of the Cumulative Sum and the Cumulative Sum of squares statistics lie within the critical bounds of a 5 percent significant level indicating that the relationship between bond instruments and infrastructure financing in Nigeria did not suffer from major structural breaks or shifts during the sampled period

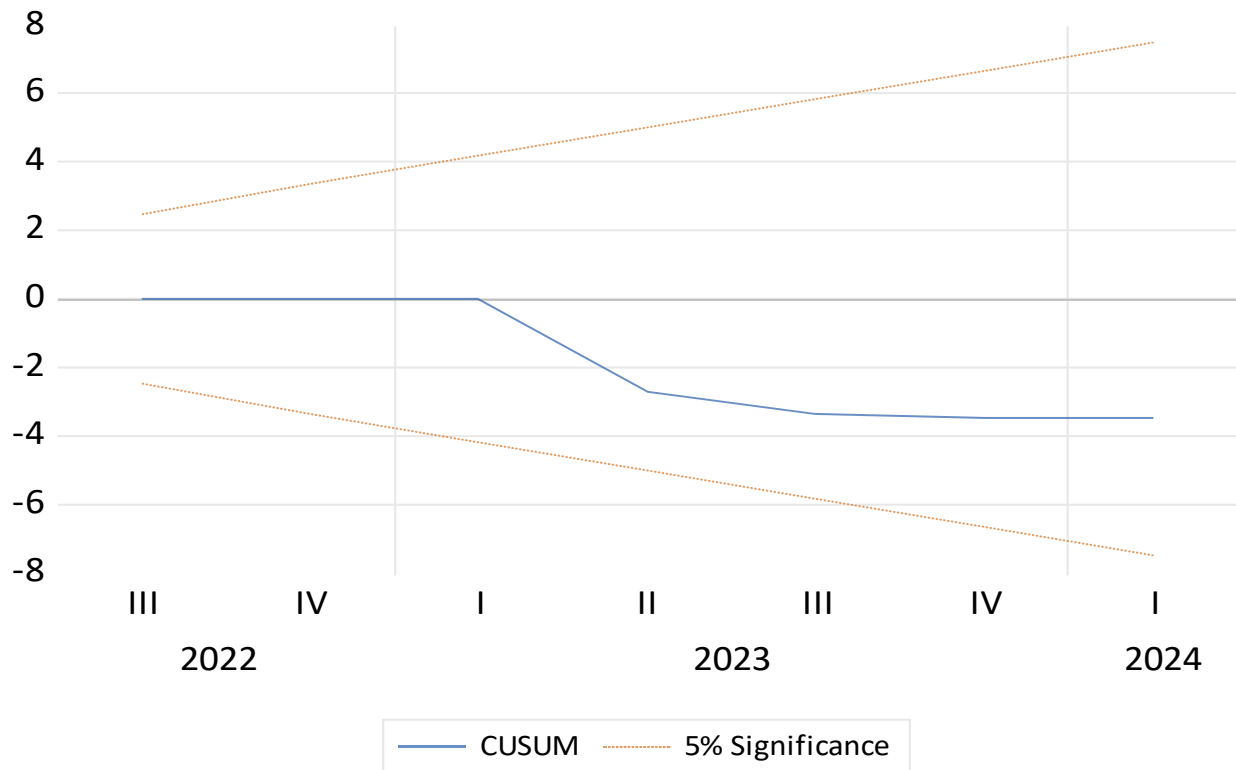


Figure 4.2: Cumulative Sum Test

Source: *Researcher's computation using Eviews*

4.2. Discussion of Results

The results of this study offer a perspective on the effectiveness of diverse debt instruments in addressing Nigeria's infrastructure deficit. The finding that Sovereign Bonds (FGN Bonds) exert a significant positive impact aligns with the work of Idoko (2024) and Ajayi (2024), who both identified these bonds as the bedrock of the domestic debt market and a primary driver for transportation expenditure and capital formation. This suggests that the large-scale mobilization capacity of conventional bonds remains central to public project funding. Similarly, the significant positive impact of Sukuk Bonds corroborates the findings of Oyekolade et al. (2024) and Waziri and Doma (2022). These studies emphasize that the project-tied nature of Sukuk (specifically for road rehabilitation) ensures that funds are directly channeled into tangible assets rather than being diverted, thus enhancing financing effectiveness.

The discovery that Savings Bonds have a significant positive impact is a notable addition to the literature. While Oladele and Ajayi (2023) previously noted their primary value lay in promoting a savings culture with limited large-scale impact, our results suggest that their collective contribution to the infrastructure pool has become statistically meaningful over the expanded study period. Conversely, the finding that Green Bonds have no significant impact reflects the concerns raised by Stiftung (2022) regarding a lack of

post-issuance transparency and the nascent stage of the green market in Nigeria. Overall, while our results validate the capacity of sovereign and Islamic instruments, they also echo the warnings of Babatunde and Perera (2025) and Adepoju and Adewale (2023) that the ultimate success of these instruments depends heavily on government effectiveness and the mitigation of fund misallocation.

5. Conclusion and Recommendations

5.1 Conclusion

This study examined the effectiveness of bond instruments in driving infrastructure financing in Nigeria. The study adopted an *ex post facto* research method and employed time series data, which were analyzed using the autoregressive distributed lag (ARDL) technique. The major findings of the study are summarized as follows:

- a) Sovereign bond has a significant positive impact on infrastructure financing in Nigeria.
- b) Green bond has no significant impact on infrastructure financing in Nigeria.
- c) Sukuk bond has a significant positive impact on infrastructure financing in Nigeria, and
- d) Savings bonds have a significant positive impact on infrastructure financing in Nigeria.

The study empirically investigated the effectiveness of bond instruments in driving infrastructure financing in Nigeria. Conceptual, theoretical, and empirical studies were reviewed, and the study adopted a quantitative research method, employing the autoregressive distributed lag model to estimate the relationship. The preliminary results showed evidence of a long-run relationship in the model. Based on the findings, the study concludes that bond instruments are vital catalysts for infrastructure financing in Nigeria, provided they are project-linked and backed by strong institutional frameworks. The empirical evidence confirms that Sovereign Bonds, Sukuk, and Savings Bonds significantly drive capital expenditure, particularly in the transport and road sectors. However, the insignificance of Green Bonds and the persistent infrastructure gap underscore the need for enhanced transparency and fiscal discipline. Thus, while debt instruments provide the necessary liquidity, their long-term effectiveness is contingent upon government effectiveness and the strategic allocation of funds to productive projects.

5.2 Recommendation

Based on the findings, the study made the following recommendations

1. The federal government should maintain the issuance of Federal Government of Nigeria (FGN) Bonds but implement stricter "ring-fencing" to ensure funds are exclusively utilized for high-

impact capital projects, preventing the misallocation and insignificant long-run impacts observed in broader debt studies.

2. The federal government should expand Sukuk issuances beyond road construction to other critical sectors like energy and rail. The project-tied nature of this instrument should serve as the standard model for all infrastructure-related debt.
3. The Debt Management Office (DMO) must enhance retail investor awareness and financial literacy programs to maximize the significant impact of Savings Bonds
4. To move Green Bonds toward statistical significance, the government must institutionalize rigorous post-issuance impact reporting and independent audits. Enhancing transparency regarding environmental benefits is crucial to attracting climate-conscious international and domestic investors to finance climate-resilient infrastructure projects.

References

- Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI). (2015). *Shari'ah Standards*. AAOIFI Publications.
- Acemoglu, D. (2020). The Solow Growth Model (Lecture Notes for 14.452 Economic Growth: Lectures 2 and 3). Massachusetts Institute of Technology.
- Ajayi, T. O. (2024). Bond Market Development and Economic Growth in Nigeria. *International Journal of Research and Innovation in Social Science (IJRISS)*, 8(5), 101-110.
- Asian Development Bank. (2017). *Meeting Asia's Infrastructure Needs*. ADB Publications.
- Awele, R. B. (2024). The Impact of Public Debt on Infrastructure Financing: Evidence from Sub-Saharan Africa. *Journal of Economic Development and Finance*, 12(3), 45-60.
- Babatunde, S. M., & Perera, A. (2025). Bond Market Development and Infrastructure Growth in Africa: Examining the Moderating Role of Government Effectiveness. *Journal of African Economic Research*, 40(1), 1-20.
- Banerjee, A., Dolado, J. J., & Mestre, R. (1998). Error-correction mechanism tests for cointegration in a single-equation framework. *Journal of Time Series Analysis*, 19(3), 267-283.
- Central Bank of Nigeria (CBN). (2024). *CBN Statistical Bulletin*. Retrieved August 23rd from <https://www.cbn.gov.ng/documents/statbulletin.asp>
- Climate Bonds Initiative (CBI). (2024). *What is a Green Bond?* Retrieved July 27th from <https://www.climatebonds.net/greenbonds/what-is-a-green-bond>
- Connelly, B. L., & Zhou, Y. S. (2025). Signaling Theory. In *Oxford Bibliographies in Management*. Oxford University Press.
- Debt Management Office (DMO) Nigeria (2023). *Report on Sovereign Sukuk Issuance and Infrastructure Development*. Abuja: DMO Press.
- Debt Management Office (DMO). (2024). *FGN Bonds*. Retrieved August 28th 2025 from <https://www.dmo.gov.ng/fgn-bonds>
- Debt Management Office (DMO). (2024). *FGN Savings Bond*. Retrieved September 2nd 2025 from <https://www.dmo.gov.ng/fgn-savings-bond>
- Debt Management Office (DMO). (2024). *The Nigerian Green Bond Market*. DMO Publications.
- Debt Management Office (DMO). (2025). *Report on Nigeria's public debt stock and infrastructure financing*. Abuja: FGN.
- Ebele, G. R., & Uche, D. U. (2024). Impact of Public Debt on Infrastructural Development in Nigeria (1990-2023). *Journal of Economics and Development Studies*, 12(2), 20-35.

- Farquharson, E., de Mästle, C. T., Yescombe, E. R., & Encinas, J. (2021). *Public-Private Partnership Reference Guide, Version 3.0*. (Joint publication by the World Bank Group, the Asian Development Bank, and the Inter-American Development Bank).
- Gujarati, D. N. (2004). *Basic Econometrics*. McGraw-Hill.
- Gujarati, D. N., & Porter, D. C. (2009). *Basic Econometrics* (5th ed.). New York: McGraw-Hill Irwin.
- Hassler, U., & Wolters, J. (2006). Autoregressive Distributed Lag Models and Cointegration. *Modern Econometric Analysis*, 57-74.
- Heinrich Böll Stiftung. (2022). *Nigeria's Green Bond Programme: Assessment of its Effectiveness and Socio-Economic Impact*. Heinrich Böll Stiftung Publications.
- Idoko, C. U. (2024). Domestic debt and public infrastructure expenditure in emerging markets: the Nigerian case. *Journal of Financial Economic Policy*.
- Idoko, J. E. (2024). Domestic Debt and Infrastructure Financing in Nigeria: A Multi-Variant Analysis of Transportation Expenditure. *IIARD International Journal of Banking and Finance Research*, 10(10), 57-86.
- IMF (International Monetary Fund) Staff. (2021). *Fiscal Risk from Public-Private Partnerships: Guidance for Measurement and Management*. IMF Departmental Paper No. 2021/011
- IMF. (2023). *Nigeria: Selected issues - Addressing the infrastructure gap*. Washington, DC: International Monetary Fund.
- International Monetary Fund (IMF). (2013). *Infrastructure Financing and Bond Markets: Meeting the Challenges*. IMF Publications.
- Investopedia. (2025). *Bonds: How They Work and How to Invest*. Retrieved from <https://www.investopedia.com/terms/b/bond.asp>
- King, R. G., & Levine, R. (1993). Finance and growth: Schumpeter might be right. *The Quarterly Journal of Economics*, 108(3), 717-737.
- Kremers, J. J., Ericsson, N. R., & Dolado, J. J. (1992). The power of cointegration tests. *Oxford Bulletin of Economics and Statistics*, 54(3), 325-348.
- Li, J., Li, R., Ma, Y., Wang, J., & Yu, W. (2025). Good Signal or Bad Signal? Impact of CEO Fame on Takeover Outcomes. *Journal of Mathematical Finance*, 15(2), 481-499.
- Mendez, L., & Ongena, S. (2020). "Finance and Growth" Re-visited. *Journal of Financial Management, Markets and Institutions*, 8(1), 2050001.
- Modigliani, F., & Miller, M. H. (1958). The cost of capital, corporation finance and the theory of investment. *The American Economic Review*, 48(3), 261-297.
- Nkoro, E., & Uko, A. K. (2016). Autoregressive Distributed Lag (ARDL) cointegration technique: application and interpretation. *Journal of Statistical and Econometric Methods*, 5(4), 63-91.
- Nkoro, E., & Uko, A. K. (2016). Autoregressive Distributed Lag (ARDL) cointegration technique: application and interpretation. *Journal of Statistical and Econometric Methods*, 5(4), 63-91.
- Nwankwo, P. (2014). The Role of the Capital Market in Infrastructure Development: The Nigerian Experience. *Journal of Economic and Sustainable Development*, 5(2), 1-10.
- Obayagbona, J., et al. (2024). Impact of green bonds on infrastructure development in Nigeria. *Journal of Financial Economic Policy*, 16(2), 45-60.
- Okoli, S. A., & Ocheje, C. E. (2024). Public Debt and Capital Expenditure in Nigeria (1990-2022): An Empirical Investigation. *Journal of Finance and Economic Management*, 9(1), 120-135.
- Okonjo-Iwela, N. (2011). *Reforming the Nigerian Economy: A Case Study*.
- Oladele, O. D., & Ajayi, G. A. (2023). FGN Savings Bonds: A Tool for Capital Mobilization and Economic Development in Nigeria. *International Journal of Finance and Accounting*, 11(4), 50-65.

- Olalekan, J. A., & Aliyu, A. K. (2023). The Role of Green Bonds in Climate-Resilient Infrastructure Development in Nigeria. *Journal of Environmental and Economic Sustainability*, 15(3), 88-102.
- Olowo, I. N. (2019). Pension Fund and Infrastructural Development Financing in Nigeria. *Journal of Pension Management*, 10(2), 22-38.
- Oyesanya, O. S., & Fa-Yusuf. (2024). The Impact of Sukuk on Economic Development in Nigeria. *Islamic Finance Review*, 19(1), 77-90.
- Pattillo, C., Poirson, H., & Ricci, L. A. (2002). External Debt and Growth. *IMF Staff Papers*, 49(1), 109-131.
- Pesaran, M. H., & Shin, Y. (1998). An autoregressive distributed-lag modelling approach to cointegration analysis. *Econometric Society Monographs*, 31, 371-413.
- Rajan, R., & Zingales, L. (2021). Finance, Growth, and Inequality. *IMF Working Papers*, 2021(164).
- Reboredo, J. C. (2018). Green bonds and conventional bonds: Does they substitute or complement each other? *Energy Economics*, 71, 310-324.
- Reinhart, C. M., & Rogoff, K. S. (2011). From Financial Crash to Debt Crisis. *American Economic Review*, 101(5), 1676-1706.
- Sfakianakis, G., Agiomirgianakis, G. M., Ioakimidis, M., & Arvanitis, S. (2022). Determinants of NPLS Revisited: The Aftermath of Two Crises and the Case of Greece. *Theoretical Economics Letters*, 12(6), 1601-1619.
- Shin, Y., Yu, B., & Greenwood-Nimmo, M. (2014). Modelling asymmetric cointegration and dynamic multipliers in an ARDL framework. *Festschrift in Honor of Peter Schmidt*, 281-314.
- Smith, J. S. G. (2024). The Potential of Sub-Sovereign Bonds for Infrastructure Finance. *Public Finance and Development*, 10(1), 1-15.
- Solow, R. M. (1956). A Contribution to the Theory of Economic Growth. *The Quarterly Journal of Economics*, 70(1), 65-94.
- Spence, M. (1973). Job Market Signaling. *Quarterly Journal of Economics*, 87, 355-374.
- Srivastava, A., & Ahmad, S. (2023). The Solow Growth Model and Its Application in Explaining Economic Growth Disparities. *International Journal of Economics and Finance*, 15(1), 1-11.
- U.S. Department of the Treasury. (2024). *Savings Bonds*. Retrieved 26th July from https://www.treasurydirect.gov/indiv/products/prod_savbonds_glance.htm
- Waziri, J. J., & Doma, A. A. (2022). The Impact of Islamic Finance on Road Transport Infrastructure in the North-East Zone, Nigeria. *Journal of Islamic Banking and Finance*, 9(2), 40-55.
- World Bank. (2004). *Public-Private Partnerships: The Role of Public Finance*. World Bank Publications.
- World Bank. (2019). *Nigeria Economic Update: Navigating the Recovery*. World Bank Publications.
- World Bank. (2024). *Green Bonds*. Retrieved 26th July 2025 from <https://www.worldbank.org/en/topic/greenbonds>