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ORIGINAL CONTRIBUTION

The Moderating Role of ESG Reporting Between Bank Risk Exposures and Financial Stability of International Categorized Deposit Money Banks

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Abstract— The financial stability and ESG reporting of Deposit Money Banks (DMBs) have become a global concern for investors due to the risk exposure experienced by banks in driving global and domestic economic investment. Regulators in the DMBs industry have laid down banking ESG reporting policy and regulating mechanisms to achieve financial stability due to risk exposure experienced by DMBs in the banking operations. Despite the Central Bank of Nigeria (CBN) intervention for sound ESG reporting and financial stability, Nigerian International categorsied banks are continuously exposed to various risks and poor reporting on ESG which threaten financial stability. The study examined the effect of bank risk exposure on financial stability as well as the moderating influence of ESG reporting with bank risk exposure on financial stability of International Categorised DMBs in Nigeria. An Expost facto research design was employed with panel regression and SGMM within the period of 2014 to 2025. The findings revealed that bank risk exposures had negative and positive significant influence on financial stability as well as ESG reporting significantly moderate among International categorized DMBs in Nigeria. The study concluded that there exists significant moderation influenced by ESG reporting with bank risk exposure on financial stability. The study suggested that the CBN should enforce the integration of quality ESG reporting into the risk governance contexts of DMBs to achieve financial stability of international classified DMBs in Nigeria

Index Terms— ESG, Financial stability, Inflation rate, Bank risk exposure, Real gross domestic product

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Introduction

Commercial banks' operations face a variety of risks, including lending activities, funding pressures, financial market fluctuations, internal processes, and emerging Environmental, Social and Governance (ESG) concerns. When these risks are not detected and managed properly, they can damage banks' financial continuity, limit their resilience to unanticipated economic disruptions, and jeopardize the banking system's financial stability (Fakunmoju, 2026). The situation is especially pertinent in Nigeria, where commercial banks or Deposit Money Banks (DMBs) operate in an economic climate marked by macroeconomic uncertainty, shifting regulatory frameworks, inadequacies in corporate governance, and rising Environmental, Social and Governance (ESG) challenges, which in turn threaten financial stability.

DMBs financial stability is a global concern to all economic agents, due to financial intermediaries' functions play in driving global and domestic economic activities and investment. Regulators of the deposit money banks industry thrive and emphasize banking policy and regulations mechanisms to ensure financial stability due to the risk exposure characterized by banks; this can enhance the survival and long-term operation of deposit money banks. Globally, Ngo et al. (2025) pointed out that commercial banks or Deposit Money Banks (DMBs) constitute a pillar of a

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significant proportion of financial intermediation, thus financial stability of these banks is therefore essential for maintaining public confidence and ensuring efficient resource allocation. However, the banking industry is continuously exposed to various forms of risks that may threaten its financial soundness and long-term stability.

Bank risk exposure is a situation of financial institutions' vulnerability to possible losses brought on by operational and external uncertainty, which include credit, liquidity, market, operational, and solvency risks were just a few of the risks, that Deposit Money Banks (DMBs) frequently face (Jegede et al., 2024; Ozili, 2025), this is due to lending activities serve as primary source of bank revenue. Bank risks via credit risk exposure, liquidity risk exposure, market risk exposure, operational risk exposure, and solvency risk were sometimes considered the most important risks DMBs experience during their financial intermediary role, and these risks adversely impact banks' overall stability, capital health, and profitability in Nigeria.

The ability of banks to withstand both internal and external disruptions while effectively carrying out their primary duties of financial intermediation is referred to as financial stability (Ozili, 2025). Strong capital adequacy, high-quality assets, sufficient liquidity levels, and steady profitability are characteristics of a stable banking system. Regulators have given the challenges of financial stability a lot of attention, predominantly in the aftermath of the global financial meltdown of 2007-2009 and the ongoing problems with the banking industry in many developing nations like Nigeria. The removal of Heritage Bank Plc's operating license in Nigeria in 2024 highlighted the vital need for strong risk management frameworks and improved financial resilience among banking institutions.

Akarogbe et al. (2024) pointed out that Nigeria's banking sector faces difficult economic circumstances, including volatile currency rates, ongoing inflationary tendencies, growing borrowing costs, and general economic uncertainty. These circumstances make banks more vulnerable to risk and may make it more difficult for them to maintain long-term financial stability. Furthermore, new operational and cyber-related risks have emerged because of the quick development of digital banking services and ongoing modifications to regulatory frameworks, making efficient risk management crucial for guaranteeing the security and resilience of financial institutions.

The Central Bank of Nigeria and the Nigeria Deposit Insurance Corporation have put in place several policy initiatives and supervisory measures to strengthen the banking sector and enhance risk management, although several issues still exist. The stability of Deposit Money Banks in Nigeria is nevertheless threatened by challenges like credit risk exposure, liquidity risk exposure, market risk exposure, operational risk exposure, and capital risk. These persistent challenges emphasize how crucial it is to carry out additional empirical research to gain a profound understanding of the relationship between risk exposures and bank financial stability. High levels of risk exposure impair banks' financial stability by destructively DMBs profitability, weakening capital strength, decreasing liquidity, and raising the likelihood of a financial crisis or failure (Atari et al., 2026).

Theoretically, financial fragility hypothesis argued that financial network theory states that risks in one bank can quickly spread to other linked banks, generating systemic vulnerabilities that could cause the banking to become financially unstable. Effective management of credit, liquidity, market, and operational risks is crucial for preserving financial performance in the Nigerian banking industry (Akarogbe et al., 2024; Animasaun et al., 2025; Jegede et al., 2024). However, most of these past studies failed to investigate how ESG reporting moderate with bank risk exposures and their influence on the stability of international authorized banks in Nigeria. Hence, a research lacuna exists in past empirical studies, which motivates this study.

Deposit Money Banks (DMBs) operate as financial intermediation, mobilizing deposits, offering credit facilities, and supporting general economic activity. The banking sector, by the nature of their business operations faces a lot of risks, such as credit risk exposure, liquidity risk exposure, market risk exposure, operational risk exposure, and solvency risk which in most cases lead some of them to develop distress syndrome thus led to collapse of DMBs in Nigeria (Ozili, 2025). The ability of DMBs to sustain financial stability and strength in their finances is crucial to the efficacy of DMBs operations. However, scholars such as Adem (2023) were worries over banks' ability to maintain financial stability and resist unfavorable economic and financial shocks have increased due to increased risk exposure to a variety of banking risks, such as credit, liquidity, market, operational, and solvency risks. Due to these worries from various scholars and banking regulatory institutions, CBN in the year 2024 instigate new recapitalization of DMBs in Nigeria from ₦25 billion to ₦500 billion for international authorization bank while ₦200 billion national authorization bank. Despite this recent reform of DMBs by CBN, there still exist threat to DMBs financial stability due to various risk exposure measures like credit risk exposure, liquidity risk exposure, market risk exposure, operational risk exposure, and solvency risk.

The Nigerian banking sector has been functioning in an environment marked by significant economic instability in recent years, including ongoing inflation, erratic currency prices, rising interest rates, and unpredictable economic conditions, which had led to various risks for DMBs and unable to achieve targeted financial stability (Adem, 2023). These uncontrollable environmental elements have made DMBs more vulnerable to several types of risks and raised questions about their long-term ability to maintain sound financial stability (Ozili, 2025). Even though banks in Nigeria have partially maintained a respectable degree of financial stability due to several years of reform and banking regulation, the persistent problem of risks exposure characterized with DMBs operations caused an increase in non-performing loans, lack of liquidity, losses associated with exchange rates volatility, and operational flaws, continues to endanger Nigerian DMBs financial stability (Animasaun et al., 2025; Hoong, 2025).

A variety of institutional and operational obstacles limit ESG reporting's usefulness as a method for improving risk management and sustaining financial stability in Nigeria's banking sector. One major concern is the lack of comprehensive uniformity in ESG disclosure standards, which can impair the comparability and utility of information disclosed by different institutions (Ozili, 2025). The restricted availability of reliable ESG data, combined with the significant resources necessary for data collection, reporting, compliance, and verification, may further limit effective disclosure. Furthermore, some banks may lack the specialized staff and technical capabilities needed to identify, measure, and communicate ESG

risks effectively. Inadequate ESG reporting may reduce the capacity of DMBs to anticipate and manage emerging risks, with possible implications for their credit, liquidity, market, operational, and overall financial stability (Fakunmoju, 2026).

Even though there is a large amount of empirical research reviewed focused on link between risks and financial performance proxied with profitability, equity return, asset returns, and net profit margin, while little attention focused on the connection between DMBs risk and financial stability among international and national authorized banks in Nigeria. Furthermore, rather than looking at the combine effects of various risk exposures like credit risk exposure, liquidity risk exposure, market risk exposure, operational risk exposure, and solvency risk on bank stability, proxied with the bank financial stability index, and the moderating influence of ESG reporting of DMBs in Nigeria, earlier research has mostly concentrated on individual risk factors on performance, leaving a gap that calls for more empirical research, and this gap identified motivate this study.

Literature Review

The study anchored on institutional theory and the Financial Fragility Hypothesis (FFH), which explained how ESG reports moderate bank risks and bank financial stability relationship.

Institutional Theory

Institutional theory provides a theoretical explanation for the relationship between banks' risk exposures and their financial stability, as mediated by Environmental, Social, and Governance (ESG) reporting. According to the idea, which was first proposed by Meyer and Rowan (1977) and later developed by DiMaggio and Powell (1983), external institutional pressures have a significant influence on bank behavior around risk taking and core strategies line for financial stability. Pyka et al. (2025) noted that institutional theory enhanced formal banking rules to embrace ESG reporting, established professional norms, stakeholder pressures, and prevalent society values are the reasons for ESG reporting, risk and financial stability targets. Deposit money banks (DMBs) must adhere to these standards by institutionalizing procedures that encourage transparency and accountability, such as ESG disclosure and sound risk frameworks to preserve DMBs financial stability (Fakunmoju, 2026).

According to institutional theory, Nigeria's International categorized DMBs are subject to several institutional and stakeholder expectations that promote ethical banking practices and increased openness in ESG-related disclosures. The CBN and other regulatory bodies, together with shareholders, depositors, foreign investors, and other stakeholders, may be the source of these expectations (Alhamrani et al., 2026; Madjid et al., 2026). Banks can disclose information on their environmental initiatives, social responsibilities, governance structures, risk-control procedures, board oversight, and ethical standards through ESG reporting, with the objective of achieve financial stability (Mirza et al., 2025). ESG reporting may increase accountability, boost stakeholder confidence, and facilitate more efficient identification and management of bank risk exposures by making such information more readily available and of higher quality.

Financial Fragility Hypothesis (FFH)

The financial fragility hypothesis was propounded by Minsky (1992). Minsky's Financial Fragility Hypothesis states that as commercial banks consistently raise their exposure to debt, leverage, and other types of financial risk, they become more vulnerable to financial instability. Bank management may become overconfident and encourage more aggressive risk-taking during a protracted period of favorable economic conditions. Banks face increased liquidity strain and a diminished ability to withstand financial shocks as risk exposures mount, making them more vulnerable overall and endangering financial stability. Minsky (1992) FFH assumes that commercial banks may become financially fragile as credit risk, liquidity risk, market risk, operational risk, and leverage exceed their ability to absorb losses. Thus, sound risk management, appropriate capital, and regulatory monitoring are required to ensure financial stability.

Nishi (2019) and Ryoo (2013) align with Minsky (1992) position that prolonged periods of economic and financial stability may encourage commercial banks to take increasing risks, eventually making the financial system more vulnerable to instability. Minsky contends that financial organizations may grow more vulnerable as they acquire excessive debt, risk, and leverage. Economic stability might encourage banks to take more risks, creating financial fragility over time. This theory provides a strong explanation for the relationship between risk exposure, leverage, liquidity concerns, and bank instability. An increase in bank risk exposures beyond sustainable levels increases financial fragility and consequently reduces the financial stability of commercial banks. Thus, the mathematical models for bank risk exposures and financial stability are displayed below.

Globally, commercial banks have,

Assets - L = Loans

Liabilities - D_b = Deposits, E = Equity

Leverage Ratio:

$$l = \frac{L}{E}$$

Assets $- L =$ Loans

$$\text{Liabilities} - D_b = \text{Deposits}, \quad E = \text{Equity}$$

Risk exposure of bank

$$RE = \frac{\text{Risk Weighted Assets}}{\text{Total Assets}} = \theta \tag{1}$$

Where θ rises when commercial banks move from hedge to speculative to lending. Inculcating Minsky-Keen Model to Banking Model to explain bank financial fragility via stability.

The four Minsky variables were;

$$\omega = \text{Wage Share}$$

$$\lambda = \text{Employment Rate}$$

$$d = \frac{D}{Y} = \text{Private Debt Ratio of Firms}$$

$$f = \text{Bank Financial Fragility}$$

absorb as bank financial stability.

Wage dynamics:

$$\frac{d\omega}{dt} = \omega\left[\phi(\lambda) - \alpha\right] \tag{2}$$

Employment dynamics

$$\frac{d\lambda}{dt} = \lambda\left[\frac{\hat{k}(\pi_e, f)}{v} - \delta - \alpha - \beta\right] \tag{3}$$

Now investment $\hat{k}$ depends on both expected profit $\pi_e = 1 - \omega - rd$ and bank fragility f.

$$\frac{\partial \hat{k}}{\partial f} < 0$$

For private debt dynamics

$$\frac{dd}{dt} = d[r(f) - g] + \hat{k}(\pi_e, f) - (1 - \omega) \tag{4}$$

Interest rate $r(f) = r_0 + pf$ is endogenous because commercial banks risk exposure rises, banks charge higher risk premium p.

To account for bank risk exposure in the equation 4,

$$\frac{df}{dt} = \varphi_1(g - g_0) + \varphi_2(d - d_0) - \varphi_3(CAR - CAR_{\text{target}}) \tag{5}$$

This is the Minsky built up, where;

$$\varphi_1 > 0$$

= During Boom $g > g_0$, Confidence rises, banks lower lending standard and f rises. This is an indicator of "stability is destabilizing".

$$\varphi_2 > 0$$

= Rising private debt d increases loan to asset ratio to higher risk exposure.

$$\varphi_3 > 0$$

= Higher capital adequacy ratio (CAR) = E/L reduces fragility.

Where: f can be measured as;

$$f_t = w_1 \frac{NPL_t}{TotalLoans_t} + w_2 \frac{L_t}{E_t} + w_3(1 - LCR_t) \tag{6}$$

Where;

$$NPL = \text{NPL}$$

$$L/E = \text{Leverage}$$

$$LCR = \text{LCR}$$

$$f_t = \text{Financial Stability}$$

Thus, Equation 5 is transformed into equation 6 in the study econometric model. The euqation 5 explained theoretical mathematical model of the underpinned theory which served as the study model in the methodology.

The study by Elbadry (2018) empirically focused on the effect of regulations with risk exposures (credit risk and insolvency risk) on banking stability in Africa using non-linear regression. Two-step System Generalized Method of Moments (GMM) within the period 2006–2020. The finding revealed that credit and insolvency risk do not have a uniform impact on bank stability but rather have a non-linear connection with definable threshold values. At levels below these thresholds, increases in credit and insolvency risks are associated with greater bank stability. However, when these risks exceed their respective threshold levels, their consequences worsen, threatening the stability of African banks. The study also shows that monetary policy and macroprudential regulation significantly improve bank stability. However, this study failed to consider other banks risk exposure and their influence on bank stability. Shirai (2025) empirically examined the link between climate risk, price stability, and the financial stability of Central banks in Asia. The finding revealed that central banks may manage climate change-related finances most credibly and practically by focusing on their primary goal of protecting financial stability. Using forward-thinking supervisory measures such as climate-driven scenario exercises, resilience stress testing, and stronger transparency responsibilities enables better detection and control of these bank risks across the financial sector.

Ozili (2025) investigated the link between financial risk and profitability of DMBs in Nigeria. The findings revealed that credit and operational risks were important predictors of bank profitability, with higher loan default rates and operational inefficiencies associated with weaker financial performance. Inflation-related market risk also affects profitability, while its impact is quite small. However, during the study period, liquidity risk had no statistically significant effect on profitability. Overall, the evidence suggests that Nigerian banks face greater profitability pressures due to deteriorating loan quality, inefficient operating activities, and unfavorable macroeconomic conditions, whereas improvements in liquidity management appear to have reduced the importance of liquidity-related issues. Abu Khalaf and Awad (2024) examined the influence of credit and liquidity risks on bank profitability during 2019-2023 using panel regression. Finding revealed that credit risk has a large negative impact on profitability, whereas liquidity risk has no significant effect. The liquid assets-to-deposit ratio and bank size have a positive impact on bank profitability, while GDP growth and inflation have no substantial impact.

Hunjra et al. (2022) examined the combined influence of credit, liquidity, and operational risks on the performance of banks in South Asia using GMM. Finding revealed that credit risk and operational risk substantially diminish bank profitability, indicating that rising bad loans and inefficient internal processes weigh heavily on earnings. Market risk reduces profitability, albeit with a lower impact. Conversely, liquidity risk has shown as insignificant influence on profitability trends during the review period. Collectively, the evidence points to loan defaults, cost inefficiencies, and broader macroeconomic instability as the dominant threats to Nigerian banks, while liquidity control appears to have become more effective. Henry and Adeyinka (2024) found that there exist combined influence of market and operational risks explains about 66% of ROA under the pooled model, 61% under fixed effects, and 65% under random effects. For EPS, the explanatory power is approximately 70%, 74%, and 73% across the respective models. Market risk depicted direct association with performance, while operational risk shown adverse association. Abbas et al. (2021) examined the link between funding liquidity risk and banks' risk-taking behavior using the two-step system GMM technique on US commercial banks within 2002 to 2018. Finding revealed that funding liquidity upsurges the risk-taking of US banks. Additionally, banks with high deposit volumes are less sensitive to financing shortfalls, which weakens management's oversight of aggressive risk-taking. The research implies that increasing financing liquidity increases both risk-weighted assets and liquidity creation, and that the presence of deposit insurance creates moral hazard, as banks respond to rising deposits by taking on more risk.

Adusei (2015) focused on rural banks in Ghana and reported that liquidity risk influenced by bank size; nevertheless, a positive and significant association was found between liquidity risk and bank stability in Ghana. Acharya and Mora (2015) examined how liquidity support shapes commercial bank lending behavior and concluded that elevated deposit withdrawals heighten lending risk among financial institutions. Sang Tang My (2022) focused on credit risk and financial stability with the mediating role of bank profitability. The findings revealed that size and prior period profitability had a direct influence on bank profitability, although non-performing loans, loan loss provision, non-interest income, efficiency, and bank credit growth all have a positive impact. Bank profitability has little effect on bank credit risk; however, bank stability and previous-period profitability had an influence on bank financial stability. Finally, non-performing loans, non-interest income, loan loss provision, and historical bank stability have a beneficial impact on the current financial stability of commercial banks. Herring (1999) found that credit risk triggered high-severity events, which are anticipated to pose the greatest threat to financial stability which caused possibility of financial losses.

Kim (2018) empirically indicates that banks with greater market dominance take on more liquidity risk, implying that a fall in competition increases financial fragility. During financial crises, small banks with high market power tend to lower liquidity risk, whereas large banks with high market power do not adjust their risk-taking patterns. Thus, liquidity risk is a major determinant of bank competition and financial stability.

Empirically, Hidayat et al. (2021) established that operational risk adversely affected the financial performance of the GCC banking sector. Emilia (2022) found that market risk negatively influenced the performance of microfinance banks in Nigeria. Gontarek (2017) revealed that poor management of operational risk endanger banks performance both in the short and long runs. Amdework (2021) posited that credit risk threaten performance of Ethiopian commercial banks. Aruwa et al. (2026) claimed that operational risk hindered the performance of DMBs in Nigeria. Barba and Lucenteforte (2020) focused on liquidity risk and bank profitability in emerging economies. Bello et al. (2024) focused on how financial risk connect with profitability among listed Nigerian DMBs. It was found that liquidity and operational risks had a direct significant connection with profitability, whereas interest rate risk had insignificant direct connection with profitability among listed DMBs in Nigeria.

Yousfi (2021) investigated the effect of financial risks on profitability of Islamic banks in Jordan. The finding revealed that financial risks negatively affect profitability. Million et al. (2021) studied the influence of credit risk on profitability among banks in Ethiopia, and finding established that credit risk proxy by non-performing loan, loan loss provisions, and capital adequacy significantly influenced profitability of banks in Ethiopia. Empirically, Imbierowicz and Rauch (2014) found that liquidity and credit risks had no simultaneous connection. Nevertheless, both are important considerations in bankruptcy. In view of diverse scholars such as Ngo et al. (2025), Akarogbe et al. (2024), and Hunjra et al. (2022), though there is no studies focused on combine influence of bank risk exposure proxied with credit risk exposure, liquidity risk exposure, market risk exposure, operational risk exposure and capital risk (solvency risk) on bank stability proxied with bank financial stability index of DMBs in Nigeria. Thus, there exist empirical gap that needs to be investigated, and this gap is used to formulate hypothesis:

H01: Bank Risk Exposure (credit risk exposure, liquidity risk exposure, market risk exposure, operational risk exposure and (capital risk or solvency risk) have no significant influence on bank stability proxied with bank financial stability index of DMBs in Nigeria

Environment Social and Governance (ESG) reporting entails disclosing details about how firms handle their social responsibilities, environmental responsibilities, and governance structure (Alhamrani et al., 2026; Ribando & Bonne, 2010). To improve indoctrination of ESG in the global financial system, attract sustainability-focused investors, manage risk exposures, and further global sustainability goals, the banking industry has embraced ESG reporting. Since it presents a bank as forward-thinking in tackling environmental and social issues and as dedicated to long-term stability and responsible stewardship and ESG reporting often seen as an indication of lower financing risk (Friede et al., 2015; Lisin et al., 2022). The influence of ESG on bank performance, financial stability, equity returns, and lending decisions has been thoroughly examined in previous research (Abdelsalam et al., 2023; Bătae et al., 2020; Loan et al., 2024; Mallek et al., 2024), these studies found that ESG disclosure negatively influenced bank performance, financial stability, equity returns, and lending decisions among commercial banks. Evidence further suggests that banks with a solid ESG image tend to allocate a greater share of their portfolios to consumer and commercial loans and are more inclined to lend to clients with strong sustainability credentials (Bressan, 2024; Houston & Shan, 2022).

Other empirical research has shown a decrease in lending operations during times of financial stress (Danisman & Tarazi, 2024), lower financial returns when ESG commitment exceeds an ideal threshold (Zhi et al., 2025), and declining financial performance due to growing compliance costs and resource allocation trade-offs (Nareswari et al., 2023). Furthermore, a number of studies have revealed no significant correlation between ESG reporting and financial performance (Lamanda & Tamásné Vőneki, 2024), and disclosure of environmental information has been linked to unfavorable results at the corporate level outcome (Saygili et al., 2022). Due to scale benefits from ESG, larger banks have more money to engage in ESG initiatives which attract investors, depositor trust, and information transparency, which enhanced ESG and performance (Azmi et al., 2021; Taliento et al., 2019). Moreover, larger banks are more likely to implement and disclose ESG policies because of their greater financial capacity, which boosts market returns (La Torre et al., 2020; Mallek et al., 2024). Therefore, large banks have more ESG-related costs even if they can leverage their size to increase performance and diversify their banking business.

In the banking industry, ESG is increasingly recognized as a key determinant of bank performance and lending conduct especially in developed and emerging economies (Fakunmoju, 2026). Studies on the moderating role of ESG reporting between bank risk exposures and financial stability of International Categorised DMBs in Nigeria close to non-existence. Examining this underlying moderating linkage is important for understanding the extent to which ESG reporting moderately influences bank risk exposure and financial stability of DMBs in Nigeria, this enhance informing regulatory policy, and for guiding banks in advancing sustainable finance agendas. Considering the empirical lacuna identified, the hypothesis below is developed:

H02: ESG reporting has no significant moderating influence with bank risk exposures on financial stability of International Categorised DMBs in Nigeria.

Data and Methodology

The study employed a quantitative approach via an expost facto research resign. This design is appropriate for examining relationships and causal inferences using scientific and quantitative techniques. Thus, the study relied on secondary data from published financial reports of selected international categorised DMBs in Nigeria. These banks were Access Bank, First Bank, GTBank, UBA, Union Bank and Zenith bank and data on study variables such as CRE, LRE, MRE, and ORE, SRE as proxy for bank risk exposure, while bank stability proxies with financial stability index with

BS, INF, and RGDP as control variables, as well as ESG Reporting (ESGR) as the moderating variable. The study variables data were sourced from international categorized published financials within the period from 2014 to 2025.

Model Specification and Estimation Methodology

Considering the equation 5 above from underpinned theory which was employed to formulate econometric equations for the study. The Minsky's Financial Fragility Hypothesis as the underpinned theory states that commercial banks consistently raise their risk exposures resulting from traditional role of financial intermediation and become more vulnerable to financial instability. The study employed panel regression, adopted Fixed Effect (FE) and Pooled OLS, as well as the SGMM to account for robust analysis of the panel data for study variables.

$$f_t = w_1 \frac{NPL_t}{TotalLoans_t} + w_2 \frac{L_t}{E_t} + w_3(1 - LCR_t) + \alpha_i + \varepsilon_{it}$$

Where;

NPLt/Total Loanst measures the proportion of the bank's loan portfolio that has fallen into default or is no longer generating repayments as scheduled. A rise in this ratio reflects a deterioration in loan quality and indicates a greater possibility that the bank may incur credit-related losses.

Lt/Et measures the relationship between the bank's outstanding loans and its equity capital. An increase in this ratio implies that lending activities are becoming larger relative to the bank's capital base, thereby increasing its exposure to potential losses arising from borrowers' inability to repay.

1-LCRt is used to reflect the bank's liquidity vulnerability through the inverse of the Liquidity Coverage Ratio. A lower LCR results in a higher value for this component, indicating that the bank has a relatively smaller liquidity buffer available to meet its short-term obligations.

(w1, w2,) and (w3) are the respective weights attached to the three risk indicators. They establish the importance assigned to each component in constructing the combined risk measure.

ft represents financial stability via bank's aggregate credit-risk index at period (t). With positive weights, an increase in the index implies worsening overall risk conditions, whereas a decline in the index suggests an improvement in the bank's financial stability.

The equation 6 was transformed to reflect bank exposure risks like credit risk exposure, liquidity risk exposure, market risk exposure, operational risk exposure and (capital risk or solvency risk) towards financial stability as response variable. Thus, equation 7 below depicted hypothesis of the study which was transformed from equation 6.

$$f_{it} = w_0 + w_1 CRE_{it} + w_2 LRE_{it} + w_3 MRE_{it} + w_4 ORE_{it} + w_5 SRE_{it} + w_6 BS_{it} + w_7 INF_{it} + w_8 RGDP_{it} + \alpha_i + \varepsilon_{it} \quad (7)$$

Equation 7 - Before Moderating of ESGR

$$f_{it} = w_0 + w_1 CRE_{it} \times ESGR_{it} + w_2 LRE_{it} \times ESGR_{it} + w_3 MRE_{it} \times ESGR_{it} + w_4 ORE_{it} \times ESGR_{it} + w_5 SRE_{it} \times ESGR_{it} + w_6 BS_{it} + w_7 INF_{it} + w_8 RGDP_{it} + \alpha_i + \varepsilon_{it} \quad (8)$$

Equation 8 - After Moderating of ESGR

Where:

Where:

f_{it} = Financial Stability

CRE = Credit Risk Exposure

LRE = Liquidity Risk Exposure

MRE = Market Risk Exposure

ORE = Operational Risk Exposure

SRE = Solvency Risk Exposure

BS = Bank Size

INF = Inflation Rate

$RGDP$ = Real Gross Domestic Product

$ESGR$ = Environment, Social and Governance Report

$w_1 - w_8$ = Coefficient of Risk Exposure Indicators and control variables

$\alpha_i + \varepsilon_{it}$ = Represents the unobserved component of the equation

Table I
Distribution of the study sample

Variable Symbols	Definition	Computation of Variables Used in the Model	Source of Data
Response Variables			
FS	Financial Stability	Financial Stability Index = (ROA + Equity/Assets) / SD(ROA)	International Categorised DMBs
Explanatory Variables			
Bank Risk Exposures (BRE)			
CRE	Credit Risk Exposure	Non-performing Loans / Total Loans	International Categorised DMBs
LRE	Liquidity Risk Exposure	Loan-to-Deposit Ratio (LDR) = Total Loans / Total Deposits	International Categorised DMBs
MRE	Market Risk Exposure	Net Interest Margin Sensitivity	International Categorised DMBs
ORE	Operational Risk Exposure	Cost-to-Income Ratio	International Categorised DMBs
SRE	Solvency Risk Exposure	Debt-to-Equity Ratio	International Categorised DMBs
Control Variables			
BS	Bank Size	Total Assets	International Categorised DMBs
INF	Inflation Rate	[(CPI(t) - CPI(t-1)) / CPI(t-1)] x 100	World Development Indicators
RGDP	Real Gross Domestic Product	[(Real GDP(t) - Real GDP(t-1)) / Real GDP(t-1)] x 100	World Development Indicators
Moderating Variable			
ESG	Environmental, Social and Governance Disclosure	Bloomberg ESG Scores	S&P Global Report

Source: Researchers' Computation (2026)

Conceptual diagram below depicted the objectives and hypotheses developed in this study.

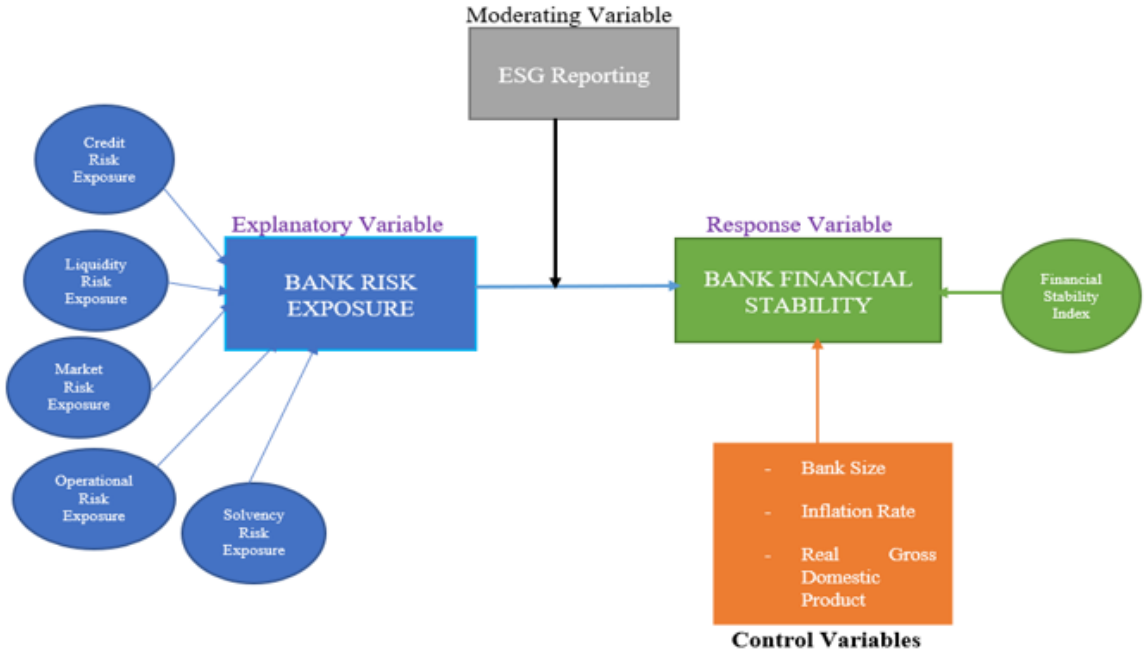


Fig. 1 *Conceptual framework*

Empirical Results and Discussions

Descriptive statistics

The descriptive statistics depicted the trend analysis of the study variables in Table II; the FS indicate an average value of 9.41, while the minimum (min) and maximum (max) values ranged from 2.18 to 20.18. The standard deviation of 4.28 shows that FS experienced a relatively wide dispersion around its mean. A skewness coefficient of 1.84 indicates that the distribution is positively skewed, while the kurtosis value of 2.91 is very close to the normal distribution benchmark of 3, while the Jarque-Bera (J-B) probability of 0.82, which exceeds the 5% significance level, implies that there exists normality trend. For CRE, the mean value was 8.61, min and max values of 5.42 and 23.42, Standard Deviation (SD) of 3.98, and

skewness of 2.04, while the kurtosis value was 3.93. Since the J-B probability value of 0.02 is lower than the 5% significance level, the CRE follows a normal distribution is rejected. LRE recorded a mean of 26.96, with minimum of 6.51 to maximum value of 30.82, with an SD of 3.25 indicating a moderate degree of variability. The skewness coefficient of 0.94 points to a mild positive skew, while the kurtosis of 1.64 suggests a distribution flatter than the normal distribution. With a *p*-value of 0.79 greater than 5% for J-B depicted that LRE is relatively consistent across observations and free from serious distributional problems.

The mean value of MRE was 4.13 (min. 2.23, max. 9.87) and the SD is 1.82, showing moderate dispersion. It exhibits high positive skewness (2.76) and is leptokurtic (5.15). With a *p*-value of 0.40 > 0.05, MRE is normally distributed, though its variation suggests that some banks/periods face markedly higher market risk. The average value of ORE is 3.92 (min. 2.79, max. 15.63) with SD of 2.74, reflecting notable dispersion. It is nearly symmetric (skewness = -0.21) and peaked with thick tails (kurtosis = 4.32). With a *p*-value of 0.94 > 0.05, normality is satisfied, though operational risk differs across the sample. The mean SRE is 5.53 (min. 1.83, max. 10.93) with SD of 1.27, indicating low dispersion. It is moderately positively skewed (1.24) and leptokurtic (4.64). Since the probability value of J-B is 0.01 < 0.05, normality is rejected for SRE, suggesting that outliers may influence its distribution.

Table II
Descriptive statistics result

Variable	Mean	Max.	Min.	Std. Dev.	Skew.	Kurt.	J-B	Prob.
FS	9.41	20.18	2.18	4.28	1.84	2.91	1.93	0.82
CRE	8.61	23.42	5.42	3.98	2.04	3.93	10.41	0.02
LRE	26.96	30.82	6.51	3.25	0.94	1.64	2.32	0.79
MRE	4.13	9.87	2.23	1.82	2.76	5.15	2.91	0.40
ORE	3.92	15.63	2.79	2.74	-0.21	4.32	4.64	0.94
SRE	5.53	10.93	1.83	1.27	1.24	4.64	2.16	0.01
INF BS	9.54 8.23	20.74 30.92	8.35 5.95	2.43 1.73	1.92 1.37	2.83 2.83	4.96 2.92	0.26 0.33
RGDP ESG	98.82 12.00	298.76 24.32	73.28 8.32	6.26 3.63	1.80 1.98	2.95 2.05	7.29 3.84	0.03 0.51

Source: Researchers' Computation (2026)

Lastly from Table II, INF averaged 9.54 with 8.35 min and 20.74 max values and SD of 2.43, showing moderate variation. It is positively skewed (1.92) and mesokurtic (kurtosis = 2.83, near 3). A *p*-value of J-B probability value was 0.26 > 0.05 confirms normality, indicating that inflation fluctuated during the period but without significant statistical problems. BS averaged 8.23 (5.95–30.92) with SD of 1.73, showing moderate variation. It is positively skewed (1.37) and approximately mesokurtic (kurtosis = 2.83). With probability value of J-B, $p = 0.33 > 0.05$, BS is normally distributed and suitable for further analysis despite observed differences. The mean RGDP is 98.82 (min. 73.28, max. 298.76) with an SD of 6.26, showing variability. It is positively skewed (1.80) and approximately mesokurtic (2.95). Since probability value of J-B, $p = 0.03 < 0.05$, RGDP violates the normality assumption, suggesting the presence of unusual observations associated with macroeconomic variations and that ESG indicates mean value of 12.00 and J-B value of 3.84 with probability <5% which insinuates that the ESG reporting among International categorized DMBs were normally distributed. Table III depicted pearson correlation matrix, which focused on connection of study variables.

Table III
Correlation matrix result

Variables	FS	CRE	LRE	MRE	ORE	SRE	INF	BS	RGDP	ESG
FS	1									
CRE	-0.14	1								
LRE	-0.12	-0.05	1							
MRE	-0.08	0.04	0.39	1						
ORE	0.09	-0.27	-0.14	-0.19	1					
SRE	0.11	-0.03	-0.41	-0.13	0.18	1				
INF	-0.21	0.72	0.52	0.82	0.62	0.42	1			
BS	0.21	0.07	0.62	0.69	-0.32	-0.21	-0.42	1		
RGDP	0.11	-0.04	0.32	0.21	-0.14	-0.17	0.28	0.51	1	
ESG	0.63	-0.32	-0.12	-0.24	0.18	-0.32	-0.36	0.52	0.47	1

Source: Researchers' Computation (2026)

Table III depicted the correlation matrix indicates that most pairwise correlations are below the commonly used 0.80 threshold. However, the correlation between INF and MRE is 0.82, slightly exceeding this threshold. This relatively high pairwise correlation warrants further consideration but does not, by itself, establish the presence of problematic multicollinearity. This indicates there exists no overlap of variables in the panel regression models. Therefore, additional multicollinearity diagnostics, particularly the Variance Inflation Factor (VIF), were examined in table IV below.

Table IV
Estimation of Variance Inflation Factor (VIF) Result

Variable	VIF	1/VIF
ESG Reporting	1.17	0.42
CRE	1.76	0.03
LRE	1.38	0.03
MRE	1.80	0.85
ORE	1.75	0.39
SRE INF	1.19 1.04	0.76 0.41
BS	1.42	0.70
RGDP	1.38	0.49
Mean VIF	1.43	

Source: Researchers' Computation (2026)

The study also used the Variance Inflation Factor (VIF) as a helpful addition to the correlation matrix to test for multicollinearity. VIF values show that there is no multicollinearity among the independent variables; VIF readings above 10 often indicate the presence of problematic multicollinearity. Table IV shows that all VIF values are less than two, with an average VIF of 1.43, indicating a very low level of multicollinearity. This indicates that the independent variables have low correlation, reducing the possibility of multicollinearity that could compromise the reliability of the regression model.

Test for Cross-Sectional Panel Dependence, Unit Root and Cointegration

Cross-Sectional Panel Dependence Test

Table V
Pesaran Cross-sectional panel dependence test

Variables	*t*-statistic	*p*-value
FS	1.543	0.218
CRE	1.021	0.390
LRE	1.498	0.721
MRE	0.832	0.203
ORE	1.610	0.341
SRE	1.027	0.109
INF BS	1.045 1.298	0.093 0.152
RGDP ESG	1.027 1.053	0.181 0.193

Researchers' Compilation (2026) @
5% level of Significance (**)

From Table V, it was shown that among the study variables that there is no cross-sectional dependence across the panel data since $p > 0.05$, this indicates no spillover shocks in one unit (Bank) affect other banks since the study is categorized as cross-sectional panel. Thus, the error terms among selected banks were not correlated and that first-generation panel unit root tests, such as LLC, IPS, ADF-Fisher, and PP-Fisher can be validly applied. Therefore, First-generation panel estimators like 'Fixed Effect (FE) panel regression, Random Effect (RE) panel regression, Pooled Regression (PR) panel regression' would be considered for the estimation since there is no evidence of cross-sectional dependence and spillover effect across the panel data.

Table VI
Unit root test in levels

Variable	LLC	IPS	ADF–Fisher	PP–Fisher
FS	0.823 (0.519)	1.621 (0.803)	2.618 (0.823)	7.932 (0.012)**
CRE	0.701 (0.703)	1.203 (0.219)	1.375 (0.629)	2.632 (0.421)
LRE	3.429 (0.602)	2.301 (0.320)	1.932 (0.610)	2.521 (0.821)
MRE	0.423 (0.322)	4.320 (0.052)**	2.929 (0.382)	9.832 (0.020)**
ORE	2.109 (0.933)	0.832 (0.723)	2.721 (0.831)	2.721 (0.193)
SRE	2.031 (0.934)	2.021 (0.392)	1.621 (0.352)	2.201 (0.521)
BS	3.821 (0.920)	2.930 (1.340)	1.252 (1.231)	0.832 (1.021)
INF RGDP ESG	0.902 (0.523) 1.321 (0.432) 1.865(0.522)	1.822 (0.732) 0.954 (0.128) 1.002(0.521)	2.521 (0.722) 1.832 (0.342) 1.962(0.732)	1.931 (0.831) 2.952 (0.921) 1.031(0.721)

Source: Researchers' Computation (2026)

Table VI displays the unit root test results for the first difference variables. The PP-Fisher test provides solid assurance that all variables become stationary following the initial differencing. The majority of variables are essentially non-stationary in levels but stationary after initial

differencing, indicating mainly I (1) behavior, according to the panel unit-root tests in Table VII. A few variables exhibit mixed stationarity signals at levels under particular tests, however these findings vary throughout the four methods. All variables provide strong confirmation of stationarity at first differences across various unit roots tests, such as LLC, IPS, ADF-Fisher, and PP-Fisher.

Table VII
Unit root test in first difference

Variable	LLC	IPS	ADF–Fisher	PP–Fisher
D(FS)	10.457 (0.000)**	9.532 (0.012)**	12.653 (0.001)**	30.193 (0.000)**
D(CRE)	12.452 (0.001)**	7.216 (0.050)**	10.923 (0.004)**	35.435 (0.000)**
D(LRE)	12.782 (0.002)**	11.623 (0.01)**	12.935 (0.003)**	40.623 (0.000)**
D(MRE)	8.117 (0.008)**	10.243 (0.000)**	18.729 (0.001)**	51.832 (0.000)**
D(ORE)	8.715 (0.000)**	13.621 (0.000)**	20.023 (0.000)**	41.633 (0.000)**
D(SRE)	11.652 (0.040)**	8.823 (0.002)**	16.170 (0.002)**	68.952 (0.000) **
D(BS)	9.723 (0.002)**	10.934 (0.001)**	13.923 (0.031)**	41.821 (0.000)**
D(INF) D(RGDP) D(ESG)	9.932 (0.041)** 10.421(0.003)** 12.863(0.000)**	7.654 (0.000)** 11.943 (0.001)** 16.632(0.001)**	27.233 (0.000)** 38.932 (0.000)** 31.830(0.001)**	50.621 (0.000)** 60.632 (0.000)** 48.412(0.000)**

Source: Researchers' Computation (2026) @ 5% ** Significance level

The study used the Kao (1999) residual-based panel cointegration test because of the dataset's nature. This approach is suitable for panels with a comparatively lengthy time dimension (T = 16) and a small cross-sectional size (N = 6). This is because the Kao test maintains a homogeneous cointegrating vector when pooling data across cross-sections. In the current analysis, when the banking institutions function under the same institutional and regulatory framework that supports the assumption of common long-run slope coefficients across banks, this feature is beneficial. Table VIII below shows the cointegration test results for each of the equations (response variables).

Table VIII
Result for Kao cointegration test

Variable	ADF t-stat	Prob.	Significance
FS	-10.832	0.001	**

Source: Researchers' Computation (2026)
Explanatory Variable: CRE, LRE, MRE, ORE, SRE, BS, INF, RGDP
Note: *** is 1% significance; ** is 5% significance; * is 10% significance

There exists strong evidence of long run connection between bank risk exposures indicators can be found in the empirical results of the Kao cointegration test in Table VIII. Specifically, the null hypothesis of no cointegration is decisively rejected for the FS model specification at the 5% significance level, indicating the presence of a stable long-run equilibrium relationship linking bank risk exposure indicators, such as CRE, LRE, MRE, ORE, and SRE with control variables like BS, INF, and RGDP and financial stability. According to the Kao test results, there is a stable long-run connection between bank risk exposure and financial stability across selected Nigerian international categorized DMBs. This offers an empirical basis for the panel estimators used in this study to estimate long-run coefficients in subsequent analyses.

Restatement of research hypothesis using panel regression result

H0: Bank Risk Exposure (credit risk exposure, liquidity risk exposure, market risk exposure, operational risk exposure, and solvency risk has no significant influence on bank stability among DMBs in Nigeria.

From Table IX, the panel regression results were based on the hypothesis developed, as stated in the panel model specifications. The response variable in this model specification was financial stability. The Fixed Effects (FE) estimator serves as the chosen panel regression model in the study due to the Hausman test result that picked fixed panel regression for the study, as shown in table IX, the Hausman test (χ^2 = 28.31, p < 0.05) and the Testparm LM test (F = 6.17, p < 0.05) support the Fixed Effects model over Random Effects and Pooled OLS. However, SGMM supported static panel model because it addresses endogeneity and dynamic bias which enhanced robust analysis of the study. The Wald test (χ^2 = 94.84, p < 0.05) confirms the overall model significance, while the Arellano-Bond AR (2) test (p = 0.817, p>5%) indicates no second-order serial correlation. The Hansen test (p = 0.259, p>5%) also confirms the validity of the instruments, and that small number of N and T =12 was supported by Bun and Windmeijer (2010) and Judson and Owen (1999).

The Fixed Effects (FE) estimator was grounded on the estimator's capacity to account for time-invariant and unobserved bank-specific traits, such as managerial risk appetite via financial intermediary role and financial stability. The use of bank risk exposure is probably connected with these unobserved effects, which could lead to bias in the pooled and RE panel estimators. Therefore, the pooled OLS estimate was solely presented as a test of the results' robustness. Table IX displays the influence of bank risk exposure metrics (CRE, LRE, MRE, ORE, and SRE) with INF, BS, and RGDP on financial Stability of International categorized DMBs in Nigeria. The $Adj.R^2$ value for the FE estimates shows that the model accounts for around 59% of the within-bank variation in the financial stability model of selected banks, with a high F-statistic value of 56.93 (0.01, p < 0.05), demonstrating the FE model is strong, robust and significantly explained how bank risk exposure indicators (CRE, LRE, MRE, ORE, and SRE) along with INF, BS, and RGDP as control variables contributed to financial stability among DMBs in Nigeria.

Considering the coefficients of the explanatory variables, such as CRE, LRE, MRE, ORE, SRE, INF, BS, and RGDP, the FE model was adopted due to result of the Hausman test. Among the indicators of bank risk exposure, such as CRE, LRE, and MRE had negative and significant coefficients across all three models. For the FE panel model, CRE = -0.62, *t*-stat = -4.53 & *p*<5%, LRE = -0.52, *t*-stat = -5.92 & *p*<5% as well as MRE = -0.17, *t*-stat = -3.15 & *p*<5%. This indicates that a unit increase in CRE, LRE, and MRE significantly reduced financial stability with 0.62, 0.52 and 0.17 units respectively. In SGMM, CRE = -0.83 [0.00, p<5%], LRE = -0.25 [0.01, *p*<5%], MRE = -0.85 [0.02 *p*<5%]. This means a unit increase in Credit, Liquidity, and Market Risk Exposure will reduce Financial Stability by 0.83, 0.25 and 0.85 units respectively. This conforms to a priori expectation.

Conversely, ORE and SRE had positive and significant coefficients with financial stability of DMBs in Nigeria. This insinuates that ORE = 0.39, *t*-stat = 5.37, & *p*<5% and SRE = 0.95, t-stat = 6.19, & i<5% and that a unit increase in ORE and SRE had significantly increased financial stability with 0.39 and 0.95 units respectively. In SGMM, ORE = 0.82 [0.01, *p*<5%] and SRE = 0.32 [0.00, *p*<5%]. A unit increase in operational and solvency risks exposure increases financial stability by 0.82 and 0.32 units. This is contrary to a priori expectation but may reflect improved operational risk disclosure and solvency risk management frameworks. For the control variables, INF is negative and significant in the FE panel model. As a unit increase in INF led to significant adverse effect on financial stability of banks in Nigeria. The SGMM coefficient is -0.82 [0.00, *p*<5%], implying high inflation erodes financial stability while BS is positive and significant in FE and SGMM [0.94, *p*=0.03<0.05]. Larger banks enhance stability, supporting too-big-to-fail and economies of scale argument as well as RGDP is positive and significant in FE panel model RGDP = 0.04, *t*-stat = 4.82 & *p*<5% and SGMM [0.06, *p*=0.05 <0.05], indicating economic growth promotes financial stability, though weakly in this study. Therefore, this study rejected the null hypothesis that: H01: Bank Risk Exposure (credit risk exposure, liquidity risk exposure, market risk exposure, operational risk exposure, and solvency risk exposure) have no significant influence on bank stability among International categorized DMBs in Nigeria.

From Table IX, the Wu-Hausman endogeneity test was conducted to determine whether the independent variables were correlated with the error term. The results indicate that all measures for credit derivatives such as CRE, LRE, MRE, ORE, SRE, INF, BS, and RGDP were exogenous, with Wu-Hausman statistics of all study variables p>5% respectively, this indicates the presence of exogeneity among study variables in the panel model.

Table IX
Result for Financial Stability (FS) -before moderating of ESG

Variables	Pooled OLS			Fixed Effect			SGMM		
	Coef.	*t*-Stat.	Prob.	Coef.	*t*-Stat.	Prob.	Coef.	*t*-Stat.	Prob.
Constant	5.12	2.10	0.01	3.14	9.42	0.01	1.94	3.07	0.00
CRE	-0.62	-3.32	0.02	-0.62	-4.53	0.02	-0.83	3.91	0.00
LRE	-0.71	-3.89	0.01	-0.52	-5.92	0.01	-0.25	4.93	0.01
MRE	-0.47	-6.29	0.03	-0.17	-3.15	0.00	-0.85	-4.14	0.02
ORE	0.56	6.21	0.00	0.39	5.37	0.01	0.82	5.16	0.01
SRE	0.83	5.03	0.00	0.95	6.19	0.03	0.32	4.93	0.00
INF	-0.92	-7.45	0.01	-0.42	-4.32	0.00	-0.82	7.32	0.00
BS	0.83	1.21	0.40	0.82	3.10	0.01	0.94	5.32	0.03
RGDP	0.03	0.95	0.09	0.04	4.82	0.02	0.06	5.13	0.05
Adj. R-sq.	0.54			0.59					
F-stat.	76.38(0.00)			56.93(0.01)					
Wald chi2							94.84(0.00)		
Hausman Test				chi2(8) = 28.31 (0.00)					
Testparm Test (LM Test)				*F*-stat = 6.17(0.00)					
Heteroskedasticity				= 25.27 (0.60)					
Serial Correlation Test				*F*-stat = 0.84(0.63)					
Arellano-Bond: AR(2)				0.817					
Hansen test (*p*-value)				0.259					

Wu-Hausman Endogeneity Test

Endogenous Variables	Wu-Hausman *F*-statistic	p-value	Decisions
CRE	1.42	0.20	Exogenous
LRE	0.72	0.41	”
MRE	0.75	0.52	”
ORE	0.45	0.36	”
SRE	0.92	0.45	”
INF	0.18	0.16	”
BS	0.64	0.22	”
RGDP	0.21	0.38	”

Dependent variable: Financial stability @5% level of significance

The financial stability of banks covers financial operational sensitivity and continuity despite risks expose to in the course financial intermediary role (Fakunmoju, 2026; Jegede et al., 2024). Previous research, such as that by Emilia (2022), discovered that market risk has a detrimental

influence on Nigerian microfinance institutions performance while Gontarek (2017) showed that inadequate operational risk management puts banks' performance at risk over the long and short terms. According to Amdework (2021), credit risk poses a threat to Ethiopian banks' performance.

According to Aruwa et al. (2026), the performance of Nigerian DMBs was hampered by operational risk. Liquidity risk and bank profitability had a negative link (Barba & Lucenteforte, 2020). Yousfi (2021) found that found that financial risks negatively affect profitability. Million et al. (2021) established that credit risk proxy with non-performing loan, loan loss provisions, and capital adequacy significantly had negative influenced on profitability of banks. Imbierowicz and Rauch (2014), Ngo et al. (2025), Akarogbe et al. (2024), and Hunjra et al. (2022) established that credit and liquidity risks hindered the performance and survival of banks. These past empirical studies never focused on combined effect of bank risk exposure proxied by (CRE, LRE, MRE, ORE, SRE) on bank stability of International categorized DMBs in Nigeria. Thus, there exists empirical gap and the findings of the rejected the null hypothesis that bank Risk Exposure (credit risk exposure, liquidity risk exposure, market risk exposure, operational risk exposure, and solvency risk) has no significant influence on bank stability proxied by the bank financial stability index of DMBs in Nigeria.

Table X
Result for Financial Stability (FS) - after moderation of ESG reporting

Variables	Pooled OLS			Fixed Effect			SGMM		
	Coef.	*t*-Stat.	Prob.	Coef.	*t*-Stat.	Prob.	Coef.	*t*-Stat.	Prob.
Constant	1.02	1.13	0.41	0.15	2.92	0.04	0.83	2.97	0.00
CRE*ESG	-0.92	-4.02	0.00	-0.93	-6.49	0.00	-0.63	2.89	0.00
LRE*ESG	-1.31	-9.29	0.01	-0.82	-4.12	0.01	-0.96	5.13	0.01
MRE*ESG	-1.72	-8.09	0.02	-0.33	-5.25	0.00	-0.85	-5.60	0.03
ORE*ESG	0.94	4.51	0.01	0.84	10.30	0.00	0.82	4.26	0.00
SRE*ESG	0.63	4.93	0.00	0.29	7.40	0.02	0.32	4.62	0.00
INF	-1.62	-8.20	0.00	-1.02	-7.62	0.00	-0.56	1.90	0.20
BS	1.43	1.71	0.92	0.64	1.20	0.31	0.24	1.02	0.13
RGDP	0.54	1.05	0.26	0.04	4.82	0.02	0.36	6.43	0.01
Adj. *R*-sq.	0.62			0.75					
F-stat.	84.21(0.01)			102.42(0.00)					
Wald chi2							98.32(0.01)		
Hausman Test	chi2(8) = 32.52 (0.00)								
Testparm Test (LM Test)	*F*-stat = 10.83 (0.02)								
Heteroskedasticity	= 31.73 (1.62)								
Serial Correlation Test	*F*-stat = 1.20 (0.59)								
Arellano-Bond: AR(2)	0.897								
Hansen test (*p*-value)	0.429								

Wu-Hausman Endogeneity Test			
Endogenous Variables	Wu-Hausman *F*-statistic	p-value	Decisions
CRE*ESG	1.33	0.28	Exogenous
LRE*ESG	1.04	0.44	”
MRE*ESG	0.83	0.59	”
ORE*ESG	1.05	0.62	”
SRE*ESG	1.02	0.48	”
INF	0.83	0.64	”
BS	0.72	0.28	”
RGDP	1.10	0.43	”

Dependent variable: Financial stability @5% level of significance

Table X shows that χ^2 = 25.67 = 32.52 (0.00, p<5%) in the Hausman Test indicates significance at 5%. The Random Effect Model is not as good as the Fixed Effect. LM Test: Significant (F = 10.83 (0.02, p<5%)). The Wu-Hausman Endogeneity Test showed that the p-values > 0.05 (0.28 to 0.64), Fixed Effect is chosen over Pooled OLS that every variable is exogenous and there is no endogeneity issue, yet SGMM is still robust. The SGMM Diagnostics shown that AR (2) = 0.897 (p > 0.05) which insinuates that no second-order serial correlation and the study model is correctly specified. The Hansen Test = 0.429 (p > 0.05) while Wald Chi2 = 98.32 (0.01, p<5%). These results indicate that the Instruments are valid, no over-identification and the overall model is significant.

Table X further established that CRE = FE: -0.93 (p=0.00), SGMM: -0.63 (p=0.00), LRE = FE: -0.82 (p=0.01), SGMM: -0.96 (p=0.01) and MRE = FE: -0.33 (p=0.00), SGMM: -0.85 (p=0.03) had adverse and significant moderating influence with ESG reporting on bank financial stability since CRE*ESG, LRE*ESG and MRE*ESG had p<5%. This indicates that International categorized DMBs were highly exposed to CRE, LRE, and MRE and spent heavily on ESG which led to bad loans, drained liquidity, and exposure to exchange rate market risk and therefore reduced capital available to cover credit losses which in turn caused financial instability. On the other hand, ORE*ESG = FE: 0.84 (p=0.00), SGMM: 0.82 (p=0.00) as well

as SRE*ESG = FE: 0.29 (*p*=0.02), SGMM: 0.32 (*p*=0.00) had positive and significant effects on bank financial stability. This insinuates that ESG strongly mitigate operational and solvency risks due to sound ESG practices which reduce fraud, system failures, and operational losses, thus improving stability among International Categorised DMBs in Nigeria. The Adj.$R2$ = 0.75 and *F*-stat = 102.42 (*p*<5%) under the Fixed Effect (FE) Model which explained 75% of the variation in financial stability and thus the study model is well fitted, jointly and significantly explained the study variables used in modelling financial stability of International categorized DMBs in Nigeria. A shift in *Adj.*$R2$ signifies that there exists a significant moderating influenced of ESG reporting with BRE on bank financial stability in Nigeria.

Conclusion

The study dwell on how ESG reporting moderate with bank risk exposure (CRE, LRE, MRE, ORE, SRE) on bank financial stability of International categorized DMBs in Nigeria through Pooled OLS, Fixed Effect, and System Generalized Method of Moments to control for heterogeneity, endogeneity, and dynamic bias. The findings indicated that bank risk exposure had a negative (CRE, LRE, MRE) and positive (ORE, SRE) significant effect on bank financial stability as well as ESG reporting significantly moderate the link between bank risk exposure and financial stability. The study anchored on institutional theory and Minsky's Financial Fragility Hypothesis which states that DMBs should institutionalize ESG reporting and embrace professional measures to manage risk exposures resulting from traditional role of financial intermediation, which make them more vulnerable to financial instability. However, if risk exposure ethically manages based on banking principles and regulations, DMBs will achieve financial stability.

The finding of the study conformed to a priori expectation and the central proposition of institutional theory and the Financial Fragility Hypothesis, which suggests that excessive risk buildup leads to poor asset quality, funding illiquidity, and adverse market movements which erode bank capital, lessen profitability and activate systemic distress, thereby undermining financial stability. Therefore, it was concluded that ESG reporting strongly moderate with bank risk exposure and significantly affect financial stability of International Categorised DMBs in Nigeria. This can be evidence from *Adj.*$R2$ in Table IX and Table X, before moderation of ESG reporting *Adj.*$R2$ was 59% and after moderation *Adj.*$R2$ was 75% variances in financial stability, this there exist significant moderating influenced of ESG reporting with bank risk exposure on financial stability of International categorized DMBs in Nigeria. Thus, the null hypothesis two, that ESG reporting has no significant moderating influence with bank risk exposures on financial stability among International Categorised DMBs in Nigeria, was rejected.

Based on the findings, the following recommendations were proposed. The CBN should enforce stricter credit appraisal standards, forward-looking provisioning (IFRS 9), and strict loan monitoring to curtail credit risk exposure and strengthen market risk hedging guidelines against interest rate and exchange rate volatility to reduce market risk exposure which in turn enhance bank financial stability of International categorized DMBs. The Monetary Policy Committee of the CBN should also sustain single-digit inflation targeting, as price stability directly enhances financial stability. Lastly, International categorized DMBs should sustain investment in technology and internal controls to turn operational risk management into a source of financial stability which enhance DMBs continuity. Also, the Financial Reporting Council of Nigeria (FRCN), the Central Bank of Nigeria (CBN), and other pertinent regulatory bodies are advised to further integrate ESG factors into the risk governance and financial stability frameworks of international classified DMBs in Nigeria. Additionally, banks should improve the quality of their sustainability disclosures by shifting from primarily voluntary and descriptive reporting to the methodical delivery of precise, timely, comparable, and independently verifiable ESG information and that priority of consideration and disclosure should be given to ESG risks and their possible effects on financial stability, banks' credit, liquidity, market, operational, and capital risks by international categorized DMBs board decisions making.

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- **Ethical approval:** Ethical approval was obtained from University of South Africa (UNISA) Research Committee
- **Informed consent:** After being fully informed, participant willingly took part in the study.
- **Data availability:** The associated author will disclose the data upon reasonable request.
- **Generative AI disclosure:** For language refining, only generative AI algorithms were employed. The final version of this publication has been reviewed and approved by the author.

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