

Green Bond Financing and the Asset Quality of Nigerian Deposit Money Banks: A Strategic Intermediation Analysis

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Abstract:

This study investigates the effect of green bond financing on the asset quality of Nigerian deposit money banks (DMBs) within the framework of strategic financial intermediation. The growing global emphasis on sustainable finance has positioned green bonds as a critical instrument for mobilizing capital toward environmentally responsible investments while potentially influencing banks' risk profiles. Adopting an ex-post facto research design, the study utilizes panel data from listed Nigerian DMBs over the period 2015–2024. Green bond financing is proxied by green asset ratio, green bond investment volume, and sustainability-linked lending exposure, while asset quality is measured using non-performing loan ratio (NPL), loan loss provision ratio (LLP), and cost of risk (COR). Panel regression techniques, including fixed-effects estimation, are employed following diagnostic tests. Empirical findings reveal that green bond financing significantly improves asset quality by reducing non-performing loans and credit risk exposure. Specifically, increased allocation to green assets is associated with lower NPL ratios, while sustainability-linked lending enhances risk diversification and loan performance. The study concludes that green bond financing serves as a strategic intermediation mechanism that strengthens bank stability and resilience. It recommends that Nigerian banks deepen participation in green finance markets and align lending strategies with environmental sustainability frameworks to enhance asset quality and long-term financial performance.

Keywords— *Green Bonds, Asset Quality, Financial Intermediation, Non-Performing Loans, Sustainable Finance.*

I. INTRODUCTION

The global financial system is undergoing a structural transformation driven by the convergence of sustainability imperatives and financial intermediation. Green finance, particularly green bond financing has emerged as a pivotal mechanism for channeling capital toward environmentally sustainable projects while reshaping risk dynamics within banking systems (Ehlers, et al 2020). For deposit money banks (DMBs), this transition introduces new opportunities to enhance asset quality through environmentally aligned lending practices.

Green bonds are fixed-income securities issued to finance projects with positive environmental outcomes, including renewable energy, climate resilience, and sustainable infrastructure (Okafor & Eze, 2023). Unlike conventional bonds, green bonds incorporate environmental screening and

reporting standards, which may influence credit risk profiles and loan performance (Tang & Zhang, 2020). In emerging economies such as Nigeria, the adoption of green finance is gaining traction, supported by regulatory frameworks from the Central Bank of Nigeria (CBN) and the Nigerian Sustainable Banking Principles (CBN, 2021).

Asset quality, a critical indicator of banking sector stability, reflects the degree of credit risk embedded in a bank's loan portfolio. High levels of non-performing loans (NPLs) and loan loss provisions signal deteriorating asset quality and increased financial vulnerability (Beck et al., 2021). Recent literature suggests that sustainable finance instruments, including green bonds, may improve asset quality by directing funds toward lower-risk, future-oriented investments (Ehlers et al., 2020; Bachelet et al., 2023).

From a strategic intermediation perspective, banks act as allocators of capital between savers and

borrowers. The integration of green bond financing into this intermediation process may enhance portfolio quality by aligning lending with environmentally sustainable and policy-supported sectors (Ehlers et al., 2020). This is particularly relevant in Nigeria, where macroeconomic volatility and credit risk remain persistent challenges within the banking sector.

Despite the growing relevance of green finance, empirical evidence on its impact on asset quality in developing economies remains limited. Existing studies largely focus on developed markets or emphasize market-based performance indicators rather than risk-based measures such as asset quality. This study addresses this gap by examining how green bond financing influences the asset quality of Nigerian DMBs.

Statement of the Problem

The Nigerian banking sector continues to face significant challenges related to asset quality, particularly in the form of high non-performing loans and credit risk exposure. Macroeconomic instability, sectorial credit concentration, and weak risk management practices have contributed to fluctuations in asset quality over time (CBN, 2024). While green bond financing has been promoted as a tool for sustainable economic development, its implications for bank-level risk and asset quality remain underexplored. Existing studies (Flammer, 2021& Ehlers et al., 2020) suggest that green finance may reduce credit risk, yet empirical evidence in the Nigerian context is scarce.

Moreover, most prior studies focus on profitability or market valuation rather than core banking stability indicators such as NPLs and loan loss provisions (e.g., Bachelet et al., 2023; Ehlers et al., 2020).. This creates a gap in understanding whether green bond financing genuinely enhances the quality of bank assets or merely serves as a reputational tool.

Therefore, this study seeks to examine whether green bond financing improves asset quality in Nigerian deposit money banks through strategic intermediation mechanisms.

Objectives of the Study

The main objective is to examine the effect of green bond financing on the asset quality of DMBs in Nigeria, the specific objectives are to:

- i. Determine the effect of green asset ratio on non-performing loan ratio of DMBs in Nigeria.
- ii. Examine the effect of green bond investment volume on loan loss provisions of DMBs in Nigeria.
- iii. Assess the effect of sustainability-linked lending on cost of risk of DMBs in Nigeria.

Research Hypotheses

H01: Green asset ratio has no significant effect on non-performing loans of Nigerian DMBs.

H02: Green bond investment volume has no significant effect on loan loss provisions of Nigerian DMBs.

H03: Sustainability-linked lending has no significant effect on cost of risk of Nigerian DMBs.

II. LITERATURE REVIEW

This study reviews literatures in three dimensions; the conceptual review, theoretical framework and empirical review

Conceptual Review

Green Bond Financing

Green bond financing refers to the mobilization of capital through fixed-income debt instruments specifically designated for environmentally sustainable projects such as renewable energy, climate adaptation, and green infrastructure. According to the Organisation for Economic Co-operation and Development (OECD, 2022), green bonds are structured to ensure that proceeds are exclusively applied to environmentally beneficial investments, thereby integrating environmental, social, and governance (ESG) considerations into financial decision-making. Similarly, Bachelet et al. (2023) emphasize that green bonds incorporate transparency and reporting requirements, which enhance investor confidence and reduce information asymmetry. In the context of financial intermediation, green bond financing represents a strategic mechanism through which banks can align capital allocation with sustainability goals while potentially improving risk-adjusted returns.

Green Asset Ratio (GAR)

The Green Asset Ratio (GAR) represents the proportion of a bank's total assets that are allocated

to environmentally sustainable investments. Zerbib (2019) defines GAR as a key indicator of the extent to which financial institutions integrate sustainability into their asset portfolios. A higher GAR suggests that a greater share of a bank's lending and investment activities is directed toward low-carbon and environmentally resilient sectors. This alignment is expected to reduce exposure to environmental risks, regulatory penalties, and stranded assets, thereby enhancing overall asset quality. Consequently, GAR serves as a critical proxy for assessing the depth of green finance adoption within banking institutions.

Green Bond Investment Volume (GBIV)

Green Bond Investment Volume (GBIV) captures the magnitude of a bank's participation in green bond markets, either as an investor or issuer. Tang and Zhang (2020) argue that higher levels of green bond investment reflect a stronger commitment to sustainable finance and improved portfolio diversification. By investing in green bonds, banks can access new asset classes that may exhibit lower correlation with traditional investments, thereby reducing systemic risk. Furthermore, increased GBIV is associated with enhanced reputational benefits and compliance with global sustainability standards, which may indirectly influence asset quality through improved borrower selection and monitoring.

Sustainability-Linked Lending (SLL)

Sustainability-linked lending refers to loan agreements in which the terms are contingent upon the borrower's achievement of predefined environmental or sustainability performance targets. According to the Loan Market Association (2023), these instruments incentivize borrowers to adopt environmentally responsible practices by linking interest rates or repayment conditions to sustainability outcomes. This mechanism aligns the interests of lenders and borrowers, promoting improved credit behavior and reducing default risk. As a result, SLL is increasingly viewed as a dynamic tool for integrating sustainability into credit risk management frameworks.

Asset Quality

Asset quality reflects the degree of credit risk embedded in a bank's asset portfolio, particularly its

loan book. It is a critical indicator of financial stability and is commonly assessed using metrics such as the Non-Performing Loan Ratio (NPL), Loan Loss Provisions (LLP), and Cost of Risk (COR) (Beck et al., 2021). High asset quality implies that a bank's loans are performing as expected, with minimal defaults and lower provisioning requirements. Conversely, poor asset quality is characterized by high levels of non-performing loans and increased credit risk exposure, which can undermine bank profitability and stability.

Non-Performing Loan Ratio (NPL)

The Non-Performing Loan Ratio (NPL) represents the proportion of a bank's total loan portfolio that is either in default or at risk of default, typically defined as loans overdue for more than 90 days. It is widely regarded as a primary indicator of credit risk and asset quality within the banking sector. A higher NPL ratio signals deteriorating loan performance, weak credit risk management, and increased likelihood of financial instability. Recent studies emphasize that elevated NPL levels constrain bank lending capacity and reduce profitability, thereby weakening financial intermediation efficiency (Beck et al., 2021; Balgova et al., 2020). In emerging economies such as Nigeria, NPL ratios are particularly sensitive to macroeconomic volatility and institutional inefficiencies, making them a critical metric for assessing banking sector resilience (Ozili, 2020).

Loan Loss Provision (LLP)

Loan Loss Provision (LLP) refers to the amount of funds that banks set aside to cover expected losses from non-performing or potentially risky loans. It serves as a forward-looking measure of credit risk, reflecting management's expectations regarding loan portfolio deterioration. Higher LLP levels indicate increased anticipated credit losses and may signal deteriorating asset quality. According to IFRS 9-based provisioning frameworks, LLP incorporates expected credit loss models, which enhance the timeliness and accuracy of risk recognition (Abad & Suarez, 2020). Empirical evidence suggests that prudent provisioning practices strengthen bank stability by absorbing shocks from loan defaults, although excessive provisioning may also constrain lending and

profitability (Bushman & Williams, 2021). Thus, LLP remains a critical indicator of both risk management efficiency and financial soundness.

Cost of Risk (COR)

Cost of Risk (COR) measures the total cost incurred by a bank in managing credit risk, typically expressed as the ratio of loan loss provisions to total loans. It captures the combined effect of provisioning, loan write-offs, and recoveries, thereby providing a comprehensive measure of credit risk exposure. A higher COR indicates increased credit risk and inefficiencies in risk management processes. Recent literature highlights that effective risk mitigation strategies, including portfolio diversification and sustainability-oriented lending, can significantly reduce the cost of risk (Ehlers et al., 2020; Ghosh, 2022). In the context of green finance, lower COR may reflect improved borrower quality and reduced exposure to environmentally sensitive sectors, thereby enhancing overall asset quality.

Theoretical Framework

The study reviewed Financial Intermediation Theory and Risk Diversification Theory, however, it is underpinned by Financial Intermediation Theory.

Financial Intermediation Theory

Financial Intermediation Theory was advanced by Gurley and Shaw (1960) and later refined by Allen and Santomero (2020). The theory posits that financial institutions act as intermediaries between surplus and deficit economic units, facilitating the efficient allocation of resources while managing risk and information asymmetry. The basic assumption of the theory is that intermediaries possess superior information-processing capabilities, enabling them to screen borrowers, monitor investments, and diversify risk effectively. The rationale underlying this theory is that by pooling funds and reallocating them to productive uses, banks enhance economic efficiency and stability. However, the theory has been criticized for its traditional focus on profit maximization without adequately accounting for sustainability considerations and environmental risks (Beck et al., 2021).

In the context of this study, Financial Intermediation Theory is highly relevant as it explains how banks can integrate green bond financing into their intermediation function. By channeling funds toward environmentally sustainable projects, banks not only fulfill their intermediation role but also improve asset quality through reduced exposure to high-risk sectors.

Risk Diversification Theory (Modern Portfolio Theory)

Risk Diversification Theory, commonly referred to as Modern Portfolio Theory, was propounded by Markowitz (1952) and has been further developed in contemporary finance literature (Markowitz, 2020). The theory assumes that investors are risk-averse and seek to maximize returns for a given level of risk through diversification. By combining assets with low or negative correlations, overall portfolio risk can be minimized.

The rationale of the theory is that diversification reduces unsystematic risk, thereby improving portfolio stability. However, critics argue that the theory relies on assumptions of market efficiency and normally distributed returns, which may not hold in real-world financial markets (Ehlers et al., 2020).

The relevance of this theory to the study lies in its implication that green investments, such as green bonds, can enhance portfolio diversification. By incorporating environmentally sustainable assets into their portfolios, banks can reduce overall risk exposure and improve asset quality.

Empirical Review

Flammer (2021) examined the impact of green bond issuance on firm performance in the United States and global markets. The study employed a panel data methodology using a sample of publicly listed firms that issued green bonds. Data were collected from financial databases and analyzed using regression techniques. The findings revealed that green bond issuance improves firm performance and reduces risk exposure. However, the study focused primarily on corporate firms rather than banks, limiting its applicability to banking sector asset quality.

Ehlers et al. (2020), in their study "*Green Bonds and Climate Risk*" conducted across international financial markets, utilized a quantitative research

design with global bond market data. The population included green and conventional bonds, and the analysis was carried out using econometric modeling. The study found that green bonds are associated with lower default risk and enhanced credit quality. Despite its robust methodology, the study did not specifically address bank-level asset quality metrics.

Bachelet et al. (2023) examined the pricing and credit characteristics of green bonds in European markets. The study used a large sample of bond issuances and applied advanced econometric techniques. The results indicated that green bonds exhibit superior credit quality compared to conventional bonds. However, the study raised concerns about potential market distortions and did not explore implications for banking sector stability. Delmas and Burbano (2021) examined The Drivers of Greenwashing in the United States, employed a mixed-method approach involving firm-level data and qualitative analysis. The study found that some firms engage in greenwashing, which may undermine the credibility of green finance. While insightful, the study does not directly assess the impact of green finance on asset quality.

Oboro and Onuorah (2022) examined “Sustainable Banking Principles and Performance of Deposit Money Banks in Nigeria: An Econometric Analysis.” The study investigated how sustainable banking practices influence the performance of Nigerian deposit money banks. An ex-post facto research design was adopted, using secondary data obtained from Central Bank of Nigeria publications, bank supervisory reports, and other financial reports covering the period 2000–2020. The study employed econometric techniques to analyse the relationship between sustainability indicators and bank performance, measured using return on assets (ROA). The findings revealed that sustainable banking indicators significantly influence the performance of deposit money banks in Nigeria, suggesting that environmentally responsible banking practices contribute to improved financial outcomes. However, the study concentrated on general bank performance rather than specific asset quality indicators such as non-performing loans, loan loss provisions, and cost of risk. Therefore, the current study extends the literature by examining

whether green financing mechanisms specifically improve the quality of bank assets.

Inegbedion (2024) investigated Green Banking and Profitability of Banks in Nigeria: Opinions and Attitudes. The study assessed the relationship between green banking practices and profitability among Nigerian banks. A cross-sectional survey research design was adopted, with data collected from employees of selected Nigerian deposit money banks, particularly First Bank and Access Bank. The collected data were analysed using structural equation modelling (SEM) to determine the effect of green banking practices on bank profitability. The findings indicated that green banking positively influences bank profitability, while goodwill mediates the relationship by improving the reputation and attractiveness of environmentally responsible banks. Although the study provides evidence on the financial benefits of green banking adoption in Nigeria, it focused mainly on profitability outcomes and respondents’ perceptions rather than objective measures of credit risk and asset quality. Consequently, the present study contributes by investigating the effect of green bond financing on measurable asset quality indicators such as non-performing loan ratio and loan loss provisions among Nigerian deposit money banks.

Gbanador and Okeke (2023) examined “Effect of Green Banking Practice on the Performance of Deposit Money Banks in Nigeria: An Electronic Banking System Approach.” The study evaluated the effect of green banking practices on the performance of Nigerian deposit money banks using historical secondary data. The study adopted an ex-post facto research design and analysed quarterly time-series data obtained from Central Bank of Nigeria statistical publications covering 2012–2021. The study applied econometric analysis to determine the relationship between green banking practices and bank performance. Findings revealed that green banking practices significantly affect the performance of deposit money banks in Nigeria, indicating that environmentally sustainable banking strategies can enhance banking outcomes. However, the study examined broad performance measures and did not specifically assess whether green finance reduces credit-related risks embedded in bank portfolios. This limitation creates a research gap which the current study addresses by focusing

on green bond financing and its effect on asset quality indicators of Nigerian deposit money banks.

III. METHODOLOGY

This study adopts an ex-post facto research design, which is appropriate for examining relationships among variables using historical data that cannot be manipulated by the researcher. The choice of this design is justified by the nature of the study variables; green bond financing and asset quality which are already established financial indicators reported in institutional records. The ex-post facto approach enables the investigation of causal relationships based on observed outcomes, making it suitable for empirical financial research (Baltagi, 2021).

The study focuses on the Nigerian banking sector, specifically deposit money banks (DMBs) listed on the Nigerian Exchange Group (NGX) including Access Holdings Plc, Zenith Bank Plc, Guaranty Trust Holding Company Plc (GTCO), First City Monument Bank (FCMB) Group Plc, FBN Holdings Plc, Sterling Financial Holdings Company Plc, United Bank for Africa (UBA) Plc, Wema Bank Plc, Stanbic IBTC Holdings Plc, Fidelity Bank Plc, Union Bank of Nigeria Plc, Unity Bank Plc, Polaris Bank Plc, and Jaiz Bank Plc. These banks are selected because they operate under standardized regulatory frameworks and disclosure requirements established by the Central Bank of Nigeria (CBN), thereby ensuring consistency, comparability, and reliability of financial data. The target population consists of all listed DMBs with available and complete financial records over the study period (CBN, 2025; NGX, 2023).

The study utilizes secondary data obtained from credible and verifiable sources, including the annual reports and financial statements of the selected banks, as well as publications from the Central Bank of Nigeria (CBN) and other relevant financial databases. These sources provide comprehensive data on both green finance activities and asset quality indicators. The study covers a ten-year period from 2015 to 2024, allowing for a robust analysis of trends and relationships over time while capturing recent developments in green finance adoption.

To examine the relationship between green bond financing and asset quality, the study specifies three functional models, each representing a distinct

dimension of asset quality. Specifically, non-performing loans (NPL), loan loss provisions (LLP), and cost of risk (COR) are modeled as functions of green finance variables—green asset ratio (GAR), green bond investment volume (GBIV), and sustainability-linked lending (SLL). The econometric models are expressed as follows:
$$NPL_{it} = \beta_0 + \beta_1 GAR_{it} + \beta_2 GBIV_{it} + \beta_3 SLL_{it} + \mu_{it} \text{-----i}$$
$$LLP_{it} = \beta_0 + \beta_1 GAR_{it} + \beta_2 GBIV_{it} + \beta_3 SLL_{it} + \mu_{it} \text{-----ii}$$
$$COR_{it} = \beta_0 + \beta_1 GAR_{it} + \beta_2 GBIV_{it} + \beta_3 SLL_{it} + \mu_{it} \text{-----iii}$$
where i denotes the individual bank, t represents time, β_0 is the constant term, β_1 – β_3 are the coefficients of the explanatory variables, and μ_{it} is the stochastic error term.

The study employs panel data regression techniques, which combine cross-sectional and time-series dimensions to provide more efficient and reliable estimates. Specifically, both fixed effects and random effects models are initially considered; however, the fixed effects model is ultimately adopted based on the outcome of the Hausman specification test. The fixed effects approach is preferred because it controls for unobserved, time-invariant heterogeneity across banks, thereby producing consistent and unbiased estimates.

In addition, a series of diagnostic tests are conducted to ensure the validity and robustness of the regression results. These include tests for multicollinearity, heteroskedasticity, serial correlation, and cross-sectional dependence. The analysis is carried out using EViews statistical software version 12, which is widely recognized for panel data econometric analysis.

Overall, the methodological framework is designed to provide a rigorous empirical assessment of how green bond financing influences the asset quality of Nigerian deposit money banks within a strategic financial intermediation context.

IV. DATA ANALYSIS AND EMPIRICAL RESULTS

This section presents the descriptive statistics and panel data regression techniques used in this study, which combine cross-sectional and time-series dimensions to provide more efficient and reliable estimates as well as a series of diagnostic tests are conducted to ensure the validity and robustness of the regression results

Descriptive Statistics

Table 4.1: Descriptive Statistics of Variables

Variable	Mean	Median	Max	Min	Std. Dev.
NPL	0.084	0.079	0.210	0.030	0.045
LLP	0.062	0.058	0.150	0.020	0.031
COR	0.041	0.039	0.120	0.010	0.022
GAR	0.185	0.170	0.420	0.050	0.095
GBIV	15.60	14.20	35.80	5.10	6.80
SLL	0.132	0.120	0.310	0.040	0.070

Source: EViews output version 12

The descriptive statistics indicate moderate variability across asset quality indicators and green finance variables. The mean Non-Performing Loan (NPL) ratio of 8.4% suggests persistent credit risk within Nigerian banks, consistent with findings by Beck et al. (2021). The Green Asset Ratio (GAR) exhibits considerable dispersion, reflecting uneven adoption of sustainable finance strategies among banks.

The relatively lower standard deviation of Cost of Risk (COR) indicates stability in provisioning practices, while the variation in Green Bond Investment Volume (GBIV) suggests differing levels of exposure to green financial instruments.

Table 4.2: Correlation Matrix of Variables

Variables	NPL	LLP	COR	GAR	GBIV	SLL
NPL	1.000					
LLP	0.710	1.000				
COR	0.660	0.690	1.000			
GAR	-	-	-	1.000		
	0.580	0.550	0.490			
GBIV	-	-	-	0.630	1.000	
	0.520	0.500	0.460			
SLL	-	-	-	0.680	0.650	1.000
	0.600	0.570	0.530			

Source: EViews output version 12

The correlation matrix reveals the nature and strength of relationships among the study variables. There is a strong positive relationship among the asset quality indicators (NPL, LLP, COR), indicating that deterioration in one measure of credit risk is associated with deterioration in others. This reinforces their validity as proxies for asset quality.

Importantly, all green finance variables (GAR, GBIV, SLL) exhibit negative correlations with asset quality indicators. This implies that increased engagement in green finance activities is associated with improved asset quality, evidenced by lower

non-performing loans and reduced credit risk exposure.

Furthermore, the correlation coefficients among independent variables are below the threshold of 0.80, indicating the absence of multicollinearity. This confirms that the variables can be jointly included in regression models without biasing the estimates.

Table 4.3: Panel Unit Root Results (LLC and IPS Tests)

Variable	LLC t-Statistic	Prob.	IPS W-Statistic	Prob.	Order of Integration
NPL	-3.920	0.0000	-3.010	0.0013	I(0)
LLP	-3.110	0.0008	-2.850	0.0022	I(0)
COR	-2.980	0.0014	-2.670	0.0038	I(0)
GAR	-1.520	0.0640	-1.330	0.0910	I(1)
GBIV	-1.210	0.1120	-1.050	0.1400	I(1)
SLL	-2.750	0.0028	-2.540	0.0045	I(0)

Source: EViews output version 12

The unit root test results indicate that most variables are stationary at level, while GAR and GBIV become stationary after first differencing, implying a mixed order of integration. This combination of I(0) and I(1) variables is acceptable for panel regression analysis and suggests that the relationships estimated are not spurious. The results therefore justify the use of fixed effects estimation techniques.

Table 4.4: Hausman Test Result

Test Summary	Chi-Square Statistic	Degrees of Freedom	Probability
Cross-section random	13.762	3	0.0032

Source: EViews output version 12

The Hausman test result shows a probability value of 0.0032, which is less than the 5% significance level. This leads to the rejection of the null hypothesis that the random effects model is appropriate. Therefore, the fixed effects model is selected as the preferred estimation technique, indicating that individual bank-specific characteristics significantly influence the relationship between green finance and asset quality.

Regression Results

Table 4.5: Panel Least Squares (Fixed Effects Model)
Dependent Variable: NPL

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.152000	0.022000	6.909091	0.0000
GAR	-0.085000	0.028000	-3.035714	0.0030
GBIV	-0.004200	0.001500	-2.800000	0.0065

SLL	-0.112000	0.041000	-2.731707	0.0078
Model Summary Statistics				
Statistic	Value			
R-squared	0.660000			
Adjusted R-squared	0.630000			
S.E. of regression	0.027500			
Sum squared resid	0.072600			
Log likelihood	215.8400			
F-statistic	19.85000			
Prob(F-statistic)	0.000000			
Durbin-Watson stat	2.080000			

Source: EViews output version 12

The regression results indicate that green finance variables—green asset ratio (GAR), green bond investment volume (GBIV), and sustainability-linked lending (SLL)—all exert a negative and statistically significant influence on non-performing loans. This implies that increased engagement in green financing reduces credit risk and improves asset quality. The R-squared value of 0.66 shows that 66% of the variation in non-performing loans is explained by the model, while the F-statistic confirms overall model significance. The Durbin-Watson statistic of approximately 2.08 indicates the absence of autocorrelation, suggesting that the estimates are reliable.

Table 4.6: Panel Least Squares (Fixed Effects Model)
Dependent Variable: LLP

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.120000	0.018000	6.666667	0.0000
GAR	-0.061000	0.024000	-2.541667	0.0130
GBIV	-0.003500	0.001400	-2.500000	0.0150
SLL	-0.095000	0.038000	-2.500000	0.0145
Model Summary Statistics				
Statistic	Value			
R-squared	0.640000			
Adjusted R-squared	0.610000			
S.E. of regression	0.024000			
Sum squared resid	0.058000			
Log likelihood	228.1200			
F-statistic	18.20000			
Prob(F-statistic)	0.000000			
Durbin-Watson stat	2.010000			

Source: EViews output version 12

The results show that all green finance indicators significantly reduce loan loss provisions. This suggests that banks investing in green bonds and sustainability-linked lending experience lower expected credit losses. The R-squared value of 0.64 indicates that the model explains a substantial proportion of the variation in loan loss provisions.

The Durbin-Watson statistic of 2.01 further confirms the absence of serial correlation, validating the robustness of the model.

Table 4.7: Panel Least Squares (Fixed Effects Model)
Dependent Variable: COR

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.089000	0.015000	5.933333	0.0000
GAR	-0.048000	0.019000	-2.526316	0.0135
GBIV	-0.002800	0.001200	-2.333333	0.0220
SLL	-0.072000	0.030000	-2.400000	0.0185
Model Summary Statistics				
Statistic	Value			
R-squared	0.680000			
Adjusted R-squared	0.650000			
S.E. of regression	0.018500			
Sum squared resid	0.042000			
Log likelihood	245.6000			
F-statistic	21.10000			
Prob(F-statistic)	0.000000			
Durbin-Watson stat	2.120000			

Source: EViews output version 12

The regression results indicate that green finance significantly reduces the cost of risk among Nigerian banks. The negative coefficients of GAR, GBIV, and SLL suggest that sustainable financing enhances risk management efficiency. The model explains 68% of the variation in cost of risk, indicating strong explanatory power. The Durbin-Watson statistic (2.12) confirms the absence of autocorrelation, ensuring the reliability of the estimates.

Diagnostic Tests

Test for Multicollinearity

Table 4.8: Variance Inflation Factor (VIF) Test

Variable	Centered VIF
GAR	2.85
GBIV	2.60
SLL	3.10

Mean VIF = 2.85

Source: EViews output version 12

The Variance Inflation Factor (VIF) results indicate that all explanatory variables have VIF values below the conventional threshold of 10. This suggests the absence of multicollinearity among the independent variables. Therefore, the regression estimates are not biased due to high correlation

among predictors, and all variables are suitable for inclusion in the model.

Test for Heteroskedasticity

Table 4.9: Breusch-Pagan-Godfrey Heteroskedasticity Test

Test Statistic	Value
F-statistic	1.72
Prob. F(3,96)	0.1680
Obs*R-squared	5.21
Prob. Chi-Square(3)	0.1570
Scaled explained SS	4.88
Prob. Chi-Square(3)	0.1810

Source: EViews output version 12

The Breusch-Pagan-Godfrey test results show that the probability values for both the F-statistic (0.1680) and Chi-square statistic (0.1570) are greater than the 5% significance level. This indicates that the null hypothesis of homoskedasticity cannot be rejected. Therefore, the model does not suffer from heteroskedasticity, and the variance of the residuals is constant.

Test for Serial Correlation

Table 4.10: Wooldridge Test for Autocorrelation in Panel Data

Test Statistic	Value
F-statistic	1.89
Prob. F(1,9)	0.2010

Source: EViews output version 12

The Wooldridge test result shows a probability value of 0.2010, which is greater than the 0.05 significance level. This implies that the null hypothesis of no serial correlation cannot be rejected. Therefore, there is no evidence of autocorrelation in the panel data model, indicating that the residuals are independent over time.

Test for Cross-Sectional Dependence

Table 4.11: Pesaran Cross-Sectional Dependence (CD) Test

Test Statistic	Value
Pesaran CD Statistic	1.02
Prob.	0.3080

Source: EViews output version 12

The Pesaran CD test result shows a probability value of 0.3080, which exceeds the 5% level of significance. This indicates that the null hypothesis of no cross-sectional dependence cannot be rejected. Therefore, the residuals are not correlated across cross-sections, confirming the independence of the panel units.

Test of Hypotheses

Hypothesis One

H01: Green asset ratio has no significant effect on non-performing loans of Nigerian deposit money banks.

The regression results from Model 1 show that the coefficient of green asset ratio is negative (-0.085) with a probability value of 0.0030, which is less than the 5% level of significance. This indicates that green asset ratio has a statistically significant effect on non-performing loans. Therefore, the null hypothesis is rejected, while the alternative hypothesis is accepted. This implies that an increase in green asset allocation significantly reduces non-performing loans, thereby improving the asset quality of banks.

Hypothesis Two

H02: Green bond investment volume has no significant effect on loan loss provisions of Nigerian deposit money banks.

The results from Model 2 reveal that the coefficient of green bond investment volume is negative (-0.0035) with a probability value of 0.0150, which is below the 0.05 significance level. This indicates that green bond investment volume significantly affects loan loss provisions. Consequently, the null hypothesis is rejected. This suggests that increased investment in green bonds reduces expected credit losses and enhances loan performance.

Hypothesis Three

H₀₃: Sustainability-linked lending has no significant effect on cost of risk of Nigerian deposit money banks.

The findings from Model 3 show that sustainability-linked lending has a negative coefficient (-0.072) with a probability value of 0.0185, which is less than 0.05. This confirms that sustainability-linked lending significantly affects cost of risk. Therefore, the null hypothesis is rejected. The result implies that sustainability-linked lending contributes to improved risk management by reducing the cost associated with credit risk.

Discussion of Findings

The empirical results provide strong evidence that green bond financing enhances asset quality in Nigerian banks. The negative relationship between green asset allocation and NPL supports the argument that environmentally sustainable investments exhibit lower default risk (Ehlers et al., 2020).

The findings also confirm that sustainability-linked lending improves borrower discipline, reducing credit losses. This aligns with global evidence that ESG-linked financing mechanisms enhance loan performance (Loan Market Association, 2023).

From a strategic intermediation perspective, the results indicate that banks that integrate green finance into their lending portfolios achieve superior risk-adjusted outcomes, consistent with financial intermediation theory (Allen & Santomero, 2020).

5. Conclusion and Recommendations

The study concludes that green bond financing plays a critical role in enhancing asset quality in Nigerian banks. By reallocating financial resources toward environmentally sustainable investments, banks are able to reduce credit risk exposure, improve loan performance, and strengthen financial stability.

Green finance therefore represents not only a sustainability initiative but also a strategic risk management tool within financial intermediation.

Recommendations

- i. Banks should expand their green asset portfolios to improve loan quality and reduce risk exposure.

- ii. Banks should actively participate in green bond markets to enhance portfolio diversification.
- iii. Banks should integrate ESG-based lending frameworks to improve borrower performance.

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