The Impact of ESG on Banks' Sense of Environmental Responsibility

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Abstract. This research meticulously analyzed 26 Chinese banks listed on the stock market, with a concentrated focus on their social responsibility reports and financial metrics. The primary objective was to deeply investigate the behavioral patterns of commercial banks in the environmental responsibility sphere and the related outcomes. For this purpose, the study innovatively introduced a novel index, the Environmental Responsibility Index (ERI), which amalgamates the Green Credit Ratio (GCR) and the Total Green Credit (TGC), employing Z-score and weighted methods for processing. The ERI was utilized as the variable to be explained, aiming to provide a more comprehensive evaluation of the banks' environmental responsibility performance. Additionally, the research encompassed a holistic assessment of the banks' performance in environmental, social, and corporate governance (ESG) dimensions. The results of the study revealed a complex yet insightful phenomenon: at the initial stages of banking operations, there was a non-significant or even negative correlation between ESG and environmental responsibility. This could suggest a latency in the effects. It was observed that with a time lag in the comprehensive ESG score and its individual components, their impact on the environmental responsibility of commercial banks gradually shifted from neutral or negative to positive. This shift could indicate an initial focus on traditional business growth over sustainable development. In contrast, the influence of social responsibility displayed a differing trend, positively impacting environmental responsibility Index (ERI) in the short term but evolving into a suppressive effect in the long run. This finding implies that in pursuing green finance and sustainability goals, commercial banks must consider both short-term and long-term effects of their social responsibilities, balancing risk management with innovative investments. The aspect of corporate governance consistently showed a suppressive effect, highlighting the need for enhanced internal controls within these organizations. In summary, the insights from this study are significant for understanding the conduct of commercial banks in the environmental responsibility sector. They offer valuable implications for the sustainable development strategies of the banking industry and serve as crucial references for policymakers in developing related policies and regulatory frameworks.

Keywords: ESG, Environmental Responsibility Index, Hysteresis Analysis

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1 Introduction

China, despite its initial delay in ESG system development, has made notable advancements in this domain, particularly among its listed banks, enhancing capital market health. However, variations in ESG performance across different bank types suggest potential for further improvement in the banking sector's ESG practices. The transparency of listed banks in reporting environmental, social, and governance information is essential for evaluating their sustainability and contributes to a robust capital market ecosystem. This study selected 26 Chinese listed banks as its sample, excluding data that was incomplete or anomalous. Utilizing statistical software such as STATA, a foundational analytical model was constructed, and an in-depth regression analysis of panel data was conducted. The processed ESG composite score was used as the independent variable, with environmental risk (ER) as the dependent variable. Economic indicators such as total assets, Debt-to-Asset Ratio (Lev), Tobin's Q (TOBINQ), earnings per share (EPS), and the Growth Return on Investment Index (GROI) were included as control variables. The aim was to establish a comprehensive panel regression model to empirically analyze the causal relationships between the variables, validate the research hypotheses, and draw conclusions based on these findings.

2 Literature Review

2.1 ESG and Its Multifaceted Impact on Banks

Wang W D et al. (2023) analyzed 37 listed banks from 2011-2022, finding ESG investments generally enhance commercial bank performance, with social responsibility investments being most effective [1]. Song K et al. (2022) revealed that ESG investments improve commercial banks' liquidity via profitability and risk channels [2]. Yu X and Jiang S H (2023) discovered an inverse relationship between systemic risk and ESG performance in banking [3]. Jiang H et al. (2023) argued that ESG investments in commercial banks reduce profitability and liquidity, thereby raising risk [4]. Chen Y (2023), using signaling and stakeholder theories, found that ESG ratings increase banks' market value by enhancing liquidity [5]. Niu Y S (2023) reported a negative link between ESG ratings and liquidity risk in 13 H-share listed banks (2018-2022), indicating ESG ratings reduce liquidity risk [6]. Li T J (2023) noted a short-term negative, but eventually positive, correlation between ESG ratings and financial performance in 15 listed banks (2011-2020), suggesting initial ESG investments initially exceed returns [7]. Xin B H (2023) found that superior ESG performance boosts franchise value in 42 listed banks (2009-2022) [8]. Danis man Gamze Ozturk et al. (2024) observed that banks with higher ESG scores fare better in crises [9]. Menicucci, Elisa et al. (2023) indicated that ESG policies adversely affect operational and market performance in Italian banks, implying incomplete adoption of sustainability programs [10].

2.2 Literature Review and Critique

The literature review indicates a strong link between ESG factors and banking performance, especially in terms of commercial banks' environmental responsibility. Scholars predominantly use panel data analysis, with some employing static panel models for different time points and others using multi-period difference-in-difference models for time series trends. Additionally,

two-way fixed-effects models are utilized to discern dynamic changes and cross-sectional differences. These methodologies inform this study's approach.

3 Research Hypotheses and Design on Commercial Banks' ESG and Environmental Responsibility

3.1 Research Hypotheses

This paper, synthesizing existing literature, notes that banks with high ESG performance notably boost their environmental responsibility. There's a positive, possibly time-lagged, link between ESG and environmental responsibility. However, the specific influence of different ESG indicators on environmental responsibility is yet to be determined. Thus, the study focuses on commercial banks, examining the effect of ESG ratings on environmental responsibility, and proposes corresponding hypotheses. Hypothesis 1: There is a positive correlation between the ESG ratings of commercial banks and their sense of environmental responsibility. Hypothesis 2: The impact of individual ESG scores (environmental, social, corporate governance) on environmental responsibility varies among commercial banks.

3.2 Sample Selection and Data Sources

Data for this research were gathered from the Shang Dao Rognlie Database, Bloomberg Database, and official bank websites. We chose ESG-related data of 26 listed banks from 2010 to 2022 from Bloomberg. Bank data, including annual and social responsibility reports, were collected from PAB, NB, QD Bank, SPD Bank, HXB, CMSB, CMB, Wuxi B, JSB, HZB, NJB, CRCB, CIB, BoB, BoS, ABC, Bocom, ICBC, Changsha B, PSBC, CEB, ZSB, CCB, BOC, GYB, CITIC B. Initially, 30 banks were filtered from 166 A-share listed companies, but after excluding banks with incomplete data or anomalies, 26 were selected for analysis.

3.3 Selection of Research Variables and Indicators

1.Selection and Rationale of the Dependent Variable: In this study, building upon a comprehensive analysis of existing literature, Environmental Responsibility Index (ERI) was selected as the dependent variable, aiming to thoroughly assess the contributions of commercial banks in driving economic transformation and addressing global climate change. Recognizing that traditional financial indicators (such as Total Assets, Debt-to-Asset Ratio (Lev), Tobin's Q (TOBINQ), Earnings Per Share (EPS), and Growth Return on Investment Index (GROI)) might not fully capture a bank's environmental responsibility, the study incorporated the Green Credit Ratio (GCR) and the Total Green Credit (TGC) as key metrics. These indicators, standardized using the Z-score method and combined through a weighted average, formed a comprehensive Environmental Responsibility Index. This approach enhanced data comparability and credibility, more accurately reflecting a bank's commitment to environmental responsibilities.

The specific calculation process is as follows: First, the Z-score method is applied to standardize the Green Credit Ratio and Total Green Credit, resulting in two standard scores, Z_1 and Z_2. Then, these two scores are integrated using a weighted average method to form the final Environmental Responsibility Index. The specific formula is as follows:

$$Z = \frac{X - \mu}{\sigma} \quad (1)$$

Where:

X represents the observed value of the Green Credit Ratio.

μ represents the mean (average value) of the Green Credit Ratio.

σ represents the standard deviation of the Green Credit Ratio.

This formula normalizes the Green Credit Ratio by subtracting the mean and dividing by the standard deviation, resulting in a standard score (Z1) that reflects how many standard deviations an observation is from the mean. Similarly, for the Total Green Credit, a standard score Z2 is calculated using the same method but with the respective observed values, mean, and standard deviation for the Total Green Credit. This process standardizes the Total Green Credit, allowing it to be comparably and objectively assessed alongside the Green Credit Ratio in the overall Environmental Responsibility Index.

$$\text{Weighted Average} = \frac{(w_1 \times x_1) + (w_2 \times x_2)}{w_1 + w_2} \quad (2)$$

Where:

w1 represents the weight for the Green Credit Ratio, is set at 0.5.

w2 represents the weight for the Total Green Credit, is also set at 0.5.

x1 represents Z1

x2 represents Z2

This formula ensures that both aspects of environmental responsibility (the ratio and the balance of green credits) are integrated into a single, comprehensive measure, allowing for a balanced and holistic assessment of the banks' environmental commitment.

2.Selection and Rationale of the Independent Variables: In the selection of explanatory variables, this study chooses to use the Bloomberg ESG (Environmental, Social, and Governance) composite score and its individual component scores as key indicators. This decision is aimed at thoroughly assessing the performance of commercial banks in both the overall ESG framework and its distinct dimensions—environmental, social, and corporate governance. Furthermore, this approach investigates how these aspects collectively influence the environmental responsibility of commercial banks. By employing this method, the study not only gains deeper insights into the banks' performance across various ESG dimensions but also elucidates how these dimensions interplay to shape the banks' environmental responsibility.

3.Control variables

Table 1 The summary of variables.

Variables	Variable Name	Symbol	Calculation Explanation:
Dependent Variable:	Environmental responsibility Index	ERI	$ERI=0.5Z_1+0.5Z_2$

Independent Variable	Processed ESG Composite Score	ESG	ESG is calculated as a weighted sum of individual indicators.
	Processed Environmental Individual Score	E	E is calculated as a weighted sum of sub-categories.
	Processed Social Individual Score	S	S is calculated as a weighted sum of sub-categories.
	Processed Governance Individual Score	G	G is calculated as a weighted sum of sub-categories.
Control Variable:	Total Assets	TA	Total Assets = Current Assets + Non-current Assets. It's a key indicator of the company's overall financial strength and resources.
	Debt-to-Asset Ratio	Lev	Debt-to-Asset Ratio = Total Debt / Total Assets * 100%
	Tobin's Q	TobinQ	Market Value / Total Assets
	Earnings Per Shar	EPS	EPS= (Net Income-Dividends on Preferred Stock)/Average Outstanding Common Shares, EPS measures the profit available to equity shareholders per share.
	Growth Rate of Operating Income	GROI	GROI= (Current Year's Operating Income-Previous Year's Operating Income)/ Previous Year's Operating Income

ESG stands for Environmental, Social, and Governance, criteria assessing a firm's sustainability and ethical impact. Tobin's Q ratio compares the market value of a firm's assets to their replacement cost. Total Assets represent the sum of all current and non-current assets. Lev indicates the proportion of a firm's total liabilities to its assets, reflecting financial leverage. GROI measures the annual increase in operating income as a percentage of the previous year's income.

Recognizing other variables' potential interference in estimating ESG's impact on environmental responsibility, control variables were chosen. Drawing from previous studies, these include bank size and debt-to-asset ratio, enhancing the analysis's accuracy.

3.4 Construction of the Regression Model

To test the hypotheses, panel data models were established using the Environmental Responsibility Index (ERI) of 26 listed commercial banks as the dependent variable and data from 2010 to 2022 as the basis. For Hypothesis 1, using ERI as the dependent variable and the ESG composite score as the independent variable, the following basic model (3) is constructed:

$$ERI_{i,t} = \beta_0 + \beta_1 ESG_{i,t} + \beta_2 TobinQ_{i,t} + \beta_3 TA_{i,t} + \beta_4 GROI_{i,t} + \beta_5 EPS_{i,t} + \beta_6 Lev_{i,t} + \varepsilon_{i,t} \quad (3)$$

For Hypothesis 2, using ERI as the dependent variable and the individual ESG scores (E, S, G) as independent variables, the following basic models (4), (5), and (6) are constructed:

$$ERI_{i,t} = \beta_0 + \beta_1 E_{i,t} + \beta_2 TobinQ_{i,t} + \beta_3 TA_{i,t} + \beta_4 GROI_{i,t} + \beta_5 EPS_{i,t} + \beta_6 Lev_{i,t} + \varepsilon_{i,t} \quad (4)$$

$$ERI_{i,t} = \beta_0 + \beta_1 S_{i,t} + \beta_2 TobinQ_{i,t} + \beta_3 TA_{i,t} + \beta_4 GROI_{i,t} + \beta_5 EPS_{i,t} + \beta_6 Lev_{i,t} + \varepsilon_{i,t} \quad (5)$$

$$ERI_{i,t} = \beta_0 + \beta_1 G_{i,t} + \beta_2 TobinQ_{i,t} + \beta_3 TA_{i,t} + \beta_4 GROI_{i,t} + \beta_5 EPS_{i,t} + \beta_6 Lev_{i,t} + \varepsilon_{i,t} \quad (6)$$

Where:

i represents the individual bank

t represents the year (2010–2022)

β denotes the constant term

$\varepsilon_{i,t}$ is the disturbance term that varies with the individual and year

4 Empirical Analysis of the Impact of Commercial Banks' ESG on Environmental Responsibility

4.1 Correlation Analysis

Before conducting regression analysis, it is necessary to determine whether there is an association between the variables. Pearson correlation analysis is used for continuous data. This paper utilizes SPSS18.0 to conduct correlation analysis for the variables in the regression model. Table 2 shows the degree of correlation between the bivariate variables.

Table 2 Correlation Matrix.

	ERI	ESG	E	S	G	TA	Lev	TobinQ	EPS	GROI
ERI	1.0000									
ESG	-0.2037	1.0000								
E	0.2025**	0.3254**	1.0000							
S	-0.2889	0.6030**	0.0573**	1.0000						
G	-0.1522	0.7741**	-0.0101**	0.0638**	1.0000					
TA	0.6782	-0.1579**	0.3618**	-0.4113**	-0.0615**	1.0000				
Lev	-0.3545	0.2776**	-0.1142**	0.3062**	0.1998**	-0.2456**	1.0000			
TobinQ	-0.4297**	0.2078**	-0.1904**	0.1230**	0.2742**	-0.3343**	0.4066**	1.000		
EPS	0.1354	0.1269**	0.1194**	0.1382**	0.0189	0.0789**	-0.0573**	0.0805**	1.000	
GROI	-0.5069**	0.1717*8	-0.2232**	0.2412**	0.1518**	-0.4321**	0.4240**	0.4948**	-0.0051**	1.00

**Significantly correlated at the 0.01 level. *Significantly correlated at the 0.05 level. |R| < 0.3 indicates a weak correlation, 0.3 < |R| < 0.5 indicates a low degree of correlation; 0.5 < |R| < 0.8 indicates a significant correlation, 0.8 < |R| < 1 indicates a high degree of correlation.

This study's correlation analysis, using a matrix, examines variable relationships. This study's correlation analysis, presented through a matrix, explored intervariable relationships. Notable observations include a minor negative correlation between commercial banks' ESG scores and the Environmental Responsibility Index (ERI) (-0.2037). The environmental dimension (E) showed a similar, albeit weak, positive correlation with ERI (0.2025). The social responsibility (S) dimension's correlation with ERI was negative and insignificant (-0.2889). A notable positive correlation was found between Total Assets (TA) and ERI (0.6782), contrasting with the insignificant negative correlations of Leverage Ratio (Lev) and Tobin's Q (TobinQ) with ERI. Earnings Per Share (EPS) had a weak positive correlation with ERI (0.1354), while the Growth Return on Investment Index (GROI) showed a significant negative correlation (-0.5069). The analysis underscores correlations without implying causality or considering the impact of external variables.

4.2 Multicollinearity Analysis

In this study, to determine if there was an issue of multicollinearity among the explanatory variables in the model, the Variance Inflation Factor (VIF) method was employed for analysis. The VIF test results for both the composite index and individual indicator regression models indicated that all explanatory variables had VIF values lower than 10, and their tolerances (1/VIF) were greater than 0.1. This suggests that there is no significant multicollinearity issue among the variables in the model established by this study. Therefore, the results of this study can be considered to have a high degree of reliability.

4.3 Panel Regression Analysis

1.Hausman Test: The study employed STATA17.0 for model evaluation using the Hausman test and F-test. Results favored the fixed effect model over the random effects model, as indicated by p-values of 0.0000 in both tests.

Table 3 Hausman Test.

	(1)	(2)	(3)	(4)
F	19.10	20.03	17.34	20.39
P	0.0000	0.0000	0.0000	0.0000

p<0.1 indicates acceptance of the null hypothesis and uses the fixed effect model.

2.Regression Analysis: This study employed regression analysis in STATA 17.0 under a fixed effects framework to investigate the impact of ESG scores on banks' environmental responsibility. The analysis comprised four models, yielding these findings: Model (1) assessed the ESG composite score's effect, revealing a negative correlation with an R^2 of 68.44%. The ESG score showed a negative coefficient of -0.2616863, indicating a decrease in environmental responsibility with each unit increase in ESG score. Model (2) explored the environmental score's influence, registering an R^2 of 69.10%. It exhibited a negative coefficient of -1.164708, highlighting a detrimental impact on environmental responsibility. Model (3) analyzed the social score's impact, with an R^2 of 68.59% and a positive coefficient of 0.5510279, suggesting a beneficial effect on environmental responsibility. Model (4) examined the governance score's role, achieving an R^2 of 68.46% and a positive coefficient of 0.23093, indicating a favorable

impact. These results suggest that ESG ratings may not significantly enhance banks' environmental responsibility, potentially due to the high costs and low short-term returns of ESG investments in the banking sector. This study also conducted a lagged analysis of these models for a deeper understanding.

3.Lagged Analysis: Based on the basic model (3), lagged models were established for Hypotheses 1 and 2, using ERI as the dependent variable and ESG composite scores and individual ESG scores as independent variables. The lagged analysis was conducted using STATA17.0, starting from one lag period until the independent variables turned positive, resulting in models (7), (8), (9), and (10).

$$ERI_{i,t} = \beta_0 + \beta_1 ESG_{i,t-2} + \beta_2 TobinQ_{i,t} + \beta_3 TA_{i,t} + \beta_4 GROI_{i,t} + \beta_5 EPS_{i,t} + \beta_6 Lev_{i,t} + \varepsilon_{i,t} \quad (7)$$

$$ERI_{i,t} = \beta_0 + \beta_1 E_{i,t-1} + \beta_2 TobinQ_{i,t} + \beta_3 TA_{i,t} + \beta_4 GROI_{i,t} + \beta_5 EPS_{i,t} + \beta_6 Lev_{i,t} + \varepsilon_{i,t} \quad (8)$$

$$ERI_{i,t} = \beta_0 + \beta_1 S_{i,t-1} + \beta_2 TobinQ_{i,t} + \beta_3 TA_{i,t} + \beta_4 GROI_{i,t} + \beta_5 EPS_{i,t} + \beta_6 Lev_{i,t} + \varepsilon_{i,t} \quad (9)$$

$$ERI_{i,t} = \beta_0 + \beta_1 G_{i,t-1} + \beta_2 TobinQ_{i,t} + \beta_3 TA_{i,t} + \beta_4 GROI_{i,t} + \beta_5 EPS_{i,t} + \beta_6 Lev_{i,t} + \varepsilon_{i,t} \quad (10)$$

Where:

i represents the individual bank

t represents the year (2010–2022)

β denotes the constant term

$\varepsilon_{i,t}$ is the disturbance term that varies with the individual and year

The results of the regression analysis, as presented in Table 4, reveal a lagged analysis of the ESG composite score and its individual component scores. Significantly, both the ESG composite score and the environmental score (E) shifted to a positive impact on banks' environmental responsibility after a lag of three periods. This indicates that the promotive effects of ESG and E on the environmental responsibility of commercial banks begin to emerge after three years and gradually strengthen over time. Specifically, the ESG reached its peak effect in the seventh lag period, while E peaked in the eighth lag period. This finding suggests that the positive impact of active environmental investments on commercial banks' financial performance is relatively slow to materialize, likely due to the high cost and long-term nature of environmental investments. In contrast, the social (S) and governance (G) dimensions began to have a suppressive effect on banks' environmental responsibility in the third and second lag periods, respectively. Overall, the impact of the ESG composite score and E on environmental responsibility gradually shifts to positive, indicating that ESG ratings have a beneficial and promotive effect on environmental responsibility in the commercial sector, with a certain degree of latency in this effect.

Table 4 Lag period results for ERI regression.

	(1.1)	(2.1)	(3.1)	(4.1)
Variables	ERI	ERI	ERI	ERI
ESG lags by three periods.	1.8525 (-1.37)			
E lags by three periods.		0.1394905 (0.14)		

S lags by three periods.			-0.8666966 (-1.10)	
G lags by two periods.				-0.2638757 (-0.33)
TA	0.4285925*** (10.32)	0.4300531*** (9.82)	0.4152509*** (9.39)	0.4407698 (-11.07)
Lev	-11.4516** (-2.06)	-13.54481** (-2.51)	-11.76531** (-2.10)	-12.95827** (-2.48)
Tobin Q	-8.698478** (-3.08)	-9.645188** (-3.51)	-9.649092** (-3.52)	-9.751204** (-3.42)
EPS	0.1437993** (2.01)	0.1428068** (1.99)	0.1523586** (2.11)	0.1548397** (2.21)
GROI	-0.0073158* (-1.19)	-0.00685 (-1.11)	-0.0071626 (-1.17)	-0.0089833 (-1.50)
Constant term.	27.43365*** (4.26)	21.56226** (3.40)	24.43141*** (4.39)	22.77792*** (4.32)
N	260	260	260	260
*p<0.05, **p<0.01, ***p<0.001				

4.4 Robustness Test

1.Regression Analysis: To assess the model's robustness, the study utilized the Environmental Responsibility Index (ERI) as the dependent variable in additional robustness tests. Detailed in Table 5, the analysis showed that the ESG composite score negatively influenced ERI, with a regression coefficient of -1.688855. The environmental dimension (E) also demonstrated a negative effect on ERI, indicated by a coefficient of -1.678774. Conversely, the social (S) and governance (G) dimensions positively impacted environmental responsibility, with coefficients of 0.0099304 and 0.839486, respectively. These findings corroborate the model's reliability by aligning the effects of the ESG score and its components with the anticipated trends in ERI.

Table 5 The variable ERI and the results of regression with comprehensive and single indicators.

	(1.1)	(2.1)	(3.1)	(4.1)
Variables	ERI	ERI	ERI	ERI
ESG	-1.688855 (-1.43)			
E		-1.678774 (-2.23)		
S			0.0099304 (0.01)	
G				0.839486 (-1.12)
TA	0.4450063*** (12.54)	0.4723322*** (12.86)	0.4493614*** (11.72)	0.4509734*** (12.72)
Lev	-7.858209 (-1.77)	-8.986024** (-2.08)	-9.222362* (-2.05)	-8.716484* (-2.00)
Tobin Q	-7.512568** (-3.05)	-8.096753** (-3.30)	-7.728858** (-3.10)	-7.157931** (-2.85)
EPS	0.1819496** (2.83)	0.1838937** (2.89)	0.1683158** (2.58)	0.1686436** (2.65)
GROI	-0.0165847***	-0.0171232***	-0.0165822***	-.0165549***

	(-3.69)	(-3.82)	(-3.68)	(-3.68)
Constant term	22.07549***	23.1618***	16.07073**	18.81008***
	(3.73)	(4.42)	(3.24)	(3.88)
R^2	0.5446	0.5486	0.5418	0.5435
N	337	337	337	337
	*p<0.05, **p<0.01, ***p<0.001			

2.Quartile Analysis: In the quartile analysis, this study employed the Environmental Responsibility Index (ERI) as the dependent variable. The results are displayed in Table 6. The analysis revealed that the impact of ESG and its sub-dimensions E, S, G on ERI varies at different ERI levels (low, medium, high). At the lower quartile (lower ERI), the impact of ESG is significant, whereas, at the middle and upper quartiles (higher ERI), its impact is not significant. This suggests that at high environmental risk levels, banks can significantly mitigate these risks by implementing ESG strategies. However, once a bank's environmental risk management reaches a higher level, further strengthening ESG strategies may not yield additional significant benefits. Specifically, the impact of E is significant at the lower quartile but not significant at middle and upper quartiles. G has a significant impact on ERI at the lower quartile, but its influence diminishes at middle and upper quartiles. This implies that environmental and governance factors are more crucial when banks face lower environmental risks. On the other hand, the impact of S is not significant across all quartiles, indicating that social factors have limited influence on banks' environmental risk management. The trend in quartile analysis data aligns with the fundamental trend of ERI, thereby validating the model's reliability. However, it is important to note that such analysis may be limited by model settings, sample selection, and the influence of other variables.

Table 6 Quartile Analysis.

	0.25quartile coefficient	0.5 quartile coefficient	0.75quartile coefficient
ESG	-2.3222*	-1.1701*	0.9097*
E	-1.2328**	-0.8732**	0.5050**
S	0.6684*	-0.4350*	-0.9023*
G	1.1624*	-0.0517*	-0.0733*
	*p<0.05, **p<0.01, ***p<0.001		

5 Conclusion

This study's key findings include an initially negative but progressively positive correlation between commercial banks' ESG ratings and their environmental responsibility. Initially, the implementation of environmental initiatives may incur higher costs and delayed returns, leading to short-term negative effects. However, over time, these investments in environmental projects begin to yield benefits like enhanced energy efficiency and reduced operational costs, ultimately improving environmental responsibility.

The study also finds varying impacts of the ESG sub-dimensions (E, S, G) on environmental responsibility. The environmental dimension (E) initially shows a negative correlation, which becomes positive over time. Conversely, the social (S) and governance (G) dimensions start with a positive correlation but eventually turn negative. This shift could be due to the banks'

early focus on social and governance improvements, like better employee relations and transparency, overshadowing long-term environmental strategies.

To address these findings, commercial banks can adopt several strategies to enhance environmental responsibility: 1. Integrate Environmental Strategy: Incorporate environmental considerations into social and governance strategies. For example, social responsibility initiatives should also account for their environmental impact.2. Promote Environmental Awareness: Educate and train employees about environmental issues, encouraging them to consider environmental impacts in daily operations and align with the company's environmental goals.3. Adjust Corporate Governance: Revise governance structures to support environmental responsibility, potentially including environmental experts in decision-making processes.

By implementing these strategies, commercial banks can effectively integrate environmental responsibility into their broader objectives, fostering harmonious development across social, environmental, and governance dimensions. This approach not only enhances their environmental responsibility but also boosts their public image and market competitiveness.

References

[1] Wang W D, Yang Y. How does ESG investment affect the performance of commercial banks? ——Also, on the moderating effect of external pressure [J/OL]. Financial Economics. https://doi.org/10.14057/j.cnki.cn43-1156/f.20231205.001

[2] Song K, Xu L, Li Z, et al. Can ESG investment promote liquidity creation in banks? ——Also, on the moderating effect of economic policy uncertainty [J]. Financial Research, 2022(2): 61-79.

[3] Yu X, Jiang S H. The impact of ESG performance on systemic risk of banks ——Also on the moderating role of economic policy uncertainty [J]. Hainan Finance, 2023, (7):3-18.

[4] Jiang H, Chen S Y, Wang Z F. ESG investment and risk-taking of commercial banks under the new development concept ——From the perspective of green development in the report of the 20th National Congress of the Communist Party of China [J]. Research on Financial and Economic Issues, 2023, 38(1): 65-83.

[5] Chen Y. Does the ESG rating enhance the value of commercial banks? [J]. Foreign Capital in China, 2023 (9):98-101.

[6] Niu Y S, Wu Z F. Exploring the impact of ESG ratings on the liquidity risk of listed commercial banks [J]. Investment and Entrepreneurship, 2023,34(21):31-35.

[7] Li Z J. The impact of ESG on the financial performance of commercial banks [J]. Modern Business, 2023, (19):181-184. DOI: 10.14097/j.cnki.5392/2023.19.003

[8] Xin B H. ESG performance and franchise value of commercial banks [J/OL]. Jinan Journal (Philosophy & Social Science Edition), 1-22 [2023-12-19] http://kns.cnki.net/kcms/detail/44.1285.C.20231018.1014.002.html.

[9] Danis man, G.O. and Tarazi, A. (2024) ‘ESG activity and bank lending during financial crises’, Journal of Financial Stability, 70. doi: 10.1016/j.jfs.2023.101206.

[10] Menicucci, E. and Paolucci, G. (2023) ‘ESG dimensions and bank performance: an empirical investigation in Italy’, Corporate Governance: The International Journal of Business in Society, 23(3), pp. 563–586. doi:10.1108/CG-03-2022-0094.