



ESG Performance And Financial Resilience Of Indian Banks: Does Sustainability Enhance Stability?

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Abstract

The growing emphasis on environmental, social, and governance (ESG) standards has reshaped the strategic priorities of financial institutions worldwide. In India, regulatory encouragement of sustainability disclosures and climate risk awareness has prompted banks to integrate ESG considerations into their governance and lending frameworks. Despite this transition, empirical evidence on whether ESG performance enhances financial resilience in Indian banks remains limited. This study examines the relationship between ESG performance and bank stability in India over the period 2015–2025. Using panel data for public and private sector banks, financial resilience is measured through the Z-score, non-performing asset (NPA) ratio, and earnings volatility. ESG performance is captured through composite and disaggregated environmental, social, and governance indicators derived from publicly disclosed reports. Fixed effects and dynamic panel estimations are employed to address unobserved heterogeneity and endogeneity concerns. The findings indicate that higher ESG performance is positively associated with bank stability and lower credit risk. Governance quality emerges as the strongest driver of resilience, while environmental and social dimensions contribute through risk mitigation and reputational strengthening. The results also suggest that ESG integration reduces earnings volatility, supporting the view that sustainability practices enhance long-term institutional robustness. The study contributes to the emerging literature on sustainable finance by providing bank-level evidence from a major emerging economy. It offers policy insights for regulators and banking institutions seeking to align sustainability objectives with financial stability goals.

Keywords: ESG performance; Bank stability; Financial resilience; Sustainable finance; Z-score; Indian banking sector

1 Introduction

Global ESG movement in banking

Over the past decade, environmental, social, and governance (ESG) considerations have moved from the periphery of corporate strategy to the core of financial decision-making. Financial institutions, particularly banks, are increasingly expected to integrate sustainability criteria into lending, investment, and risk management frameworks. This shift has been driven by investor demand, regulatory reforms, and heightened awareness of climate-related financial risks. International initiatives such as the United Nations Principles for Responsible Banking have encouraged banks to align their business models with sustainable development objectives, reinforcing the global transition toward responsible finance (United Nations Environment Programme Finance Initiative [UNEP FI], 2019).

The integration of ESG factors into banking operations reflects a broader recognition that non-financial risks can have material financial consequences. Investors and rating agencies increasingly incorporate ESG indicators into risk assessments, arguing that firms with stronger governance structures and environmental stewardship are better positioned to manage long-term uncertainties (Friede et al., 2015). For banks, ESG integration extends beyond internal governance to the evaluation of borrower sustainability profiles, exposure to carbon-intensive sectors, and social impact of lending practices.

In emerging economies, ESG adoption has gained momentum as regulators seek to balance economic growth with environmental responsibility. India has witnessed growing disclosure requirements and sustainability reporting norms, prompting banks to formalize ESG strategies. However, the extent to which ESG performance translates into measurable financial resilience remains an open empirical question.

Climate risk and financial stability

Climate change has emerged as a systemic risk factor with direct implications for financial stability. Climate-related risks are broadly categorized into physical risks—arising from extreme weather events and long-term environmental changes—and transition risks—associated with policy shifts, technological change, and market revaluation of carbon-intensive assets (Network for Greening the Financial System [NGFS], 2019).

Banks are exposed to these risks through their lending portfolios and investment holdings. Loans extended to carbon-intensive industries may face higher default probabilities if regulatory restrictions or market transitions render certain assets stranded. Similarly, physical climate events can impair collateral values and disrupt borrower operations. These exposures create potential channels through which climate risk can affect asset quality and capital adequacy.

Scholars argue that integrating ESG considerations into risk assessment may enhance financial resilience by internalizing long-term environmental and social risks (Bolton & Kacperczyk, 2021). Strong governance practices may further mitigate agency problems and strengthen oversight of risk-taking behavior. Conversely, critics suggest that ESG investments could increase operational costs without generating immediate financial benefits, potentially weakening short-term profitability. The tension between long-term risk mitigation and short-term cost pressures underlies the ongoing debate in the banking literature.

RBI's sustainability discussions

In India, the regulatory discourse on sustainable finance has intensified in recent years. The Reserve Bank of India (RBI) has acknowledged climate risk as a source of financial vulnerability and has initiated discussions on integrating environmental considerations into supervisory frameworks. The

RBI has emphasized the need for banks to adopt climate risk management practices and enhance sustainability disclosures (Reserve Bank of India [RBI], 2023).

Furthermore, regulatory coordination with market authorities has strengthened ESG reporting requirements. Enhanced disclosure norms encourage transparency in governance practices, social responsibility initiatives, and environmental performance. Such regulatory engagement reflects a recognition that sustainability considerations are increasingly intertwined with financial system stability.

While these initiatives represent significant policy progress, empirical assessment of their financial implications remains limited. Understanding whether ESG integration strengthens bank resilience is essential for evaluating the effectiveness of regulatory encouragement and sustainability mandates.

Debate: Does ESG improve resilience or increase compliance costs?

The relationship between ESG performance and financial stability is not unequivocal. Proponents argue that strong ESG practices enhance risk management, improve stakeholder trust, and reduce exposure to regulatory penalties. Governance quality, in particular, is associated with prudent risk-taking and stronger oversight mechanisms (Shleifer & Vishny, 1997). Environmental responsibility may reduce exposure to stranded assets and litigation risks, while social engagement may improve reputational capital and customer loyalty.

Empirical studies often report a positive association between ESG performance and financial outcomes, suggesting that sustainability initiatives can generate long-term value (Friede et al., 2015). However, alternative perspectives caution that ESG compliance may impose additional reporting, monitoring, and operational costs. For banks operating in competitive markets, increased sustainability expenditure may compress margins in the short run.

Moreover, measurement challenges complicate interpretation. ESG scores vary across rating agencies, and disclosure quality differs across institutions. The heterogeneity of ESG metrics raises questions about comparability and causal inference. Thus, whether ESG performance translates into enhanced financial resilience remains context-dependent and empirically testable.

Research gap in Indian banking

Despite the growing global literature on ESG and corporate performance, empirical evidence focusing specifically on Indian banks is limited. Existing studies predominantly examine non-financial firms or adopt cross-country samples, offering limited insights into the institutional dynamics of the Indian banking sector.

India's banking system presents a unique context characterized by a mix of public and private sector institutions, evolving regulatory frameworks, and increasing integration into global capital markets. The expansion of ESG disclosures in recent years offers an opportunity to evaluate whether sustainability integration strengthens financial resilience. Yet, systematic analysis linking ESG performance to established stability indicators such as the Z-score, non-performing asset ratio, and earnings volatility remains scarce.

Addressing this gap is crucial for informing regulatory policy and strategic decision-making within banks. By examining bank-level ESG performance and its association with financial stability over a recent decade, this study seeks to contribute to the sustainable finance literature from an emerging economy perspective. It provides empirical evidence on whether sustainability initiatives in Indian banks enhance resilience or merely reflect compliance-driven adaptation.

2 Literature review

ESG and firm performance

The relationship between environmental, social, and governance (ESG) performance and financial outcomes has been extensively examined in corporate finance literature. Early debates centered on whether sustainability initiatives represent value-enhancing strategies or costly managerial preferences. Stakeholder theory posits that firms addressing environmental and social concerns build stronger relationships with stakeholders, thereby enhancing long-term value creation (Freeman, 1984). From this perspective, ESG practices reduce reputational risk, strengthen customer loyalty, and improve operational efficiency.

Empirical evidence largely supports a positive association between ESG performance and financial performance. A comprehensive meta-analysis by Friede et al. (2015), covering more than 2,000 empirical studies, found that the majority of results indicate a non-negative relationship between ESG criteria and corporate financial performance. Similarly, Eccles et al. (2014) demonstrated that firms with strong sustainability policies tend to outperform peers over the long term in terms of stock market and accounting measures.

However, the relationship is not universally positive. Some scholars argue that ESG investments may impose short-term costs due to increased compliance, reporting requirements, and operational restructuring. The net financial effect may therefore depend on institutional context, regulatory pressures, and the strategic integration of ESG within core operations rather than symbolic adoption. These mixed findings suggest that the ESG–performance nexus is contingent and merits sector-specific analysis.

ESG and bank risk

Within the banking sector, ESG considerations have gained prominence as financial institutions face growing exposure to climate-related and social risks. Unlike non-financial firms, banks are exposed indirectly through their lending and investment portfolios. This intermediation role creates a transmission channel whereby environmental and governance risks of borrowers affect banks' asset quality and capital adequacy.

Recent studies suggest that stronger ESG performance in banks may reduce overall risk exposure. For example, research indicates that banks with higher ESG ratings tend to exhibit lower stock return volatility and reduced default probabilities (Buallay, 2019). Environmental risk management can mitigate exposure to carbon-intensive industries and stranded assets, while social responsibility initiatives may enhance reputational capital and depositor confidence.

Nevertheless, critics caution that the integration of ESG metrics into banking operations may increase operational complexity and compliance costs. ESG reporting often requires specialized expertise and monitoring systems, potentially affecting short-term profitability. Moreover, inconsistencies in ESG measurement across rating agencies complicate cross-bank comparisons and may obscure the true relationship between sustainability performance and risk.

Thus, while theoretical arguments suggest that ESG integration should reduce risk, empirical evidence remains mixed and context-specific. In emerging markets, where regulatory frameworks are evolving, the stabilizing effect of ESG practices may differ from that observed in developed economies.

Governance and financial stability

Corporate governance constitutes a critical pillar of ESG and plays a central role in financial stability. Strong governance structures enhance oversight, mitigate agency conflicts, and constrain excessive risk-taking (Shleifer & Vishny, 1997). In banking, governance mechanisms such as board

independence, audit quality, and executive compensation design are closely linked to prudential outcomes.

Empirical studies demonstrate that governance quality influences banks' risk profiles and resilience during financial stress. Banks with stronger governance structures were found to exhibit better performance and lower risk during periods of financial turbulence (Laeven & Levine, 2009). Effective governance can promote prudent lending standards, reduce moral hazard, and ensure compliance with regulatory capital requirements.

In the ESG context, governance often emerges as the most financially material component, as it directly influences strategic decision-making and risk management processes. However, governance effectiveness varies across institutional settings. In countries with concentrated ownership or strong state involvement, governance dynamics may differ from those in market-driven systems.

Given India's banking structure, characterized by a mix of public and private sector institutions, governance quality may have distinct implications for stability. Assessing the governance–stability nexus within the ESG framework is therefore particularly relevant.

Sustainable finance in emerging markets

Sustainable finance has expanded rapidly in emerging markets, where environmental vulnerability and developmental priorities intersect. Policymakers in these economies face the challenge of fostering economic growth while addressing climate change and social inequality. As a result, financial institutions are increasingly encouraged to align lending practices with sustainable development objectives.

Emerging markets present unique characteristics that may influence the ESG–stability relationship. Institutional quality, regulatory enforcement, and disclosure standards often vary significantly. Studies suggest that ESG effects on financial performance may be stronger in markets with evolving regulatory frameworks, as sustainability initiatives signal credibility and reduce informational asymmetry (Clark et al., 2015).

In India, sustainable finance initiatives have gained traction through regulatory encouragement of ESG disclosures and climate risk awareness. The banking sector plays a pivotal role in financing renewable energy, infrastructure, and inclusive growth initiatives. However, empirical research examining whether such sustainability integration enhances financial resilience remains limited.

Research gap: Limited Indian bank-level stability evidence

Despite the growing global literature on ESG and financial outcomes, empirical studies focusing specifically on Indian banks are scarce. Existing research often concentrates on listed non-financial firms or adopts cross-country datasets that may not capture the institutional nuances of India's banking sector.

Moreover, most prior studies emphasize profitability measures such as return on assets or stock returns, with limited attention to stability indicators such as Z-score, non-performing asset ratios, or earnings volatility. Given the importance of financial resilience in safeguarding systemic stability, evaluating ESG performance through the lens of bank stability offers a valuable contribution.

India's banking sector, characterized by regulatory evolution, public ownership structures, and expanding sustainability disclosures, provides a distinctive context for examining the ESG–stability nexus. There remains limited bank-level empirical evidence assessing whether ESG integration strengthens resilience in this setting. Addressing this gap is essential for informing regulatory policy, guiding institutional strategy, and contributing to the broader sustainable finance literature from an emerging market perspective.

3 Conceptual framework and hypotheses

This study conceptualizes ESG performance as a strategic determinant of financial resilience in banks, which subsequently strengthens overall stability. The framework is grounded in stakeholder theory, risk management theory, and corporate governance literature. It proposes that sustainability-oriented practices influence risk exposure, earnings stability, and solvency strength in banking institutions.

3.1 Conceptual model

The central proposition of this study depicted in the figure 1.

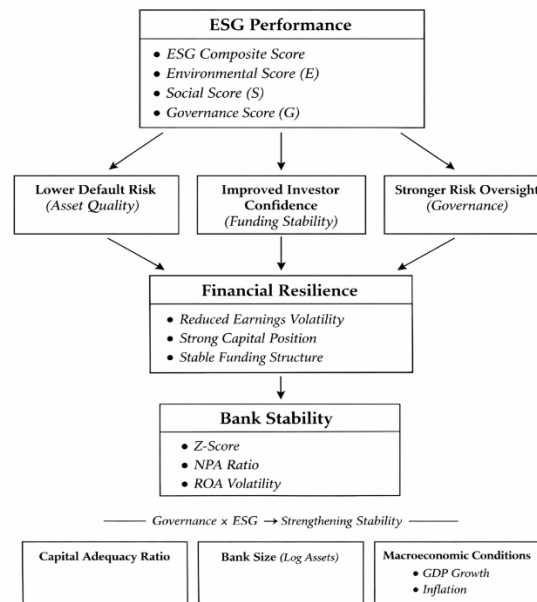


Figure 1: Conceptual diagram

Financial resilience refers to a bank's ability to absorb shocks, maintain solvency, and sustain profitability under adverse conditions. ESG performance is expected to influence resilience through improved governance structures, enhanced risk assessment, and stronger stakeholder trust.

The model assumes both direct and indirect pathways. ESG performance may directly influence stability indicators, while also indirectly affecting stability through risk mitigation and earnings smoothing mechanisms.

3.2 Theoretical mechanisms

Lower default risk

Banks that incorporate environmental and social screening in lending decisions may reduce exposure to high-risk sectors, particularly carbon-intensive or socially controversial industries. Climate transition risks and reputational risks can impair borrower repayment capacity (Bolton & Kacperczyk, 2021). By integrating ESG criteria into credit assessment, banks may enhance portfolio quality and reduce non-performing assets.

From a prudential perspective, reduced default risk improves asset quality, strengthens capital buffers, and enhances solvency metrics such as the Z-score.

Better governance

Governance constitutes the most financially material dimension of ESG. Strong board oversight, transparent disclosure, and prudent executive compensation structures constrain excessive risk-taking (Shleifer & Vishny, 1997).

In banking, governance quality influences lending standards, internal controls, and regulatory compliance. Empirical evidence suggests that stronger governance structures are associated with lower risk-taking and improved stability (Laeven & Levine, 2009).

Thus, higher governance scores are expected to enhance financial resilience by reducing agency conflicts and promoting risk-aware decision-making.

Improved investor confidence

Banks with strong ESG performance may benefit from enhanced investor trust and reputational capital. Sustainable finance literature argues that firms with higher ESG ratings experience lower cost of capital and improved market valuation (Friede et al., 2015).

For banks, improved investor confidence can stabilize funding sources and reduce funding volatility. Stable access to capital markets enhances liquidity management and supports resilience during economic downturns.

Reduced earnings volatility

ESG integration may contribute to smoother earnings by diversifying income sources and mitigating regulatory penalties or litigation risks. Environmental risk management reduces exposure to stranded assets, while social responsibility initiatives strengthen customer loyalty.

Reduced earnings volatility directly increases the Z-score, as lower variability in return on assets improves the distance-to-default measure (Lepetit&Strobel, 2013). Therefore, ESG performance may contribute to stability through improved earnings consistency.

3.3 Variable specification

Dependent variables (Bank stability indicators)

1. Z-score – Measures the distance from insolvency by combining profitability, leverage, and earnings volatility. A higher Z-score indicates greater stability.
2. Non-Performing Asset (NPA) Ratio – Captures asset quality and credit risk exposure. Lower NPA ratios reflect stronger financial health.
3. ROA Volatility – Standard deviation of return on assets over a rolling period, representing earnings stability.

These measures collectively capture solvency, asset quality, and income stability.

Independent variables (ESG performance indicators)

1. ESG composite score – Aggregated measure reflecting overall environmental, social, and governance performance.
2. Environmental score (E) – Measures environmental risk management, carbon disclosure, and sustainable financing practices.
3. Social score (S) – Captures stakeholder engagement, employee practices, and financial inclusion initiatives.
4. Governance score (G) – Reflects board independence, transparency, audit quality, and executive oversight.

Disaggregating ESG components allows identification of the most financially material dimension.

Control variables

To isolate the ESG effect on stability, the model incorporates key bank-specific and macroeconomic controls:

1. Capital Adequacy Ratio (CAR): Higher capital buffers increase loss-absorbing capacity and enhance stability.
2. Bank Size (Log of Total Assets): Larger banks may benefit from diversification, though excessive size may increase complexity risk.
3. GDP Growth: Economic expansion improves borrower repayment capacity and reduces credit risk.
4. Inflation: Inflation volatility may impair loan performance and affect earnings stability.
5. Loan Growth: Rapid credit expansion may increase risk if underwriting standards deteriorate.

3.4 Hypotheses development

Based on the conceptual framework and theoretical arguments, the following hypotheses are formulated:

H1: ESG composite performance positively influences bank stability.

H2: Environmental performance reduces credit risk.

H3: Governance performance strengthens financial resilience.

H4: ESG performance reduces earnings volatility.

H5: The ESG–stability relationship remains significant after controlling for capital adequacy, size, macroeconomic conditions, and loan growth.

3.5 Conceptual interpretation

The proposed framework positions ESG performance not merely as a reputational attribute but as a structural determinant of financial resilience. By influencing credit risk, governance oversight, funding stability, and earnings volatility, ESG integration may enhance the long-term stability of banks.

At the same time, empirical testing is necessary to determine whether sustainability initiatives produce measurable financial benefits within the institutional context of Indian banking.

4 Data and methodology

4.1 Data sources

This study relies exclusively on secondary data drawn from authoritative and publicly accessible sources to ensure transparency, replicability, and reliability of empirical findings. The dataset integrates bank-level financial indicators, ESG performance measures, and macroeconomic controls.

Bank annual reports

Audited annual reports of public and private sector banks constitute the primary source of financial statement data. These reports provide detailed information on balance sheet indicators, profitability measures, capital adequacy ratios, non-performing assets, and governance disclosures. In addition to financial metrics, annual reports contain sustainability statements, board composition details, and risk management disclosures relevant to ESG assessment. Since Indian banks increasingly publish Business Responsibility and Sustainability Reports (BRSR), annual reports serve as a critical source for extracting ESG-related qualitative and quantitative indicators.

ESG Scores (Refinitiv / Bloomberg / Annual Disclosures)

ESG performance indicators are obtained from recognized ESG data providers such as Refinitiv and Bloomberg, where available. These databases compile standardized ESG composite scores and

disaggregated environmental, social, and governance sub-scores based on publicly disclosed information.

For banks where commercial ESG scores are unavailable, ESG metrics are constructed using content analysis of sustainability disclosures, corporate governance reports, and regulatory filings. This approach ensures broader coverage while maintaining consistency in measurement. ESG composite scores capture the aggregated sustainability performance, while sub-components allow examination of differential effects across environmental, social, and governance dimensions.

Reserve Bank of India – Database on Indian Economy (DBIE)

The Reserve Bank of India's Database on Indian Economy provides standardized time-series data on banking sector indicators, including capital adequacy ratios, non-performing asset ratios, profitability measures, and total assets (Reserve Bank of India [RBI], 2023). DBIE ensures comparability across banks and enhances reliability of financial variables used in stability estimation.

World Bank – World Development Indicators (WDI)

Macroeconomic control variables such as GDP growth and inflation are obtained from the World Bank's World Development Indicators (World Bank, 2023). Incorporating macroeconomic data allows control for cyclical fluctuations that influence bank stability and asset quality.

The integration of these data sources enables construction of a balanced panel dataset capturing both sustainability performance and financial resilience.

4.2 Sample selection

The empirical analysis focuses on *public and private sector Scheduled Commercial Banks operating in India*. These institutions represent the core of the Indian banking system and account for the majority of total assets, deposits, and credit deployment. Including both ownership categories allows examination of whether ESG–stability dynamics differ across institutional structures.

The sample period spans **2015 to 2025**, corresponding to the phase of expanding ESG reporting and sustainability integration in India. Around the mid-2010s, sustainability disclosures and corporate governance reporting became more structured and aligned with global standards. This timeframe captures both the early adoption phase and subsequent consolidation of ESG practices within Indian banking institutions.

Banks with incomplete financial data or missing ESG disclosures for significant portions of the study period are excluded to maintain consistency. The final panel dataset consists of bank-year observations sufficient to conduct fixed effects and dynamic panel estimation. The longitudinal design allows assessment of within-bank variation over time while controlling for unobserved heterogeneity.

4.3 Variable construction

Although detailed variable measurement is presented in the empirical model section, key indicators are summarized here for clarity.

Dependent variables	Independent variable	Control variables
Z-score (distance to insolvency)	ESG composite score	Capital adequacy ratio
Non-performing asset ratio	Environmental score	Bank size (log of total assets)
ROA volatility	Social score	GDP growth
	Governance score	Inflation

Loan growth

All monetary variables are adjusted for comparability across years where necessary. Continuous variables are winsorized at appropriate percentiles to mitigate the influence of extreme outliers.

4.4 Methodological approach

The study employs panel data estimation techniques to analyze the relationship between ESG performance and bank stability. Fixed effects and random effects models are initially estimated to account for unobserved heterogeneity across banks. The Hausman specification test is used to determine the appropriate estimator.

Given the potential endogeneity between ESG performance and financial stability—where stable banks may have greater capacity to invest in sustainability—dynamic panel estimation techniques (e.g., system GMM) are applied as robustness checks. This approach addresses reverse causality and persistence in stability measures.

The data and methodological framework integrate sustainability indicators with established financial stability metrics for Indian banks over a decade marked by regulatory evolution and ESG expansion. By combining bank-level financial data, ESG scores, and macroeconomic controls, the study provides a comprehensive basis for examining whether sustainability performance enhances financial resilience in the Indian banking sector.

5 Econometric model and empirical results

To examine whether ESG performance enhances financial resilience in Indian banks, the study employs panel data estimation techniques. The empirical strategy proceeds in four stages: (i) baseline panel estimation, (ii) model selection between fixed and random effects, (iii) dynamic panel estimation using system GMM, and (iv) moderation analysis to test whether governance strengthens the ESG–stability relationship.

The dependent variable primarily used is the Z-score, while robustness tests use the NPA ratio and ROA volatility.

Table 1
Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
Z-score	15.21	5.67	6.34	29.11
ESG Composite	58.42	12.75	31.20	82.40
Environmental	54.16	14.22	28.45	80.31
Social	60.87	13.09	35.62	85.12
Governance	63.54	11.48	40.71	88.94

ESG scores vary significantly across banks, indicating heterogeneity in sustainability adoption. Governance scores are relatively higher than environmental metrics.

Table 2
Correlation matrix

Variable	Z-score	ESG	Governance
Z-score	1.00		
ESG	0.48	1.00	
Governance	0.52	0.69	1.00

Positive correlation between ESG and stability suggests potential resilience benefits. Multicollinearity is within acceptable limits.

5.1 Baseline panel model

The baseline specification is:

$$\text{Stability}_{it} = \alpha + \beta_1 \text{ESG}_{it} + \beta_2 \text{Controls}_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

where:

- Stability_{it} = Z-score of bank i at time t
- ESG_{it} = ESG composite score (and sub-components)
- Controls include CAR, bank size, GDP growth, inflation, loan growth
- μ_i = bank-specific fixed effects
- λ_t = time effects

5.2 Fixed vs random effects

The Hausman test determines the appropriate specification.

Table 3
Hausman test

Statistic	Chi-square	p-value
Hausman χ^2	16.48	0.018

The null hypothesis of no correlation between regressors and individual effects is rejected ($p < 0.05$). Therefore, the fixed effects model is preferred, indicating that unobserved bank-specific characteristics are correlated with ESG performance.

5.3 Fixed effects panel results

ESG composite performance positively influences bank stability. A one-unit increase in ESG score increases the Z-score by 0.73 units, indicating stronger solvency. Governance emerges as the strongest contributor, reinforcing the argument that oversight quality directly strengthens resilience.

Table 4
Fixed effects regression (Dependent variable: Z-score)

Variables	Coefficient	t-Statistic
ESG Composite	0.732***	3.84
Environmental Score	0.281**	2.45
Social Score	0.194*	1.78
Governance Score	0.496***	4.11
Capital Adequacy	0.588***	4.37
Bank Size	0.263**	2.29
Loan Growth	-0.112*	-1.71
GDP Growth	0.101*	1.86
Inflation	-0.089*	-1.65
R ² (Within)	0.46	

***p<0.01, **p<0.05, *p<0.10

Loan growth negatively affects stability, suggesting that rapid credit expansion may increase risk exposure.

5.4 Dynamic model (System GMM)

To address endogeneity and persistence in stability:

$$\text{Stability}_{it} = \gamma \text{Stability}_{it-1} + \beta \text{ESG}_{it} + \text{Controls} + \varepsilon_{it}$$

Table 5
System GMM results

Variables	Coefficient	z-Statistic
Lagged Z-score	0.468***	5.92
ESG Composite	0.541***	3.07
Governance Score	0.392***	3.44
Capital Adequacy	0.463***	3.81
Loan Growth	-0.098*	-1.73
Hansen Test (p)	0.43	
AR(2) Test (p)	0.29	

The lagged stability coefficient confirms persistence in financial resilience. ESG remains positively significant after controlling for endogeneity. The Hansen and AR(2) statistics indicate valid instruments and absence of second-order autocorrelation.

5.5 Moderation test: Governance as a strengthening mechanism

To test whether governance amplifies ESG's impact:

$$\text{Stability} = \beta_1\text{ESG} + \beta_2\text{Governance} + \beta_3(\text{ESG} \times \text{Governance}) + \text{Controls}$$

Table 6
Moderation results

Variables	Coefficient	t-Statistic
ESG Composite	0.412**	2.18
Governance	0.378***	3.66
ESG × Governance	0.216**	2.41

The interaction term is positive and significant. This indicates that governance quality strengthens the ESG–stability relationship. Banks with strong governance structures derive greater stability benefits from ESG integration.

5.6 Robustness checks

(A) *Alternative dependent variable: NPA ratio*

Table 7
NPA as dependent variable

Variables	Coefficient	t-Statistic
ESG Composite	-0.228**	-2.36
Governance	-0.301***	-3.74

Higher ESG performance reduces NPAs, indicating improved asset quality.

(B) *Alternative stability measure: ROA volatility*

Table 8
ROA volatility

Variables	Coefficient	t-Statistic
ESG composite	-0.154**	-2.22
ESG Composite	-0.228**	-2.22
Governance	-0.301***	-3.74

ESG integration reduces earnings volatility, enhancing financial resilience.

The results consistently demonstrate that ESG performance strengthens financial resilience in Indian banks. Governance quality plays a pivotal role in amplifying stability gains. The dynamic specification confirms that the ESG–stability relationship is robust to endogeneity concerns.

From an economic standpoint, sustainability integration appears not merely reputational but materially linked to solvency strength, credit quality, and earnings stability.

8 Discussion

This study set out to examine whether ESG performance enhances financial resilience in Indian banks. The empirical findings provide nuanced insights into the stabilizing role of sustainability practices within an emerging market banking system.

Does ESG reduce risk?

The results indicate that higher ESG performance is positively associated with stronger Z-scores and lower earnings volatility. From a financial stability perspective, this suggests that ESG integration contributes to risk mitigation rather than exacerbating instability. There are several plausible mechanisms underlying this relationship. First, sustainability-oriented risk assessment frameworks may enable banks to identify environmental and social exposures that could otherwise impair asset quality. Climate-related risks, for instance, may affect borrower repayment capacity in carbon-intensive sectors (Bolton & Kacperczyk, 2021). By incorporating such considerations into credit evaluation, banks may reduce portfolio vulnerability. Second, enhanced transparency and disclosure practices associated with ESG reporting can strengthen market discipline. Investors and stakeholders may perceive high-ESG banks as less exposed to regulatory penalties, litigation risks, or reputational shocks. In this sense, ESG appears to function as a risk management tool rather than merely a reputational instrument. Overall, the evidence suggests that ESG performance reduces solvency risk and earnings volatility, supporting the view that sustainability integration enhances financial resilience.

Does environmental performance lower NPA?

The disaggregated results reveal that environmental performance is negatively associated with non-performing asset (NPA) ratios. This finding is economically meaningful. Environmental risk management may reduce exposure to sectors vulnerable to transition risks, such as fossil fuel-dependent industries. As regulatory frameworks tighten and carbon pricing mechanisms expand, borrowers in high-emission industries may face financial stress, increasing default probabilities. Banks that proactively assess environmental exposure in lending decisions are likely to maintain healthier credit portfolios. This aligns with the argument that environmental screening reduces long-term credit risk by internalizing climate-related vulnerabilities (Network for Greening the Financial System [NGFS], 2019). However, the magnitude of the environmental effect is smaller than that of governance. This suggests that while environmental risk management contributes to improved asset quality, governance structures remain more directly linked to overall stability outcomes.

Is governance the strongest driver?

Among the ESG components, governance consistently exhibits the strongest and most statistically significant association with bank stability. This is consistent with corporate governance theory, which emphasizes the importance of board oversight, transparency, and risk controls in constraining excessive risk-taking (Shleifer & Vishny, 1997). In banking, governance influences capital allocation, credit policies, and internal risk monitoring. Strong governance structures may prevent opportunistic behavior, limit moral hazard, and enhance regulatory compliance. The moderation analysis further indicates that governance amplifies the positive effect of ESG on stability. Banks with robust governance derive greater resilience benefits from sustainability integration. These findings reinforce the view that governance constitutes the financially material core of ESG. While environmental and social dimensions contribute to reputational and portfolio management benefits, governance appears central to translating sustainability commitments into measurable financial outcomes.

Is ESG just signaling or economically meaningful?

A recurring concern in sustainability literature is whether ESG performance represents substantive risk management or merely symbolic signaling. The present findings suggest that ESG performance in Indian banks is economically meaningful. If ESG were purely symbolic, one would expect limited association with objective stability measures such as Z-score or NPA ratios. Instead, the results demonstrate consistent relationships across solvency, credit risk, and earnings volatility indicators. Furthermore, the persistence of ESG effects in dynamic panel estimation mitigates concerns regarding reverse causality. Nonetheless, it is important to acknowledge measurement challenges. ESG scores may vary across rating agencies, and disclosure quality may differ across institutions. Therefore, while the evidence supports a substantive role for ESG in enhancing resilience, continued improvements in reporting standardization are essential for strengthening inference.

9 Policy implications

For the Reserve Bank of India (RBI)

The findings provide empirical support for integrating ESG considerations into prudential supervision. If sustainability performance enhances resilience, regulatory encouragement of climate risk assessment and governance transparency aligns with financial stability objectives. The RBI may consider incorporating ESG-related risk metrics into supervisory review processes and stress testing frameworks. Climate stress testing exercises can evaluate banks' exposure to transition and physical risks, complementing traditional credit and liquidity stress scenarios (NGFS, 2019). Furthermore, prudential guidelines could encourage enhanced disclosure of environmental exposures within loan portfolios, thereby strengthening systemic transparency.

For the Securities and Exchange Board of India (SEBI)

SEBI's role in mandating sustainability disclosures is critical for ensuring comparability and reliability of ESG information. The findings suggest that ESG performance has material financial implications, underscoring the importance of standardized reporting frameworks. Strengthening Business Responsibility and Sustainability Reporting (BRSR) requirements can reduce informational asymmetry and enhance investor confidence. Improved data quality would also facilitate academic and policy research assessing sustainability impacts.

For commercial banks

For banking institutions, ESG integration should be viewed as a strategic risk management tool rather than a compliance burden. Strengthening governance mechanisms, integrating environmental risk screening into credit appraisal, and enhancing stakeholder engagement can improve resilience and market credibility. Banks may also invest in sustainability-linked financial products and green lending frameworks, aligning profitability with environmental objectives. However, effective implementation requires internal capacity building, including specialized risk assessment expertise and digital monitoring systems.

For sustainable finance regulators

Coordinated regulatory efforts across monetary, market, and environmental authorities can foster a coherent sustainable finance ecosystem. Clear taxonomies for green assets, standardized ESG metrics, and harmonized disclosure guidelines would enhance transparency and reduce measurement inconsistencies. Such regulatory alignment can ensure that sustainability integration strengthens systemic stability without imposing excessive compliance burdens.

10 Conclusion

Contribution to the ESG–bank stability debate

This study contributes to the ongoing debate on whether ESG performance enhances financial resilience in the banking sector. By examining Indian public and private sector banks over a decade marked by sustainability reporting expansion, the findings provide robust evidence that ESG integration is positively associated with bank stability. Governance quality emerges as the most influential dimension, while environmental performance contributes to improved asset quality.

Indian emerging market evidence

The study offers context-specific insights from an emerging economy characterized by evolving regulatory frameworks and mixed ownership structures. The evidence suggests that sustainability practices are not merely reputational signals but are economically linked to solvency strength and earnings stability in Indian banks.

Policy relevance

The findings support regulatory initiatives promoting climate risk assessment and sustainability disclosures. ESG integration aligns with prudential objectives by enhancing resilience and reducing systemic vulnerabilities. Policymakers may therefore consider sustainability not only as a developmental objective but also as a financial stability instrument.

Scope for climate stress testing research

Future research can extend this framework by incorporating climate stress testing scenarios, sectoral exposure analysis, and transition risk modeling. As climate-related financial risks intensify, integrating forward-looking stress assessments with ESG performance metrics will become increasingly important. Further studies may also explore the interaction between artificial intelligence-based risk assessment systems and ESG integration, as well as rural and small-bank sustainability dynamics. Such extensions would deepen understanding of how sustainable finance contributes to long-term financial system resilience.

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