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ESG Performance and Systemic Risk: Evidence from Listed Commercial Banks

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Abstract. Against the backdrop of the goals to achieve carbon peak by 2030 and carbon neutrality by 2060, the Environmental, Social, and Governance (ESG) concept aligns with the requirements of China's sustainable development. Favorable ESG performance by banks is of great significance for the advancement of green finance in China. Concurrently, risk prevention is a perpetual theme in China's financial industry. Therefore, utilizing quarterly panel data of 36 listed banks in China from 2009 to 2023, this paper employs the DCC-GARCH model to calculate two metrics for systemic risk: CoVaR and MES. It empirically analyzes the impact of ESG ratings performance on the systemic risk of China's listed banks. Furthermore, heterogeneity analysis is conducted based on three dimensions: ownership structure, asset size, and analyst coverage. The results of robustness tests support the main conclusions of this study. The findings reveal that favorable ESG ratings performance by banks significantly exacerbates their systemic risk. This exacerbating effect is more pronounced among non-state-owned banks, large-scale banks, and banks with high analyst coverage. In view of this, it is imperative to fully refine the ESG rating system and implement differentiated supervision based on the varying effects of ESG ratings across different types of banks, thereby enhancing the risk prevention and control capabilities of listed banks.

Keywords: ESG Performance, Systemic Risk, Listed Commercial Banks.

1. Introduction

Risk prevention is an enduring theme in China's financial industry. The "14th Five-Year Plan" emphasizes improving the systemic financial risk prevention system. Furthermore, the People's Bank of China, the China Banking and Insurance Regulatory Commission, and the China Securities Regulatory Commission, while studying the communiqué of the Sixth Plenary Session of the 19th Central Committee of the Communist Party of China, once again stressed the importance of firmly holding the line against systemic risks. This implies that preventing systemic financial risks has become an imperative for ensuring high-quality and stable economic development. Currently, there is no consensus on the definition of systemic risk in academia. Foreign scholars such as Billio et al. (2017) define systemic risk as the risk that a severe shock simultaneously affecting multiple market participants will propagate throughout the entire financial system. Domestic scholars Yang Zihui et al. (2022) argue that a key characteristic of systemic risk is that the fluctuations, shocks, and even losses faced by a single financial institution or financial market are rapidly transmitted to other institutions and markets within the financial system. Among China's financial institutions, banks hold a dominant position. Chen Shaoling et al. (2021) point out that the financial industry performs a risk absorption function, with the banking sector having the strongest capacity in this regard. Consequently, numerous scholars, both domestically and internationally, have focused their research on bank systemic risk, seeking to provide empirical evidence for their respective countries to prevent and mitigate systemic risks.

In June 2022, the China Banking and Insurance Regulatory Commission (CBIRC) issued the Green Finance Guidelines for the Banking and Insurance Industry, which explicitly require banking and insurance institutions to advance green finance from a strategic height. For the first time, it was stipulated that these institutions should pay attention to environmental (E), social (S), and governance (G) risks. The ESG concept aligns with China's current sustainable development philosophy.

Achieving green finance development and the "dual carbon" goals necessitates that banks assume greater social and environmental protection responsibilities. Consequently, against the backdrop of promoting green finance and preventing systemic risks, a comprehensive and in-depth investigation into the impact of banks' ESG ratings performance on their systemic risk holds significant theoretical and practical implications for the stable and high-quality development of China's economy.

Most research on ESG ratings has focused on non-financial sectors, such as the energy industry. However, given the increasing prominence of ESG ratings in the financial sector, scholars have gradually shifted their research focus from corporates to financial institutions, particularly exploring the relationship between ESG factors and bank risk. These studies have primarily concentrated on banks' own risk-taking. For instance, Galletta et al. (2023) provide empirical support for the "stakeholder" view, demonstrating that higher ESG ratings reduce bank risk-taking through reputation effects. Similarly, Neitzert et al. (2022) find that high ESG ratings significantly mitigate banks' operational risk, default risk, and portfolio risk. Contrary to the majority of studies concluding that high ESG ratings significantly reduce commercial banks' risk-taking, Jiang Hai et al. (2023) offer support for the "cost effect" perspective, arguing that higher ESG ratings actually exacerbate the risks faced by commercial banks.

Existing literature has extensively discussed the relationship between ESG ratings and bank risk, primarily focusing on bank risk-taking. However, research specifically examining the link between ESG ratings and bank systemic risk remains scarce. Moreover, the limited studies on the impact of banks' ESG performance on systemic risk generally adopt an optimistic perspective, suggesting that favorable ESG performance curbs banks' systemic risk. This raises an important question: Could there be a contrary view? To address this gap, this paper constructs an unbalanced panel dataset using quarterly data from 36 listed banks in China over the period 2009-2023 to empirically investigate the impact of bank ESG performance on systemic risk.

2. Research Hypotheses

The rapid development of green finance has exerted a profound impact on the financial industry. ESG ratings performance effectively reflects banks' performance in environmental protection, social responsibility, and corporate governance. From an external perspective, ESG performance intensifies competition among banks. First, when a bank pursues favorable ESG performance to garner support from stakeholders, other banks follow suit by striving to improve their own ESG ratings (Gu Haifeng and Bian Yuchen, 2022). Enhanced ESG performance reduces information asymmetry between banks and corporations, increasing the likelihood of banks expanding their credit scale. However, given the scarcity of high-quality enterprises, such credit expansion exacerbates competition among banks, incentivizing them to allocate riskier assets and ultimately amplifying systemic risk. Second, favorable ESG performance helps banks gain the trust of regulatory authorities, thereby reducing external regulatory pressure (He Xiaogang et al., 2019). To some extent, reduced external regulatory pressure may enhance bank stability. From an internal perspective, superior ESG performance generates a "siphoning effect" (Gao Jieying et al., 2021). Due to the inherent resource constraints faced by banks, when they invest in environmental protection, social responsibility, and corporate governance activities—thereby improving their ESG performance—they inevitably reduce investment in other areas. Furthermore, banks with a strong sense of social responsibility tend to exercise greater caution in employee dismissals, which increases operational costs (Broadstock et al., 2020). Greater tolerance toward employees may lead to operational risks and corruption issues arising from individual employee conduct. This, in turn, forces banks to allocate more resources to supervision and management, depleting bank capital. Excessive capital occupation ultimately increases risk exposure.

Based on the above analysis, this paper proposes the following research hypothesis:

H1: Favorable ESG performance by banks exacerbates their systemic risk.

3. Research Design

3.1. Data Sources

This paper selects quarterly data of listed banks from 2009 to 2023 as the initial research sample. Considering data availability and continuity, the bank sample comprises 36 banks with strong representativeness, including 6 large state-owned commercial banks, 9 joint-stock commercial banks, 13 city commercial banks, and 8 rural commercial banks. To mitigate the impact of outliers, this paper winsorizes all micro-level continuous variables at the 1% and 99% levels. The raw data are obtained from the CSMAR database, and the quarterly data of Huazheng ESG ratings are sourced from the Wind database.

3.2. Variable Definitions

3.2.1. Dependent Variable

Following the approach of Adrian and Brunnermeier (2016), this paper employs Conditional Value at Risk (CoVaR) to measure the systemic risk of listed banks and utilizes the DCC-GARCH model to estimate CoVaR. When bank i experiences an extreme event, the Value at Risk of the financial system (CoVaR) is given by:

$$\Pr(CoVaR^{system} \leq CoVaR^{system|i} | R^{i} = VaR^{i}_{5\%}) = 5\% \tag{1}$$

ΔCoVaR is defined as the difference between the CoVaR of the financial system when bank i is under extreme duress and the CoVaR when bank i is in its normal state. This metric captures the marginal contribution of bank i to overall systemic risk and is employed in this paper as the measure of bank systemic risk.

$$\Delta CoVaR^{system|i}_{5\%} = CoVaR^{system|i=VaR^{i}_{5\%}}_{5\%} - CoVaR^{system|i=VaR^{i}_{50\%}}_{5\%} \tag{2}$$

Marginal Expected Shortfall (MES) was developed by Acharya et al. (2017) as an extension of the classical risk metric Expected Shortfall (ES). The specific calculation method is as follows:

$$ES_{\alpha,t-1} = -\sum_i \omega_i E_{t-1}(r_{i,t} | r_{m,t} < -VaR_{\alpha,m,t}) \tag{3}$$

$$MES_{\alpha,i,t-1} = \frac{\partial ES_{\alpha,m,t-1}}{\partial \omega_i} = -E_{t-1}(r_{i,t} | r_{m,t} < -VaR_{\alpha,m,t}) \tag{4}$$

Where $r_{i,t}$ and $r_{m,t}$ represent the returns of bank i and the sector as a whole, respectively; ω_i denotes the proportion of bank i's assets relative to the total assets of the banking sector; VaR is Value at Risk; and α=5%. MES is used as an alternative measure of bank systemic risk in the robustness tests.

3.2.2. Explanatory Variable

This paper employs Huazheng ESG ratings to measure the ESG performance of listed banks. Since the first quarter of 2009, Huazheng ESG ratings have provided ongoing evaluations of A-share listed companies, assigning scores based on a nine-tier rating system ranging from "AAA" to "C." These ratings offer strong timeliness and representativeness. In this paper, the ratings are converted into numerical scores using a nine-point scale: an ESG rating of AAA corresponds to a score of 9, AA corresponds to 8, and so forth. Higher scores indicate better ESG performance of the company.

3.2.3. Control Variables

Drawing on existing relevant studies, this paper selects the following variables as control variables: bank size (Size), return on assets (ROA), leverage ratio (Lev), loan-to-deposit ratio (LDR), and the natural logarithm of GDP (GDP). Detailed definitions and descriptions of these variables are presented in Table 1.

Table 1. Variable Definitions and Descriptions

Variable Type	Variable Name	Variable Symbol	Variable Description
Dependent Variable	Bank Systemic Risk	ΔCoVaR	Calculated based on the DCC-GARCH model
		MES	
Explanatory Variable	ESG Performance	ESG	Huazheng ESG ratings
Control Variables	Bank Size	Size	Natural logarithm of total assets
	Return on Assets	ROA	Net income / Total assets
	Leverage Ratio	Lev	Total assets / Total equity
	Loan-to-Deposit Ratio	LDR	Total loans / Total deposits
	GDP (Logarithm)	GDP	Natural logarithm of GDP

3.3. Model Specification

To investigate whether ESG ratings have a significant impact on bank systemic risk, we specify the following baseline regression model:

$$SR_{i,t}=\alpha+\beta\times ESG_{i,t}+\gamma\times Controls_{i,t}+\theta_b+\theta_t+\varepsilon_{i,t} \quad (5)$$

where the dependent variable SR denotes bank systemic risk. The core explanatory variable ESG is proxied by the ESG ratings of the sample banks. Controls represents a set of control variables at both the bank level and the macroeconomic level. The bank-level control variables include bank size (Size), return on assets (ROA), leverage ratio (Lev), and loan-to-deposit ratio (LDR). The macroeconomic control variable is the natural logarithm of GDP (GDP). α denotes the model intercept term, while θ_b and θ_t capture bank fixed effects and time fixed effects, respectively.ε is the random error term.

3.4. Descriptive Statistics

After winsorization at the 1% and 99% levels, the descriptive statistics for the variables in this paper are presented in Table 2. For the dependent variable, ΔCoVaR, which measures bank systemic risk, there are 1,397 observations. The mean value is 0.116, with a minimum of -0.007 and a maximum of 0.319. The standard deviation is 0.054, indicating that while there are differences in systemic risk across banks, the overall level remains manageable. For MES, the alternative measure of bank systemic risk, the mean, minimum, and maximum values are 0.144, -0.047, and 0.368, respectively. Regarding the explanatory variable, bank ESG performance has a mean of 5.621, which is close to its median. The minimum and maximum values are 4 and 7, respectively, with a standard deviation of 0.770, suggesting considerable variation in ESG performance across banks.

Table 2. Descriptive Statistics of Variables

Variable	Obs.	Mean	Min	Median	Max	Std. Dev.
$_{\Delta}$CoVaR	1397	0.116	-0.007	0.116	0.319	0.054
MES	1397	0.144	-0.047	0.142	0.368	0.068
ESG	1397	5.621	4.000	6.000	7.000	0.770
Size	1397	28.447	25.418	28.568	31.240	1.551
ROA	1397	0.579	0.158	0.560	1.288	0.280
Lev	1397	14.445	10.453	13.909	24.148	2.647
LDR	1397	77.330	47.430	75.394	109.984	12.664
GDP	1397	31.394	29.791	31.457	32.468	0.675

4. Empirical Analysis

4.1. Baseline Regression Results

To examine the relationship between the ESG performance of listed banks and their systemic risk levels, this paper conducts a fixed effects regression analysis on Model (5). Table 3 presents the full-sample regression results of ESG performance on the systemic risk of 36 listed banks. Column (1)

reports the regression results without including control variables, while Column (2) estimates the results after controlling for bank-specific characteristics and macroeconomic variables. The results show that in Column (1), the coefficient of ESG performance on bank systemic risk is 0.0031, which is statistically significant at the 5% level. After including control variables, the coefficient of ESG performance on bank systemic risk in Column (2) is 0.0035, statistically significant at the 1% level. This indicates a significant positive correlation between ESG performance and bank systemic risk, suggesting that favorable ESG performance exacerbates bank systemic risk.

Regarding the control variables, the coefficient of bank size (Size) is 0.0141, which is statistically significant at the 5% level, indicating that larger banks face a higher probability of systemic risk. The coefficient of return on assets (ROA) is negative and statistically significant at the 1% level, suggesting that an increase in the return on assets of listed banks can effectively reduce their systemic risk and overall risk level. This is because a higher return on assets enhances the cash flow of commercial banks and improves their operational stability. Simultaneously, it sends a financial signal of strong operating performance to the market and investors, thereby attracting more investment capital, further enhancing operational stability, and ultimately reducing systemic risk.The leverage ratio (Lev) and loan-to-deposit ratio (LDR) of listed banks are both positively and significantly correlated with bank systemic risk. This may be attributable to the fact that a higher leverage ratio elevates banks' financial risk, while excessive lending exacerbates credit risk and liquidity risk. The coefficient of GDP is -0.0810 and is statistically significant at the 1% level, indicating a significant negative correlation with bank systemic risk. This suggests that as the macroeconomy develops, banks form higher expectations regarding economic prospects, and household incomes rise, leading to lower default rates and consequently a reduction in the level of bank systemic risk.

Table 3. Regression Results of ESG Performance on Bank Systemic Risk

Variable	(1) ΔCoVaR	(2) ΔCoVaR
ESG	0.0031**	0.0035***
	(2.38)	(2.63)
Size		0.0141**
		(2.21)
ROA		-0.0465***
		(-4.92)
Lev		0.0020***
		(3.07)
LDR		0.0003**
		(2.23)
GDP		-0.0810***
		(-6.91)
Constant	0.1934***	2.2287***
	(20.57)	(10.71)
Bank Fixed Effects	Yes	Yes
Quarter Fixed Effects	Yes	Yes
Observations	1,397	1,397
R^2	0.741	0.743

Note: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. The values in parentheses are t-statistics. This notation applies to all subsequent tables unless otherwise specified.

4.2. Heterogeneity Analysis

This paper conducts heterogeneity analysis based on three dimensions: ownership structure, bank size, and analyst coverage. The results of the heterogeneity analysis, after controlling for bank and quarter fixed effects, are presented as follows.

The sample is divided into state-owned banks and non-state-owned banks for group-wise regression. As shown in Table 4, the coefficient of ESG performance is positive but not statistically significant

for the state-owned bank subsample, whereas for the non-state-owned bank subsample, the coefficient is positive and statistically significant at the 5% level. This indicates that, compared with state-owned banks, ESG performance significantly exacerbates systemic risk in non-state-owned banks.

A possible explanation is as follows. First, state-owned banks benefit from the "too big to fail" characteristic, which allows them to garner public recognition without relying on strong ESG ratings performance. Moreover, state-owned banks are subject to stricter regulatory oversight and policy constraints, leading them to fully consider risk factors when making ESG-related investments. Therefore, the finding that enhanced ESG efforts by state-owned banks do not significantly affect systemic risk is consistent with reality. Second, state-owned banks possess ample capital and reserves, which may mitigate the adverse effects of shadow banking activities, capital shortages, and investment inefficiency on their financial and systemic risk. Consequently, the phenomenon whereby ESG performance exacerbates bank systemic risk is primarily observed in non-state-owned banks.

Table 4. Heterogeneity Analysis Results Based on Ownership Structure

Variable	(1) State-Owned Banks	(2) Non-State-Owned Banks
ESG	0.0036	0.0034**
	(0.93)	(2.32)
Constant	0.1005	0.6065**
	(0.07)	(2.27)
Control Variables	Yes	Yes
Bank Fixed Effects	Yes	Yes
Quarter Fixed Effects	Yes	Yes
Observations	308	1,089
R^2	0.599	0.761

The sample is divided into large and small banks based on asset size, with banks having total assets above the sample mean classified as large banks and those below the mean classified as small banks. The grouped regression results are presented in Table 5. In Column (1), the coefficient of ESG performance for large banks is 0.0058, which is statistically significant at the 1% level. In Column (2), the coefficient of ESG performance for small banks is not statistically significant. This indicates that, compared with small banks, ESG performance significantly exacerbates systemic risk in large banks. There exists heterogeneity in the impact of ESG performance on bank systemic risk among listed banks with different asset sizes. A possible explanation is that large banks tend to have greater systemic importance than small banks and are also more likely to engage in high-risk business activities.

Table 5. Heterogeneity Analysis Results Based on Bank Size

Variable	(1) Large Banks	(2) Small Banks
ESG	0.0058***	0.0020
	(3.18)	(0.86)
Constant	-0.0378	1.2663***
	(-0.08)	(2.73)
Control Variables	Yes	Yes
Bank Fixed Effects	Yes	Yes
Quarter Fixed Effects	Yes	Yes
Observations	794	603
R^2	0.571	0.811

Data on analyst coverage are obtained from the CSMAR database. Based on the level of analyst coverage, the sample is divided into two groups: banks with coverage above the sample mean are classified as the high-analyst-coverage group, while those below the mean are classified as the low-analyst-coverage group. The grouped regression results are presented in Table 6. In Column (1), for banks with high analyst coverage, the coefficient of ESG performance is 0.0072, which is statistically significant at the 1% level. In Column (2), for banks with low analyst coverage, the coefficient of

ESG performance is not statistically significant. This indicates that the exacerbating effect of ESG performance on bank systemic risk is more pronounced for banks with high analyst coverage.

A possible explanation is that banks with greater analyst attention are more committed to improving their ESG performance, potentially overlooking latent systemic risks in activities such as asset allocation, green finance investment, and project development. Moreover, high analyst coverage may incentivize bank management to pursue enhanced personal reputation and cultivate an image of socially responsible leadership. This could lead to excessive or impractical investments in ESG initiatives, thereby increasing banks' own risk exposure and ultimately amplifying systemic risk.

Table 6. Heterogeneity Analysis Results Based on Analyst Coverage

Variable	(1) High Analyst Coverage	(2) Low Analyst Coverage
ESG	0.0072***	0.0004
	(3.06)	(0.23)
Constant	0.5599*	-0.5625
	(1.78)	(-1.01)
Control Variables	Yes	Yes
Bank Fixed Effects	Yes	Yes
Quarter Fixed Effects	Yes	Yes
Observations	638	759
R^2	0.681	0.755

4.3. Robustness Tests

This paper conducts robustness tests using two approaches: replacing the dependent variable and adjusting the research sample. Specifically, we replace the systemic risk measure ΔCoVaR with MES and re-estimate the regression. Subsequently, to account for potential sample selection bias, we adjust the sample scope based on the baseline regression model by selecting 16 listed banks from the first quarter of 2009 to the fourth quarter of 2023 for regression analysis. The results continue to support the main conclusions of this paper. The detailed regression results are presented in Table 7.

Columns (1) and (2) report the regression results after replacing the dependent variable with MES, while Column (3) presents the results after adjusting the sample. The regression coefficients of ESG performance remain positive and statistically significant across all columns, supporting the main conclusion that favorable ESG performance exacerbates bank systemic risk.

Table 7. Robustness Test Results

Variable	(1) MES	(2) MES	(3) 16 Banks
ESG	0.0107***	0.0103***	0.0043**
	(5.40)	(5.08)	(2.28)
Constant	0.2052***	0.3420	0.3032
	(14.50)	(1.09)	(1.22)
Control Variables		Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
Quarter Fixed Effects	Yes	Yes	Yes
Observations	1,397	1,397	894
R^2	0.634	0.638	0.588

5. Summary

This paper selects quarterly data of 36 listed banks in China from 2009 to 2023 as the research sample to investigate the impact of ESG ratings performance on the systemic risk of listed banks in China. The findings reveal that improved ESG ratings performance significantly exacerbates the systemic

risk level of listed banks in China, indicating that latent systemic risk persists beneath the surface of favorable ESG performance. Furthermore, the impact of ESG ratings performance on bank systemic risk exhibits heterogeneity. The exacerbating effect of improved ESG ratings performance on systemic risk is more pronounced for non-state-owned banks, large banks, and banks with high analyst coverage.

The conclusions of this paper provide effective policy implications for regulating bank ESG investments and preventing and mitigating bank systemic risk.

First, banking regulatory authorities should integrate ESG rating indicators into the regulatory framework. It is essential to improve the ESG rating system for commercial banks in China and establish a more comprehensive disclosure system for ESG-related information. Regulatory authorities need to enhance policy guidance on green finance investment behaviors of banks, preventing banks from engaging in blind investments driven solely by the pursuit of favorable ESG performance.

Second, recognizing the heterogeneity in the impact of improved ESG ratings on systemic risk across different types of banks, regulatory authorities should implement differentiated supervision based on these varying effects. Specifically, efforts should be strengthened to construct ESG-related risk management systems for non-state-owned banks, large banks, and banks with high analyst coverage. Additionally, state-owned banks should be guided toward more standardized and rationalized ESG practices, thereby enhancing the capacity of the ESG rating system to control systemic risk in commercial banks.

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