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ESG Performance and Bank Financial Risk: The Moderating Role of Economic Policy Uncertainty in Vietnam

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Abstract

Background and Objectives: Environmental, Social, and Governance (ESG) practices are increasingly integrated into banking activities as mechanisms to enhance financial stability and support sustainable development. In emerging economies such as Vietnam, however, ESG adoption remains uneven, and empirical evidence on its implications for bank financial risk is still limited. Moreover, banks operate under fluctuating macroeconomic conditions in which economic policy uncertainty (EPU) may alter the effectiveness of ESG performance. This study examines the impact of ESG performance on the financial risk of Vietnamese commercial banks, with particular emphasis on the moderating role of economic policy uncertainty.

Methodology: The study employs panel data from 24 Vietnamese commercial banks over the period 2014–2024. Bank financial risk is measured using the Z-score (insolvency risk) and the loan loss provision (LLP) ratio (credit risk). ESG indicators are manually constructed from annual and sustainability reports based on 16 standardized criteria across environmental, social, and governance dimensions. A key contribution of this study is the construction of an Economic Policy Uncertainty (EPU) index derived from text-mining official policy documents issued by the State Bank of Vietnam and relevant ministries. Panel estimations including Ordinary Least Squares (OLS), Fixed Effects (FE), Random Effects (RE), and Feasible Generalized Least Squares (FGLS) are conducted, with FGLS serving as the preferred specification to address heteroskedasticity and autocorrelation.

Key Findings: The results reveal heterogeneous effects of ESG dimensions on bank financial risk. Environmental performance is associated with lower Z-scores, indicating higher short-term financial risk, while social performance reduces loan loss provisions, suggesting improved asset quality. Governance does not exhibit a significant risk-mitigating effect under stable policy conditions. However, under heightened economic policy uncertainty, the ESG–risk relationship changes significantly. Environmental and social activities tend to amplify financial risk during periods of elevated policy uncertainty, whereas governance emerges as a key stabilizing factor that enhances banks' resilience.

Policy Implications: The findings highlight that ESG strategies should be aligned with prevailing macroeconomic conditions. During periods of high economic policy uncertainty, strengthening governance mechanisms is critical for risk management and financial stability. In contrast, environmental and social initiatives may yield more sustainable benefits under stable policy environments. Overall, the study underscores the importance of integrating ESG performance with coherent regulatory oversight and macroeconomic stability to support sustainable banking development in emerging economies.

Keywords: ESG Performance; Bank Financial Risk; Economic Policy Uncertainty; Z-score; Vietnam

JEL Classification Codes: G21; G28; G32; M14; Q56

1. Introduction

Over the past decade, the global development paradigm has shifted from conventional growth-oriented models toward a sustainability-driven framework. Within this transformation, Environmental, Social, and Governance (ESG) considerations have evolved from peripheral concerns into integral components of corporate and financial decision-making. Escalating challenges related to climate change, social inequality, and corporate governance failures have prompted regulators, investors, and financial institutions to reassess traditional mechanisms of capital allocation. Increasing evidence suggests that integrating ESG criteria into lending and investment activities not only facilitates the reallocation of capital toward sustainable sectors but may also strengthen the resilience and long-term stability of financial systems (World Bank, 2021).

As primary financial intermediaries, banks play a central role in channeling resources across the economy and are therefore pivotal in advancing sustainable development objectives. In recent years, the concept of sustainable banking has gained prominence, emphasizing that environmental, social, and governance risks are closely intertwined with conventional financial risks. Ignoring ESG-related factors may expose banks to regulatory penalties, reputational losses, stranded assets, and long-term value erosion (Gambetta et al., 2023). Conversely, integrating ESG criteria into credit evaluation and portfolio management can enhance risk control, improve asset quality, and reduce the likelihood of financial distress (Buallay, 2019; Miralles-Quirós et al., 2020). However, empirical findings regarding the ESG–risk nexus remain mixed, particularly in emerging markets.

Vietnam represents a particularly relevant setting for examining this relationship. In recent years, the Vietnamese government and the State Bank of Vietnam (SBV) have actively promoted green growth and sustainable finance, especially following the country's commitment at COP26 to achieve net-zero emissions by 2050. This policy direction has placed increasing pressure on banks to incorporate environmental and social risk management into their lending frameworks. Despite these regulatory efforts, ESG implementation across Vietnamese banks remains uneven. Existing evidence indicates that governance improvements have progressed more rapidly than environmental and social integration, which often remains limited to disclosure compliance rather than substantive risk assessment (Cuong & Thanh, 2025). This uneven adoption raises important questions about whether ESG engagement genuinely enhances financial resilience in the Vietnamese banking system.

In addition to ESG adoption challenges, banks operate within a dynamic and often volatile macroeconomic environment. Recent global and domestic shocks—including the COVID-19 pandemic, geopolitical tensions, and shifts in monetary and fiscal policy—have heightened Economic Policy Uncertainty (EPU). Elevated policy uncertainty increases information asymmetry, intensifies borrower default risk, and complicates banks' strategic planning. Under such conditions, ESG initiatives may either function as stabilizing mechanisms that reinforce stakeholder confidence or impose additional financial burdens that exacerbate risk. The interaction between ESG performance and policy uncertainty therefore warrants systematic empirical investigation.

Although international research on ESG and bank financial risk has expanded rapidly, several important gaps remain. First, empirical evidence on the risk implications of ESG engagement remains inconclusive. Some studies argue that strong ESG performance enhances reputational capital, reduces financing costs, and improves risk-adjusted returns (Li et al., 2023). Others, drawing on agency theory, contend that ESG initiatives may entail substantial costs and managerial discretion, potentially weakening short-term financial performance if not properly governed (Heubeck & Ahrens, 2024; Kuzey et al., 2023). Moreover, symbolic ESG engagement or greenwashing may undermine credibility and increase vulnerability, suggesting that the ESG–risk relationship may not be uniform or linear (Siddiqui et al., 2024).

Second, much of the existing literature relies on composite ESG indices, which may obscure heterogeneous effects across the Environmental (E), Social (S), and Governance (G) dimensions. Prior evidence suggests that governance often exerts the most immediate influence on risk control, while environmental and social initiatives may generate benefits over longer horizons (Broadstock et al., 2021; García & Casalegno, 2025). Given the uneven ESG development across Vietnamese banks, examining each dimension separately provides a more nuanced understanding of their distinct risk implications.

Third, despite the recognized importance of macroeconomic uncertainty in shaping financial stability, limited empirical research has examined the moderating role of Economic Policy Uncertainty in the ESG–risk relationship. Theoretical perspectives such as signaling and legitimacy theories suggest that under heightened uncertainty, strong governance and credible ESG engagement may enhance institutional trust and resilience. Conversely, the financial costs of sustaining ESG investments may intensify during periods of policy instability. Addressing this gap is particularly important for emerging economies characterized by evolving regulatory frameworks and exposure to external shocks.

Against this backdrop, this study provides a comprehensive analysis of the impact of ESG performance on the financial risk of Vietnamese commercial banks over the period 2014–2024, while explicitly examining the moderating role of economic policy uncertainty. Using a manually constructed ESG dataset disaggregated into environmental, social, and governance components, together with a newly developed EPU index derived from official policy documents, the study contributes to the literature in three keyways. First, it provides country-specific evidence from an emerging banking system. Second, it disentangles the heterogeneous effects of ESG dimensions on financial risk. Third, it introduces a policy-based measure of economic uncertainty to assess how macroeconomic conditions shape the ESG–risk nexus.

The remainder of this paper is structured as follows. Section 2 reviews the theoretical framework and develops the research hypotheses. Section 3 describes the data, variable construction, and empirical methodology, including the development of the Economic Policy Uncertainty index. Section 4 presents the empirical results and robustness analyses. Section 5 concludes the study and discusses its broader implications, followed by Section 6, which outlines policy recommendations.

2. Theoretical Framework and Research Hypotheses

2.1 ESG Performance and Bank Financial Risk

The relationship between ESG engagement and bank financial risk has attracted growing scholarly attention; however, empirical findings remain inconclusive, particularly in emerging markets. From a stakeholder and signaling perspective, strong ESG performance enhances reputational capital, improves investor confidence, and reduces information asymmetry, thereby lowering financing costs and stabilizing earnings (Dossa et al., 2025). Environmental risk management practices—such as incorporating green criteria into credit appraisal—can mitigate transition risks and reputational exposure, contributing to improved asset quality and lower financial distress risk (Azmi et al., 2021). Empirical evidence from ASEAN economies suggests that higher ESG engagement is associated with enhanced operational efficiency and reduced financial instability (Cantero-Saiz et al., 2024).

In contrast, agency theory offers a more cautious interpretation. ESG initiatives may involve discretionary spending, managerial opportunism, and increased operating costs, which could weaken short-term profitability and raise risk exposure if not accompanied by effective governance (Jensen & Meckling, 2019; Liang et al., 2024). In early stages of implementation, investments in environmental systems, social programs, and disclosure infrastructure may impose significant financial burdens. These conflicting perspectives suggest that the ESG–risk relationship may vary across institutional settings and ESG dimensions.

To provide a more granular assessment, this study examines the separate effects of Environmental (E), Social (S), and Governance (G) components on bank financial risk, proxied by the Z-score (insolvency risk) and loan loss provisions (LLP, credit risk).

2.1.1. Environmental Dimension (E)

Environmental performance reflects banks' efforts to manage climate-related risks, reduce carbon exposure, and promote green financing. From a long-term perspective, integrating environmental considerations into lending decisions may limit exposure to stranded assets and regulatory transition risks, thereby strengthening asset quality and enhancing stability (Salike & Ao, 2018). However, environmental investments often involve high initial costs, longer payback periods, and elevated project uncertainty, especially in emerging markets where green finance frameworks are still evolving (Jain et al., 2024). As a result, environmental initiatives may generate short-term financial pressures before long-term benefits materialize.

Given these opposing mechanisms, environmental engagement is expected to influence bank financial risk, though the direction may depend on contextual factors.

Hypothesis 1 (H1): Environmental (E) performance is negatively associated with bank financial risk.

2.1.2. Social Dimension (S)

The social dimension encompasses labor practices, customer protection, community engagement, and stakeholder relations. According to legitimacy theory, strong social performance enhances trust, institutional credibility, and customer loyalty, thereby reducing reputational risk and stabilizing funding sources (Salem et al., 2025). By strengthening borrower relationships and promoting transparency, social engagement may reduce moral hazard and improve repayment discipline, ultimately lowering credit risk and provisioning requirements.

Although prior studies often find that governance exerts a stronger immediate impact on financial performance, social initiatives can indirectly support risk mitigation through relationship-based channels (Azmat & Ha, 2013). Therefore, improved social performance is expected to contribute to lower bank financial risk.

Hypothesis 2 (H2): Social (S) performance is negatively associated with bank financial risk.

2.1.3. Governance Dimension (G)

Governance represents the internal control architecture of banks, including board independence, shareholder protection, transparency, and risk oversight mechanisms. Strong governance reduces agency conflicts, enhances monitoring effectiveness, and limits opportunistic behavior, thereby directly improving asset quality and reducing insolvency risk (Cantero-Saiz et al., 2024).

Among the ESG pillars, governance is often regarded as the most immediate and consistent determinant of financial stability. Weak governance structures have historically been linked to financial misconduct, excessive risk-taking, and institutional failure. Consequently, governance is expected to exert the strongest risk-mitigating effect.

Hypothesis 3 (H3): Governance (G) performance has the strongest negative association with bank financial risk.

2.2 The Moderating Role of Economic Policy Uncertainty (EPU)

While ESG performance may influence bank risk, its effectiveness is likely contingent upon macroeconomic conditions. Economic Policy Uncertainty (EPU) reflects instability and unpredictability in government policy actions, particularly in monetary, fiscal, and trade domains (Baker et al., 2016). Elevated policy uncertainty increases borrower default risk, exacerbates information asymmetry, and heightens financial market volatility.

Under conditions of high EPU, the costs and benefits of ESG engagement may change substantially.

2.2.1. Moderating Effect on Environmental and Social Dimensions

Environmental and social initiatives are typically long-term investments requiring sustained financial commitment. During periods of heightened policy uncertainty, banks face liquidity constraints, rising funding costs, and increased risk aversion. From an agency-cost perspective, continued investment in ESG initiatives may be perceived as financially burdensome, reducing flexibility in responding to macroeconomic shocks.

Under such conditions, environmental investments with uncertain short-term returns may amplify financial risk. Similarly, social programs involving ongoing expenditure may strain bank resources during economic instability. Therefore, the risk-reducing effects of E and S may weaken—or potentially reverse—when policy uncertainty rises.

Hypothesis 4a (H4a): Economic Policy Uncertainty strengthens the positive association between Environmental (E) performance and bank financial risk.

Hypothesis 4b (H4b): Economic Policy Uncertainty strengthens the positive association between Social (S) performance and bank financial risk.

2.2.2. Moderating Effect on Governance

In contrast, governance mechanisms function as internal stabilizers. During periods of elevated policy uncertainty, investors and depositors place greater value on transparency, strong internal controls, and effective risk management. From a signaling perspective, well-governed banks may preserve stakeholder confidence and contain risk more effectively under uncertain conditions.

Thus, the stabilizing effect of governance is expected to intensify when economic policy uncertainty increases.

Hypothesis 4c (H4c): Economic Policy Uncertainty strengthens the negative association between Governance (G) performance and bank financial risk.

Table 1. Summary of Research Hypotheses

Hypothesis	Relationship	Expected effect
H1	Environmental → Financial risk	Risk reduction
H2	Social → Financial risk	Risk reduction
H3	Governance → Financial risk	Risk reduction
H4a	Environmental moderated by EPU → Financial risk	The positive effect of E on financial risk is strengthened under high EPU
H4b	Social moderated by EPU → Financial risk	The positive effect of S on financial risk is strengthened under high EPU
H4c	Governance moderated by EPU → Financial risk	The negative effect of G on financial risk is strengthened under high EPU

Source: Compiled by the authors.

3. Research Methodology

3.1 Data and Sample

This study employs an unbalanced panel dataset comprising 24 Vietnamese commercial banks, including both listed and unlisted institutions, over the period 2014–2024, resulting in 240 bank-year observations. The selected period captures the consolidation of ESG disclosure practices in Vietnam as well as major macroeconomic fluctuations, including the COVID-19 shock and episodes of heightened economic policy uncertainty.

Financial data were obtained from audited financial statements, annual reports, and official publications of the State Bank of Vietnam (SBV). ESG information was manually collected from banks' annual and sustainability reports, following standardized criteria derived from the SBV's green credit regulations and the Global Reporting Initiative (GRI) framework. Consistent with Galeone et al. (2024), ESG disclosures were identified using keyword-based searches and classified into 16 indicators across three pillars: Environmental (5 indicators), Social (5 indicators), and Governance (6 indicators). Each indicator was scored on a scale from 0 to 3, reflecting disclosure intensity and implementation quality. Pillar-specific scores were aggregated and normalized to a 0–100 scale to ensure comparability across banks and over time.

This manual construction of ESG indices allows for greater contextual accuracy relative to reliance on external ESG rating agencies, which often provide limited coverage for emerging-market banks.

3.2 Variable Measurement and Empirical Model Specification

A key contribution of this study lies in the construction of a novel, manually curated dataset of Economic Policy Uncertainty (EPU), disaggregated into monetary, fiscal, and trade policy components. Using text-mining techniques applied to official government sources, this approach extends the methodology of Baker et al. (2016) and Ghirelli et al. (2019) by relying on primary policy communications rather than media-based data. Textual information was collected from the official websites of the State

Bank of Vietnam, the Ministry of Finance, and the Ministry of Industry and Trade, which represent the earliest and most authoritative channels for policy announcements and regulatory updates. All Vietnamese-language documents were web-scraped and processed using Python and VnCoreNLP to ensure accurate text normalization, segmentation, and keyword identification, thereby capturing direct signals of policy uncertainty.

An article is classified as conveying a policy uncertainty signal only when it simultaneously contains keywords from four distinct categories: (i) terms associated with uncertainty (e.g., risk, volatility, unpredictability); (ii) policy instrument-related terms (e.g., interest rates, taxation, credit, trade measures); (iii) expressions indicating policy actions or adjustments (e.g., issuance, amendment, regulation); and (iv) identifiers of relevant regulatory authorities, including the State Bank of Vietnam, the Ministry of Finance, and the Ministry of Industry and Trade. An observation is included in the EPU index only if at least one keyword from each category is present. This procedure ensures that the index captures uncertainty arising specifically from policy formulation or implementation rather than unrelated content.

After classifying the articles monthly, the policy uncertainty index for each group is calculated using relative frequency:

$$PU_t = \frac{The\ number\ of\ posts\ containing\ keyword\ combinations\ across\ 4\ groups}{The\ total\ number\ of\ posts\ in\ month\ t}$$

In this framework, PUt represents monetary (MPU), fiscal (FPU), or trade policy uncertainty (TPU). The numerator captures the intensity of policy uncertainty signals, while the denominator is normalized by the total number of published articles to control for time varying publication volume. To assess the robustness of the index, the same procedure is applied to news data from Vietnamnet and CafeF, enabling comparisons in terms of correlation, volatility, and informational content between government-based and media-based measures.

Monetary Policy Uncertainty (MPU) reflects uncertainty arising from changes or ambiguities in monetary policy instruments and objectives. It is constructed from official documents issued by the State Bank of Vietnam (SBV), including policy statements, circulars, directives, and regulatory announcements related to interest rates, credit growth targets, liquidity management, reserve requirements, and exchange rate operations. Monetary policy uncertainty is particularly relevant for banks, as it directly affects funding costs, lending behavior, interest margins, and balance-sheet risk.

Fiscal Policy Uncertainty (FPU) captures uncertainty associated with government fiscal decisions, including taxation, public spending, budget execution, and debt management. Textual data are collected from official publications of the Ministry of Finance, such as budget resolutions, tax policy amendments, public investment plans, and fiscal adjustment measures. Fiscal policy uncertainty influences banks indirectly through its impact on macroeconomic stability, corporate cash flows, and borrower creditworthiness, thereby affecting banks' asset quality and provisioning behavior.

Trade Policy Uncertainty (TPU) measures uncertainty related to trade regulations and external economic integration. This component is derived from policy documents issued by the Ministry of Industry and Trade and other relevant authorities, covering areas such as tariffs, export-import regulations, trade agreements, and trade defense measures. Trade policy uncertainty is particularly important for Vietnam's banking sector, given the country's high degree of trade openness and the exposure of banks' loan portfolios to export-oriented firms. Each component is constructed on a monthly basis using a text-mining approach. An official document is classified as signaling policy uncertainty only when it simultaneously contains keywords related to (i) uncertainty, (ii) specific policy instruments, (iii) policy actions or regulatory changes, and (iv) the issuing authority. The component-specific uncertainty indices (MPU, FPU, and TPU) are calculated as the relative frequency of uncertainty-related documents normalized by the total number of published policy documents in each period. The aggregate EPU index is then computed as the simple average of MPU, FPU, and TPU, following the approach of Baker et al. (2016) and Ghirelli et al. (2019).

$$EPU_t = \frac{MPU_t + FPU_t + TPU_t}{3}$$

According to Duong et al. (2022), the Z score represents actual financial risk and is the most important indicator for assessing asset quality. In finance, the Z-score is a widely used indicator for measuring financial risk and insolvency risk, particularly in banking and corporate finance studies (Luu, 2023). Conceptually, the Z-score captures the distance from insolvency by combining profitability, capitalization, and earnings volatility into a single metric. It is commonly calculated as:

$$Zscore = \frac{ROA + \frac{Equity}{Total\ Assets}}{\sigma\ (ROA)}$$

where ROA denotes return on assets, $\frac{Equity}{Total\ Assets}$ represents the capital ratio, and σ(ROA) is the standard deviation of ROA over time, reflecting income volatility. A higher Z-score indicates a greater financial buffer and a lower probability of insolvency, as the institution is better positioned to absorb adverse shocks. Conversely, a lower Z-score suggests increased financial fragility and heightened risk exposure. Owing to its intuitive interpretation and comprehensive structure, the Z-score has become a standard proxy for bank stability and financial risk in empirical finance literature.

Meanwhile, Azmi et al. (2021) argue that the loan loss provision (LLP) ratio captures the degree of prudence embedded in a bank’s risk management practices, often interpreted as managerial flexibility in accounting decisions. Following this perspective, the LLP ratio is employed as the second proxy for bank financial risk in this study.

$$LLP = \frac{Credit\ risk\ provisioning\ expense}{Total\ outstanding\ loans\ (\%)}$$

The key explanatory variables consist of the Environmental (E), Social (S), and Governance (G) scores, normalized on a 0-100 scale, together with Economic Policy Uncertainty (EPU). To isolate the effects of ESG and EPU, the model incorporates standard bank-specific and macroeconomic controls, including return on assets (ROA), capital adequacy (CAP), cost to income ratio (CIR), and inflation (INF), consistent with established banking risk frameworks (Cantero-Saiz et al., 2024). Prior studies document that CIR plays a critical role in asset quality and performance (Cantero-Saiz et al., 2024), while ROA and CAP contribute to risk mitigation (Baek & Kang, 2025; Jain et al., 2024; Pham et al., 2025). In addition, both governance quality and macroeconomic conditions have been shown to influence credit risk and bank value (Cantero-Saiz et al., 2024; El Khoury et al., 2023). Grounded in stakeholder, resource-based, agency, legitimacy, signaling, and sustainable finance theories, this study develops the research model described below.

Model 1: $$Y_{i,t} = \beta_0 + \beta_1 E_{i,t} + \sum_{k=1}^{4} \beta_k Control_{i,t} + \varepsilon_{i,t}$$

Model 2: $$Y_{i,t} = \beta_0 + \beta_1 S_{i,t} + \sum_{k=1}^{4} \beta_k Control_{i,t} + \varepsilon_{i,t}$$

Model 3: $$Y_{i,t} = \beta_0 + \beta_1 G_{i,t} + \sum_{k=1}^{4} \beta_k Control_{i,t} + \varepsilon_{i,t}$$

Model 4: $$Y_{i,t} = \beta_0 + \beta_1 E_{i,t} + \beta_2 (E_{i,t} \times EPU_t) + \sum_{k=1}^{4} \beta_k Control_{i,t} + \varepsilon_{i,t}$$

Model 5: $$Y_{i,t} = \beta_0 + \beta_1 S_{i,t} + \beta_2 (S_{i,t} \times EPU_t) + \sum_{k=1}^{4} \beta_k Control_{i,t} + \varepsilon_{i,t}$$

Model 6: $$Y_{i,t} = \beta_0 + \beta_1 G_{i,t} + \beta_2 (G_{i,t} \times EPU_t) + \sum_{k=1}^{4} \beta_k Control_{i,t} + \varepsilon_{i,t}$$

Note: $Y_{i,t}$ represents the dependent variable (Zscore or LLP) of bank i in year t. $E_{i,t}$, $S_{i,t}$, and $G_{i,t}$ denote the ESG scores of bank i in year t. EPU_t is the Economic Policy Uncertainty index in year t (bank-invariant). $Control_{i,t}$ refers to the set of control variables.

Table 2. Description of Variables and Expected Signs

Symbol	Variable description	Measurement	Source	References
Zscore	financial distress risk	Zscore = (ROA+Equity/(Total Assets))/(σ (ROA))	Financial statements	Luu (2023); Duong et al. (2022)
LLP	Loan loss provisions	Credit risk provisions / total outstanding loans	Annual reports	Cantero-Saiz et al. (2024); Baek & Kang (2025)
E	E	$E_{i,t}$/15*100	Annual reports and sustainability reports	Cantero-Saiz et al. (2024); Galeone et al. (2024)
S	S	$S_{i,t}$/15*100		
G	G	$G_{i,t}$/15*100		
CIR	Cost efficiency	Operating expenses / operating income	Financial statements	Galeone et al. (2024)
CAP	Equity size	Equity to total assets ratio	Financial statements	Jain et al. (2024); Baek & Kang (2025)
ROA	Return on assets	Net profit / total assets	Financial statements	Jain et al. (2024); Baek & Kang (2025)
INF	Inflation rate	Inflation rate	World Bank	Azmi et al. (2021)
EPU	Economic Policy Uncertainty	The average of the monetary policy uncertainty index, fiscal policy uncertainty index, and trade policy uncertainty index	Websites of the State Bank, the Ministry of Finance, and the Ministry of Industry and Trade	Baker et al. (2016); Ghirelli et al. (2019)

Source: Compiled by the authors.

4. Results and Discussion

4.1 Descriptive Statistics

Table 3 reports that the average Z-score is 1.66%, ranging from 0.01% to 13.27%, while the mean loan loss provision (LLP) ratio is 1.35%. These figures suggest generally low credit risk among Vietnamese commercial banks during the sample period, albeit with substantial cross-bank heterogeneity. This variation reflects differences in credit risk management quality and ESG adoption, particularly in the governance dimension. While several large banks have strengthened governance structures, increased provisioning, and integrated ESG criteria into credit appraisal to enhance risk control, smaller banks tend to exhibit weaker internal controls and higher credit risk exposure.

The average ESG scores are 45.109 for Environmental (E), 50.177 for Social (S), and 51.301 for Governance (G), with considerable dispersion across banks, indicating substantial differences in ESG implementation. Regarding control variables, the mean cost-to-income ratio (CIR) of 0.4526 suggests room for efficiency improvement, while a capital adequacy ratio (CAP) of 0.091 indicates generally adequate capitalization. The average return on assets (ROA) of 12.8% reflects moderate profitability, and an average inflation rate (INF) of 0.04 indicates a relatively stable macroeconomic environment during the period under study.

Overall, the descriptive statistics highlight heterogeneous ESG adoption across banks and provide preliminary evidence that ESG integration may influence financial risk, consistent with recent empirical studies.

Table 3. Descriptive Statistics of Variables

Variables	Observations	Mean	Standard deviation	Minimum	Maximum
Zscore	240	0.0166	0.0124	0.0001	0.1327
LLP	240	0.0135	0.0043	0.0081	0.0316
E	240	45.109	23.227	6.6510	93.338
S	240	50.177	22.108	6.6450	100.06
G	240	51.301	21.149	16.610	100.03
CIR	240	0.4526	0.1330	0.2991	0.8742
CAP	240	0.0910	0.1945	0.0405	0.1706
ROA	240	0.1280	0.0087	0.0031	0.0348
INF	240	0.0422	0.1229	0.0065	0.0498

Source: Authors' calculation.

The correlation matrix in Table 4 shows that most ESG components (E, S, and G) are correlated with both Z-score and LLP. In particular, ESG variables display statistically significant associations, though the magnitude of the correlations remains moderate. These patterns may reflect the transitional stage of ESG and green banking adoption, during which banks expand green lending portfolios that often involve longer payback periods and greater uncertainty.

Importantly, the correlations among independent variables are all below 0.5, suggesting no serious multicollinearity concerns and supporting the reliability of the subsequent regression analysis.

Table 4. Correlation Matrix

Variables	Zscore	LLP	E	S	G	CIR	CAP	ROA	INF
Zscore	1.000								
LLP	-0.293	1.000							
E	-0.140*	0.221*	1.000						
S	-0.162*	0.195*	0.834*	1.000					
G	0.144*	0.190*	0.913*	0.964*	1.000				
CIR	0.021	-0.240*	-0.061	-0.137	0.101	1.000			
CAP	0.119	-0.163	-0.159*	-0.195*	0.192*	0.402*	1.000		
ROA	0.170*	-0.109*	-0.023	-0.024	0.005	0.676*	0.444*	1.000	
INF	-0.022	0.166	0.354*	0.343*	-0.302*	-0.065	-0.085	-0.08	1.000

Source: Authors' calculation.

4.2 Regression Model Results

Table 5 presents the regression results of ESG components and control variables on Z-score, which proxies bank financial stability (higher values imply lower insolvency risk). In Panel A (Model 1), the Environmental (E) variable exhibits a negative coefficient and is statistically significant at the 1% level in the FGLS specification (-0.00216). This indicates that greater environmental engagement is associated with a lower Z-score, implying higher short-term financial risk. This result may reflect transitional trade-offs as banks increase exposure to green lending, which typically involves higher upfront costs, longer maturities, and greater uncertainty in project evaluation.

In contrast, the Social (S) and Governance (G) variables are not statistically significant in Models 2 and 3, suggesting that their stabilizing effects on bank financial risk are not clearly observable in the absence of macroeconomic conditioning factors.

Regarding control variables, the results are consistent with conventional financial theory. Profitability (ROA) and capital adequacy (CAP) are positively and significantly associated with Z-score, confirming that more profitable and better-capitalized banks exhibit stronger financial resilience. Inflation (INF), by contrast, exerts a negative effect on Z-score in the FGLS specification, highlighting the adverse impact of macroeconomic instability on bank stability.

Table 5. Regression Estimates on Zscore

Variables	Zscore							
	Ordinary Least Squares		Fixed Effects Model		Random Effects Model		Feasible Generalized Least Squares	
	Coeficient	p-value	Coeficient	p-value	Coeficient	p-value	Coeficient	p-value
Panel A. Model 1								
E	-0.00140	0.150	-0.00014	0.608	-0.00021	0.566	-0.00216***	0.004
CIR	0.00765	0.569	0.00889	0.850	0.00521	0.756	0.00812	0.082
CAP	0.17865***	0.000	0.19872***	0.004	0.25035***	0.001	0.30012***	0.000
ROA	0.69915***	0.000	0.21080	0.234	0.41020**	0.021	0.55046***	0.000
INF	-0.01216	0.785	-0.04093	0.329	-0.19004	0.641	-0.06081***	0.015
Panel B. Model 2								
S	-0.00128	0.767	-0.00225	0.129	-0.00045	0.233	-0.00124	0.188
CIR	0.00744	0.660	0.00156	0.620	0.00509	0.816	0.00622	0.084
CAP	0.17818***	0.000	0.19023***	0.003	0.22051***	0.003	0.36352***	0.000

Variables	Zscore							
	Ordinary Least Squares		Fixed Effects Model		Random Effects Model		Feasible Generalized Least Squares	
	Coeficient	p-value	Coeficient	p-value	Coeficient	p-value	Coeficient	p-value
ROA	0.62045***	0.000	0.20931	0.194	0.42220**	0.026	0.52201***	0.000
INF	-0.02044	0.555	-0.04111	0.459	-0.14024	0.622	-0.06043***	0.015
Panel C. Model 3								
G	0.00003	0.921	0.00011	0.719	0.00033	0.804	0.00021	0.710
CIR	0.00433	0.349	0.00766	0.458	0.00409	0.773	0.00462	0.185
CAP	0.15152***	0.000	0.15700***	0.004	0.14223***	0.001	0.14200***	0.000
ROA	0.70210***	0.000	0.29301	0.161	0.41700**	0.021	0.82118***	0.000
INF	-0.05319	0.421	-0.04290	0.322	-0.03341	0.441	-0.06277***	0.010

Source: Authors' calculation.
*Note: ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels.*

To test robustness, the dependent variable was replaced with loan loss provisions (LLP), which capture expected credit losses and reflect asset quality and provisioning behavior. After re-estimating the models, the FGLS specification was again selected as the preferred estimator (Table 6), as it corrects for potential heteroskedasticity and autocorrelation.

The FGLS results in Model 2 (Table 6) reveal a notable shift in significance patterns. The Social (S) variable now exhibits a negative and statistically significant coefficient (-0.00215; p = 0.017), supporting Hypothesis H2. This finding suggests that stronger social engagement reduces credit risk. Banks committed to transparency, customer protection, and stakeholder engagement may foster stronger borrower discipline and long-term relationships, thereby reducing default risk and provisioning requirements (Cornett et al., 2016; Gangi et al., 2019).

The Environmental (E) and Governance (G) variables, however, remain statistically insignificant in the LLP specification without interaction effects, indicating that their impact may depend on broader macroeconomic conditions.

Table 6. Regression Estimates on LLP

Variables	LLP							
	Ordinary Least Squares		Fixed Effects Model		Random Effects Model		Feasible Generalized Least Squares	
	Coeficient	p-value	Coeficient	p-value	Coeficient	p-value	Coeficient	p-value
Panel A. Model 1								
E	-0.00016	0.125	-0.00059	0.451	-0.00021	0.594	-0.00017	0.171
CIR	-0.00543	0.102	-0.00106	0.544	-0.00195	0.118	-0.0196	0.127
CAP	-0.00190	0.725	-0.04490***	0.003	-0.01019**	0.011	-0.00931***	0.003
ROA	-0.00171	0.357	-0.05100	0.420	-0.06117	0.356	-0.09412	0.207
INF	0.00341	0.794	0.00321	0.435	0.00830	0.510	0.00114	0.235
Panel B. Model 2								
S	-0.00016	0.224	-0.00023	0.167	-0.00018	0.113	-0.00215**	0.017
CIR	-0.00368	0.172	-0.00196	0.447	-0.00105	0.129	-0.0144	0.326
CAP	-0.00412	0.732	-0.06030***	0.006	-0.04179**	0.0216	-0.00499***	0.003
ROA	-0.00181	0.407	-0.05092	0.420	-0.06094	0.426	-0.13045	0.411

Variables	LLP							
	Ordinary Least Squares		Fixed Effects Model		Random Effects Model		Feasible Generalized Least Squares	
	Coeficient	p-value	Coeficient	p-value	Coeficient	p-value	Coeficient	p-value
INF	0.00661	0.766	0.00141	0.735	0.00260	0.800	0.00228	0.265
Panel C. Model 3								
G	-0.00124	0.560	-0.00214	0.500	-0.00145	0.279	-0.00031	0.562
CIR	-0.00998	0.102	-0.00155	0.457	-0.00275	0.273	-0.0033	0.312
CAP	-0.00306	0.439	-0.06993***	0.003	-0.03209**	0.020	0.00477***	0.004
ROA	-0.00541	0.227	-0.02102	0.465	-0.04311	0.308	-0.10555	0.167
INF	0.00745	0.691	0.00121	0.335	0.00320	0.464	0.00234	0.115

Source: Authors' calculation.
*Note: ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels.*

4.3 The Impact of ESG on Bank Financial Risk under the Moderating Role of Economic Policy Uncertainty

This subsection examines whether Economic Policy Uncertainty (EPU) moderates the relationship between ESG components and bank financial risk.

4.3.1. Z-score Specification (Table 7)

The inclusion of EPU significantly alters the ESG–risk relationship. In Model 4, the interaction term E × EPU is negative and statistically significant (-0.00273; $p < 0.05$), supporting Hypothesis H4a. This suggests that under heightened policy uncertainty, environmental investment is associated with greater financial risk. Environmental projects typically involve high initial costs and long payback periods, which may reduce financial flexibility during periods of regulatory instability.

For the Social dimension (Model 5), neither S nor S × EPU is statistically significant, indicating no clear moderating effect of policy uncertainty on the social–risk relationship in the Z-score specification.

In Model 6, the Governance (G) variable becomes positive and statistically significant (0.00074; $p = 0.031$), whereas it was insignificant in Table 5. Moreover, the interaction term G × EPU is positive and significant. These results suggest that as economic policy uncertainty increases, strong governance structures enhance banks' resilience. Effective governance mechanisms—such as transparency, accountability, and internal controls—enable banks to respond more effectively to regulatory changes and external shocks. Governance thus functions as a stabilizing buffer during uncertain policy environments, supporting Hypothesis H4c.

Table 7. Regression Results on Zscore with Economic Policy Uncertainty as a Moderating Variable

Variables	Zscore							
	Ordinary Least Squares		Fixed Effects Model		Random Effects Model		Feasible Generalized Least Squares	
	Coeficient	p-value	Coeficient	p-value	Coeficient	p-value	Coeficient	p-value
Panel A. Model 4								
E	-0.00192	0.431	-0.00562	0.410	-0.00021	0.223	-0.00032	0.154
E*EPU	-0.00125	0.443	-0.00016	0.325	-0.00021	0.105	-0.00273**	0.026

Variables	Zscore							
	Ordinary Least Squares		Fixed Effects Model		Random Effects Model		Feasible Generalized Least Squares	
	Coeficient	p-value	Coeficient	p-value	Coeficient	p-value	Coeficient	p-value
CIR	0.00175	0.193	0.00291	0.148	0.00227	0.982	0.00134	0.305
CAP	0.10846***	0.000	0.13012***	0.002	0.15092***	0.001	0.12125***	0.000
ROA	0.60993***	0.000	0.22361	0.316	0.30900**	0.025	0.66213***	0.000
INF	-0.01330	0.617	-0.10932	0.029	-0.10155	0.199	-0.01773	0.543
Panel B. Model 5								
S	-0.00018	0.126	0.00038	0.325	0.00027	0.584	-0.00043	0.300
S*EPU	0.00024	0.146	0.00016	1.024	0.00042	0.618	0.00009	0.133
CIR	0.00175	0.123	0.00091	0.218	0.00227	0.503	0.00155	0.285
CAP	0.10933***	0.000	0.11482***	0.002	0.12211***	0.001	0.17634***	0.000
ROA	0.40983***	0.000	0.21238	0.309	0.38463**	0.033	0.60513***	0.000
INF	-0.01040	0.617	-0.15913	0.035	-0.10809	0.135	-0.01220	0.463
Panel C. Model 6								
G	0.00255**	0.021	0.00025	0.664	0.00013	0.245	0.00074**	0.031
G*EPU	0.00018**	0.012	0.00022	0.766	0.00024	0.417	0.00013**	0.027
CIR	0.00615	0.543	0.00729	0.918	0.00227	0.292	0.00147	0.375
CAP	0.13312***	0.000	0.11042***	0.001	0.13701***	0.001	0.18001***	0.000
ROA	0.21343***	0.000	0.20488	0.309	0.32340**	0.042	0.30613***	0.000
INF	-0.02150	0.356	-0.10902	0.032	-0.10554	0.121	-0.01188	0.463

Source: Authors' calculation.
*Note: ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels.*

4.3.2. LLP Specification (Table 8)

Table 8 evaluates the moderating role of EPU using LLP as the dependent variable. The FGLS specification is again preferred due to its robustness to heteroskedasticity and autocorrelation.

For the Environmental variable (Model 4), E remains insignificant, consistent with Table 6. However, the interaction term E × EPU is positive and statistically significant (0.00029; $p < 0.05$), indicating that environmental engagement may increase provisioning pressure during periods of high policy uncertainty. This supports Hypothesis H4a and suggests that environmental investments become risk-enhancing when macroeconomic uncertainty intensifies.

In Model 5, the Social (S) variable remains negative and highly significant (-0.00031; $p < 0.01$), reinforcing the conclusion that social engagement reduces credit risk. However, the interaction term S × EPU is positive and statistically significant (0.00072; $p < 0.01$). This implies that under elevated policy uncertainty, the costs associated with social initiatives may outweigh their risk-reducing benefits, potentially increasing financial vulnerability. These findings provide strong support for Hypothesis H4b.

Finally, in Model 6, Governance (G) and its interaction with EPU both exhibit negative and highly significant coefficients (-0.00077 and -0.00103, respectively). This indicates that governance becomes particularly effective in reducing provisioning needs during periods of economic policy uncertainty. Strong internal controls, transparency, and disciplined risk management enable banks to better withstand unexpected regulatory or macroeconomic shocks. This finding supports Hypothesis H4c and aligns with Joosen (2024).

Table 8. Regression Results on LLP with Economic Policy Uncertainty as a Moderating Variable

	LLP							
Variables	**Ordinary Least Squares**		**Fixed Effects Model**		**Random Effects Model**		**Feasible Generalized Least Squares**	
	Coeficient	**p-value**	**Coeficient**	**p-value**	**Coeficient**	**p-value**	**Coeficient**	**p-value**
Panel A. Model 4								
E	-0.00123	0.141	-0.00303	0.261	-0.00415	0.211	-0.00027	0.464
E*EPU	0.00345	0.548	0.00011	0.172	0.00036	0.166	0.00029**	0.045
CIR	-0.0134***	0.001	-0.00344	0.319	-0.00145*	0.072	-0.01261***	0.000
CAP	-0.00150	0.235	-0.04064**	0.024	-0.01215*	0.056	-0.00748	0.541
ROA	-0.00749	0.601	-0.17742	0.167	-0.05094	0.177	-0.18362***	0.000
INF	0.04117	0.323	0.02011	0.073	0.02903	0.066	0.01431	0.307
Panel B. Model 5								
S	-0.00037**	0.012	-0.00025	0.547	-0.00024	0.151	-0.00031***	0.000
S*EPU	0.00028**	0.033	0.00076	0.419	0.00057	0.244	0.00072***	0.000
CIR	-0.0184***	0.000	-0.00172	0.341	-0.00495*	0.072	-0.01883***	0.000
CAP	-0.00410	0.520	-0.00244**	0.027	-0.02915*	0.058	-0.00678	0.305
ROA	-0.00713	0.380	-0.10763	0.457	-0.02304	0.177	-0.10892***	0.000
INF	0.04740	0.216	0.00451	0.060	0.05197	0.068	0.01767	0.301
Panel C. Model 6								
G	-0.00156	0.192	-0.00143	0.735	-0.00062	0.307	-0.00077***	0.000
G*EPU	-0.00063	0.125	-0.00134	0.164	-0.00055	0.311	-0.00103***	0.000
CIR	-0.0191***	0.007	-0.00381	0.302	-0.00612*	0.071	-0.04391***	0.000
CAP	-0.00160	0.209	-0.03064**	0.027	-0.03625*	0.058	-0.00209	0.501
ROA	-0.00173	0.420	-0.10108	0.237	-0.06654	0.156	-0.13907***	0.000
INF	0.04821	0.246	0.02288	0.065	0.05309	0.067	0.01266	0.315

Source: Authors' calculation.
*Note: ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels.*

5. Conclusions

This study examines the effects of Environmental, Social, and Governance (ESG) factors on the financial risk of Vietnamese commercial banks over the period 2014–2024, while incorporating the moderating role of Economic Policy Uncertainty (EPU). The empirical analysis is based on panel data from 24 banks and relies on a manually compiled ESG dataset comprising 16 indicators grouped into three dimensions (E, S, and G), together with a newly constructed EPU index derived from official regulatory documents. By disaggregating ESG components rather than employing a composite ESG index, and by constructing a policy-based EPU measure through textual analysis of official communications, this study contributes novel evidence that more directly reflects regulatory signals and mitigates potential media-based bias. These methodological innovations enhance the robustness of the estimations and enable a more precise evaluation of how individual ESG dimensions respond to changes in the policy environment.

The findings demonstrate that ESG dimensions exert heterogeneous effects on bank financial risk, and their impact depends critically on the stability of economic policy. In the baseline specification without EPU, the Environmental (E) dimension is associated with higher financial risk, as reflected in its negative relationship with the Z-score, suggesting short-term adjustment costs and risk exposure linked to green lending activities. The Social (S) dimension, by contrast, contributes to improved asset quality by reducing loan loss provisions, indicating that social engagement strengthens borrower discipline and risk management. Governance (G) does not exhibit a statistically significant effect under stable conditions, implying that its stabilizing function may not be fully observable in the absence of external uncertainty.

When Economic Policy Uncertainty is incorporated into the model, the ESG–risk relationship changes substantially. Under high policy uncertainty, environmental and social activities are associated with increased financial risk, reflecting the vulnerability of long-term investments and socially oriented expenditures to unstable regulatory and macroeconomic conditions. In contrast, governance emerges as the most important stabilizing factor during uncertain periods. Strong internal controls, transparency, and adaptive managerial capacity enhance banks' resilience to regulatory shocks and macroeconomic volatility.

Overall, the results suggest that ESG integration does not uniformly reduce financial risk. Instead, its effectiveness depends on the broader macroeconomic and institutional policy environment. Governance plays a central role in enhancing resilience under uncertainty, while environmental and social initiatives appear to require a stable and predictable policy framework to generate sustained risk-reducing benefits.

Future research could further disentangle the moderating role of policy uncertainty by analyzing its individual components separately. Examining monetary policy uncertainty (MPU), fiscal policy uncertainty (FPU), and trade policy uncertainty (TPU) as distinct moderating factors would provide deeper insight into whether specific ESG strategies are more effective under particular sources of policy instability. Such a disaggregated approach would enrich the understanding of the ESG–financial risk nexus and generate more targeted implications for regulators and financial institutions.

6. Policy Implications

The empirical findings offer several important policy implications for regulators, bank managers, and policymakers in Vietnam and other emerging banking systems.

First, the heterogeneous effects of ESG dimensions imply that ESG integration should not be implemented as a uniform regulatory mandate. Under relatively stable macroeconomic conditions, socially responsible practices contribute to improved asset quality by enhancing borrower discipline and strengthening stakeholder trust. Regulators should therefore promote structured frameworks for transparency, customer protection, and employee development that directly support credit risk mitigation and long-term financial sustainability.

Second, environmental initiatives—while essential for sustainable development—may generate short-term financial pressures, particularly in periods of elevated economic policy uncertainty. Green investments often involve high upfront costs, long payback horizons, and complex risk assessment requirements. In uncertain policy environments, these characteristics can constrain banks' financial flexibility. Policymakers should therefore adopt gradual and well-sequenced green finance regulations, accompanied by clear guidance, transitional mechanisms, and consistent regulatory signals. Such an approach can reduce transition risks and support a smoother integration of environmental objectives into banking operations.

Third, governance reforms should be prioritized as a core pillar of financial stability. The evidence indicates that strong governance structures significantly enhance banks' resilience under economic policy uncertainty. Regulatory authorities, including the State Bank of Vietnam, may strengthen disclosure standards, board independence requirements, and internal risk management systems to reinforce institutional robustness during periods of macroeconomic volatility.

Fourth, the moderating role of Economic Policy Uncertainty highlights that macroeconomic stability itself is a prerequisite for maximizing the benefits of ESG engagement. Transparent, predictable, and well-coordinated monetary, fiscal, and trade policies reduce uncertainty and enable banks to allocate resources more efficiently toward sustainable investments. Improved inter-agency coordination and clearer policy communication can therefore indirectly strengthen the effectiveness of ESG strategies in supporting financial resilience.

Overall, the findings suggest that ESG policy design should be aligned with prevailing macroeconomic conditions. Governance reforms should be emphasized during periods of elevated uncertainty, while environmental and social initiatives are likely to yield more durable financial stability benefits under stable policy environments. By integrating ESG objectives with broader macroeconomic stabilization strategies, Vietnamese regulators can foster a more resilient, adaptive, and sustainable banking system.

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