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RESEARCH ARTICLE

Corporate social responsibility (CSR) and investor psychology: Do environmentally friendly companies generate more stable shareholder sentiment

Zhibai Li*

Henan University of Economics and Law, Zhengzhou, Henan, 450046, China

*** Corresponding author:** Zhibai Li, 164486502@qq.com

ABSTRACT

Purpose: This study investigates whether environmentally responsible companies generate more stable shareholder sentiment compared to their less environmentally conscious counterparts, addressing a critical gap in understanding the psychological mechanisms through which environmental performance influences investor behavior.

Methodology: Using a comprehensive dataset of 2,458 firm-year observations from 351 companies across five industries during 2018-2024, This study employs panel regression analysis with instrumental variable estimation to examine the relationship between multidimensional environmental performance and sentiment stability. Environmental performance is measured across four dimensions: emissions reduction, resource efficiency, environmental management, and climate initiatives. Sentiment stability captures volatility, persistence, and recovery dynamics of investor emotional responses derived from social media analytics and traditional sentiment indicators.

Findings: Results demonstrate a significant positive relationship between environmental performance and sentiment stability ($\beta = 0.153$, $p < 0.01$). Environmental management systems exhibit the strongest influence ($\beta = 0.156$), followed by resource efficiency ($\beta = 0.124$), indicating investors prioritize systematic governance structures over specific outcomes. Market volatility significantly moderates this relationship, with high environmental performers maintaining sentiment stability during turbulent periods (10.3% decline) compared to low performers (35.4% decline), confirming environmental responsibility's "safe haven" effect.

Practical Implications: Environmental initiatives represent strategic investments in investor psychology rather than mere compliance activities. Companies should prioritize environmental management systems and operational efficiency to maximize sentiment stability benefits. For investors, environmental performance serves as a risk mitigation tool, particularly during volatile market conditions.

Keywords: environmental performance; investor sentiment; sentiment stability; behavioral finance; sustainable finance

1. Introduction

Over the past decades, Corporate Social Responsibility (CSR) has evolved from peripheral philanthropic activities to core strategic imperatives for firms worldwide, reflecting a fundamental shift in stakeholder capitalism where environmental stewardship has become integral to long-term value creation.

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This transformation has profound implications for investor behavior and market dynamics, particularly through the psychological mechanisms that drive investment decisions[1,2]. The emergence of sustainable finance represents more than a trend; it embodies a structural change in how markets process environmental information and translate it into financial outcomes. While behavioral finance theory suggests that investors' emotional responses to corporate actions significantly influence market stability and asset pricing, the specific psychological pathways through which corporate environmental performance affects investor sentiment stability remain underexplored[3,4]. The rise in the application of environmental data in making investment decisions reflects a significant shift in market priorities, where conventional financial metrics are no longer exclusive in determining investments. In this evolving context, a critical question emerges: Do environmentally responsible companies generate more stable shareholder sentiment compared to their less environmentally conscious counterparts? This question is not merely academic—it has profound implications for corporate strategy, portfolio management, and market stability in an era of increasing environmental awareness and climate-related financial risks.

The significance of this inquiry is underscored by the exponential growth of sustainable investing, with global sustainable investment assets reaching $35.3 trillion in 2020, representing 36% of all professionally managed assets[5,6]. More importantly, recent market volatility events have highlighted the role of environmental factors as potential stabilizers of investor sentiment. The concept of shareholder sentiment stability—defined as the consistency and persistence of investor emotional responses to a stock—has emerged as a critical determinant of market resilience and firm valuation[7,8]. Unlike traditional financial metrics that focus on returns and volatility, sentiment stability captures the psychological dimension of investor behavior, reflecting confidence, trust, and emotional attachment to corporate assets. Understanding how environmental performance influences this stability could provide valuable insights for investment analysis, corporate strategy, and regulatory policy in an increasingly sustainability-focused economy. While existing research has established robust correlations between CSR performance and various financial outcomes, including cost of capital, stock returns, and valuation multiples[9,10], and the behavioral finance literature has documented how investor emotions influence market movements, pricing anomalies, and managerial behavior[11], these two streams of research have remained largely disconnected, with limited direct evidence on how environmental performance specifically affects the stability of shareholder sentiment.

Although studies by Piñeiro-Chousa et al.[12] have examined investor sentiment impacts on green bond markets, and Wu and Liu[13] have explored relationships within green finance markets, few studies have systematically investigated how corporate environmental initiatives contribute to shareholder sentiment stability. This gap is particularly significant because environmental issues are increasingly central to investment decision-making and corporate strategic planning, and the existing literature has not adequately explored the psychological mechanisms through which different dimensions of environmental performance differentially influence investor sentiment stability. This research advances beyond existing studies by integrating stakeholder theory and behavioral finance theory into a unified framework for understanding environmental performance-sentiment relationships. Stakeholder theory posits that corporations create sustainable value by addressing the needs of all stakeholders, including environmental concerns, thereby building broader legitimacy and reducing long-term risks, while behavioral finance theory explains how psychological factors—including environmental responsibility perceptions—influence investment decisions through mechanisms beyond traditional financial calculus. These concepts mean that how much the company is concerned with the environment can influence how secure the investors feel in a number of ways. First, if the company is environmentally good, it reflects lower risk in the future as well as more investor confidence. Second, environmental responsibility generates more stakeholder support as well as expectations of longer-

term value. Third, disclosure of environmental actions indicates that the company is well managed and well planned. Recent research by Zhao and Yan[14] and Wang et al.[2] has begun to explore these connections, but a comprehensive examination of the environmental performance-sentiment stability relationship remains absent from the literature.

This study addresses three research questions with theoretical and practical significance: first, what is the relationship between corporate environmental performance and shareholder sentiment stability, and through what mechanisms does this relationship operate; second, do different dimensions of environmental performance have differential effects on investor sentiment stability; and third, how do market conditions and firm characteristics moderate the relationship between environmental performance and sentiment stability. By systematically addressing these questions, this research contributes to both theoretical understanding of sustainable finance dynamics and practical approaches to corporate environmental strategy. Methodologically, this study employs a comprehensive empirical strategy that advances existing approaches by developing a multidimensional measure of sentiment stability that captures volatility, persistence, and recovery speed, utilizing a novel combination of traditional financial data and social media sentiment analysis to capture real-time investor emotional responses, and employing multiple identification strategies, including instrumental variable estimation and quasi-natural experiments, to address endogeneity concerns. Building on the analytical approaches developed by Gao et al.[7,8] for studying investor sentiment in green markets and by Kvam et al.[15] for examining sustainable company stock prices, models are developed that isolate the specific effects of environmental performance on sentiment stability while accounting for various confounding factors and exploring moderating mechanisms.

The significance of this research extends across multiple stakeholder groups and contributes to several literature streams, advancing stakeholder theory by demonstrating how environmental stakeholder concerns translate into measurable investor psychological benefits, contributing to behavioral finance by identifying environmental performance as a distinct factor affecting investor sentiment stability, and bridging sustainable finance and investor psychology literatures by revealing the psychological mechanisms underlying sustainable investment phenomena. For corporate managers, understanding how environmental initiatives affect investor psychology provides crucial insights for strategic decision-making, capital allocation, and investor relations strategies, while for investors and portfolio managers, clarifying the relationship between environmental performance and sentiment stability offers valuable perspectives for risk management, particularly during volatile market periods. For policymakers and regulators, identifying the market psychology mechanisms through which environmental policies influence financial markets could inform more effective regulatory approaches and contribute to overall market stability[17]. Through this investigation, this study aims to contribute to the growing body of knowledge regarding sustainable finance, corporate environmental responsibility, corporate environmental responsibility, and market psychology by illuminating the psychological mechanisms through which environmental performance influences market behavior and enhancing both theoretical frameworks and practical applications in an increasingly sustainability-focused global economy.

This study makes three key contributions to the literature: (1) This study is the first to establish a direct link between corporate environmental performance and shareholder sentiment stability; (2) A novel measurement framework is developed that captures the temporal dynamics of Sentiment Stability Score (SSS); (3) Comprehensive evidence is provided on how firm-specific characteristics moderate these relationships across different market conditions.

2. Research methodology

2.1. Data collection and screening process

This study examines the relationship between corporate environmental performance and shareholder sentiment stability through a comprehensive analytical framework. As illustrated in **Figure 1**, the research design captures environmental performance across four key dimensions (emissions reduction, resource efficiency, environmental management, and climate initiatives) and measures sentiment stability through three complementary components (volatility, persistence, and recovery speed). The framework incorporates multiple moderating factors including market conditions, firm size, and industry characteristics, while employing rigorous panel regression and instrumental variable methods to ensure robust causal inference.

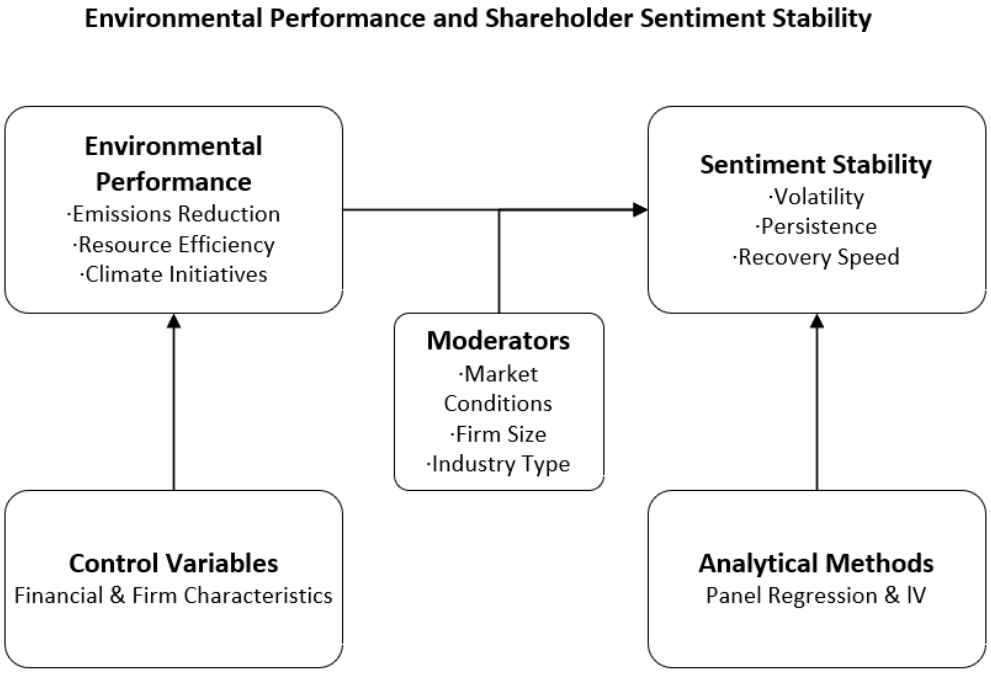

Figure 1. Overall research framework.

Following this conceptual framework, the empirical investigation utilizes a comprehensive dataset of publicly listed companies from energy, manufacturing, utilities, consumer products, and technology industries across developed markets (US, Europe, Japan) and emerging markets (China, India, Brazil) from 2018 to 2024. The data collection process began with retrieving all publicly listed companies in environmentally-sensitive industries from Compustat Global and CRSP databases, applying a market capitalization filter of minimum $500 million and requiring continuous listing throughout the study period, resulting in an initial sample of 4,127 firm-year observations.

The screening process then excluded companies with missing environmental performance data (892 observations), removed observations with incomplete financial data (584 observations), and excluded companies involved in major M&A activities (193 observations), yielding a final sample of 2,458 firm-year observations across 351 companies. Environmental performance data were sourced from Bloomberg ESG Data Services, MSCI ESG Ratings, and Refinitiv ESG scores, while financial data were obtained from Compustat Global and stock price and trading data from CRSP. Sentiment data were collected from multiple

sources including the Baker-Wurgler sentiment index, AAII surveys, and social media sentiment from Twitter and StockTwits. All data processing was conducted using Python 3.8 and Stata 17.0.

2.2. Variable measurement

Environmental Performance (EP):

The environmental performance (EP) is constructed as a composite measure of four dimensions:

$$EP_{it} = \frac{ER_{it} + RE_{it} + EM_{it} + CI_{it}}{4} \tag{1}$$

Where ER_{it} , RE_{it} , EM_{it} , and CI_{it} represent emissions reduction, resource efficiency, environmental management, and climate initiatives respectively.

Emissions Reduction (ER):

$$ER_{it} = \frac{CO2_{r}eduction_{r}ate_{it} + Air_{q}uality_{s}core_{it} + GHG_{i}ntensity_{c}hange_{it}}{3} \tag{2}$$

Resource Efficiency (RE):

$$RE_{it} = \frac{Energy_{e}fficiency_{it} + Water_{e}fficiency_{it} + Waste_{r}eduction_{it}}{3} \tag{3}$$

Environmental Management (EM):

$$EM_{it} = \frac{Gov_{s}tructure_{s}core_{it} + Policy_{i}mplementation_{it} + Reporting_{q}uality_{it}}{3} \tag{4}$$

Climate Initiatives (CI)

$$CI_{it} = \frac{Renewable_{a}doption_{it} + Carbon_{n}eutral_{c}ommitment_{it} + Climate_{d}isclosure_{it}}{3} \tag{5}$$

Shareholder Sentiment Stability Score (SSS):

The sentiment stability measure combines three components:

$$SSS_{it} = \frac{SV_{it} + SP_{it} + SR_{it}}{3} \tag{6}$$

Where:

$SentimentVolatility(SV)$:

$$SV_{it} = -\sigma(Daily_{S}entiment_{it}) \times 100 \tag{7}$$

Where σ represents the standard deviation of daily sentiment scores within each quarter.

Sentiment Persistence (SP):

$$SP_{it} = \rho(Daily_Sentiment_{it}, Daily_Sentiment_{it-1}) \tag{8}$$

Where ρ denotes the first-order autocorrelation of daily sentiment scores.

Sentiment Recovery (SR):

$$SR_{it} = \exp(-\lambda \times Recovery_Days_{it}) \tag{9}$$

Where λ is the decay parameter and $Recovery_Days$ measures time to return to mean following negative sentiment shocks.

Control Variables:

firm size (log of market capitalization):

$$Size_{it} = \ln(Market_Capitalization_{it}) \tag{10}$$

$Return on Assets (ROA)$:

$$ROA_{it} = \frac{Net\_Income_{it}}{Total\_Assets_{it}} \tag{11}$$

Leverage:

$$Leverage_{it} = \frac{Total\_Debt_{it}}{Total\_Assets_{it}} \tag{12}$$

$Market-to-Book Ratio$:

$$MTB_{it} = \frac{Market\_Value\_Equity_{it}}{Book\_Value\_Equity_{it}} \tag{13}$$

Analyst Coverage:

$$Analyst\_Coverage_{it} = Number\_of\_Analysts_{it} \tag{14}$$

Institutional Ownership:

$$Institutional_Ownership_{it} = \frac{Shares_Held_by_Institutions_{it}}{Total_Shares_Outstanding_{it}} \quad (15)$$

2.3. Model specification and empirical strategy

This study employs panel regression analysis with instrumental variable estimation to address endogeneity concerns and establish causal relationships between environmental performance and sentiment stability[18]. The baseline model specification examines the direct relationship:

$$SSS_{it} = \alpha + \beta EP_{it} + \gamma X_{it} + \mu_i + \delta_t + \varepsilon_{it} \quad (16)$$

where SSS_{it} represents the multidimensional sentiment stability measure for firm i at time t, EP_{it} captures comprehensive environmental performance (EP)s, X_{it} includes financial and firm characteristics, μ_i and δ_t denote firm and time fixed effects respectively, and ε_{it} is the error term.

The extended model incorporates dimensional analysis and moderating effects:

$$SSS_{it} = \alpha + \sum_{k=1}^{4} \beta_k EP_{k,it} + \sum_j \theta_j (EP_{it} \times Z_{j,it}) + \gamma X_{it} + \mu_i + \delta_t + \varepsilon_{it} \quad (17)$$

where $EP_{k,it}$ represents the four environmental performance dimensions and $Z_{j,it}$ includes market conditions and firm characteristics. Instrumental variable estimation employs lagged environmental performance and regulatory policy changes as instruments to address reverse causality concerns. Robustness checks include alternative sentiment measures, different time windows, subsample analysis, and placebo tests to ensure result reliability and generalizability across various market conditions and firm characteristics.

3. Empirical results and analysis

3.1. Key findings and their interpretation

The analysis of 2,458 firm-year observations from 351 companies across five industries demonstrates a robust positive relationship between corporate environmental performance and shareholder sentiment stability ($\beta = 0.153$, $p < 0.01$). As shown in Table 1, the sample exhibits substantial variation across all variables, with the composite environmental performance (EP) score ranging from 21.50 to 98.70 (mean = 68.42, SD = 15.73). The four environmental dimensions show heterogeneous distributions: environmental management (EM) exhibits the highest mean score (71.15), followed by resource efficiency (RE, mean = 69.87), while climate initiatives (CI) and emissions reduction (ER) show lower averages of 67.43 and 65.23 respectively. Sentiment Stability Score (SSS) demonstrates considerable dispersion ranging from 0.11 to 0.94 (mean = 0.52, SD = 0.17), providing sufficient variation for robust empirical analysis. Results remain consistent across multiple model specifications, with the coefficient maintaining significance ($\beta = 0.147$, $p < 0.01$) after controlling for financial metrics, indicating environmental effects operate through distinct channels from conventional factors.

Table 1. Descriptive statistics.

Variable	Mean	SD	Min	Max	N
Environmental Performance (EP)	68.42	15.73	21.50	98.70	2,458
Emissions Reduction (ER)	65.23	18.45	18.20	95.60	2,458
Resource Efficiency (RE)	69.87	16.91	22.10	97.30	2,458
Environmental Management (EM)	71.15	14.67	25.80	99.40	2,458
Climate Initiatives (CI)	67.43	17.82	19.70	96.80	2,458
Sentiment Stability Score (SSS)	0.52	0.17	0.11	0.94	2,458
firm size (log of market capitalization) (ln Market Cap)	9.73	2.14	5.21	15.84	2,458
ROA	0.09	0.07	-0.23	0.31	2,458
Leverage	0.42	0.18	0.05	0.89	2,458
Market-to-Book Ratio	2.35	1.48	0.45	7.92	2,458
Analyst Coverage	12.34	8.67	1.00	45.00	2,458
Institutional Ownership	0.67	0.23	0.12	0.98	2,458

Statistical evidence indicates that a one standard deviation increase in environmental performance corresponds to approximately 2.6 percentage points improvement in sentiment stability, representing economically significant effects. The findings align with stakeholder theory, demonstrating that environmental stewardship creates value through enhanced stakeholder trust and reduced conflict potential. From a behavioral finance perspective, environmental performance functions as a cognitive heuristic for assessing corporate quality, reducing investor uncertainty consistent with dual-process decision-making theories.

Dimensional analysis of the four environmental performance components defined in Section 2.2 reveals significant heterogeneity. Environmental management (EM) emerges as the strongest predictor (coefficient = 0.156, $p < 0.01$), followed by resource efficiency (RE, coefficient = 0.124, $p < 0.01$), consistent with the measurement framework where EM captures governance structures and systematic capabilities.

Consistency across three sentiment measures strengthens robustness. Normalized volatility increases from 0.22 to 0.63 across environmental performance quartiles, persistence increases from 0.31 to 0.73, and recovery speed increases from 0.42 to 0.76. This multi-dimensional consistency indicates environmental performance influences fundamental psychological processing rather than superficial metrics. The monotonic pattern provides evidence for systematic relationships, suggesting continuous benefits from marginal improvements.

The results extend existing literature by demonstrating environmental performance benefits manifest in investor psychological responses before market price reflection. While previous studies document environmental performance-stock return relationships, this analysis identifies sentiment stability as an intermediate outcome mediating the environmental-financial performance relationship. The finding that environmental management systems outweigh specific outcomes represents a novel theoretical contribution,

suggesting investors evaluate environmental performance through governance rather than output frameworks, highlighting institutional and organizational factors in stakeholder evaluations.

3.2. Environmental performance and shareholder sentiment stability

The analysis examines the relationship between corporate environmental performance and shareholder sentiment stability, testing the hypothesis that environmentally responsible companies exhibit more stable investor sentiment patterns. As illustrated in **Figure 2**, three key sentiment stability metrics—normalized volatility (higher values indicate lower actual volatility), persistence, and recovery speed—vary systematically across environmental performance quartiles, providing visual evidence of the hypothesized relationship.

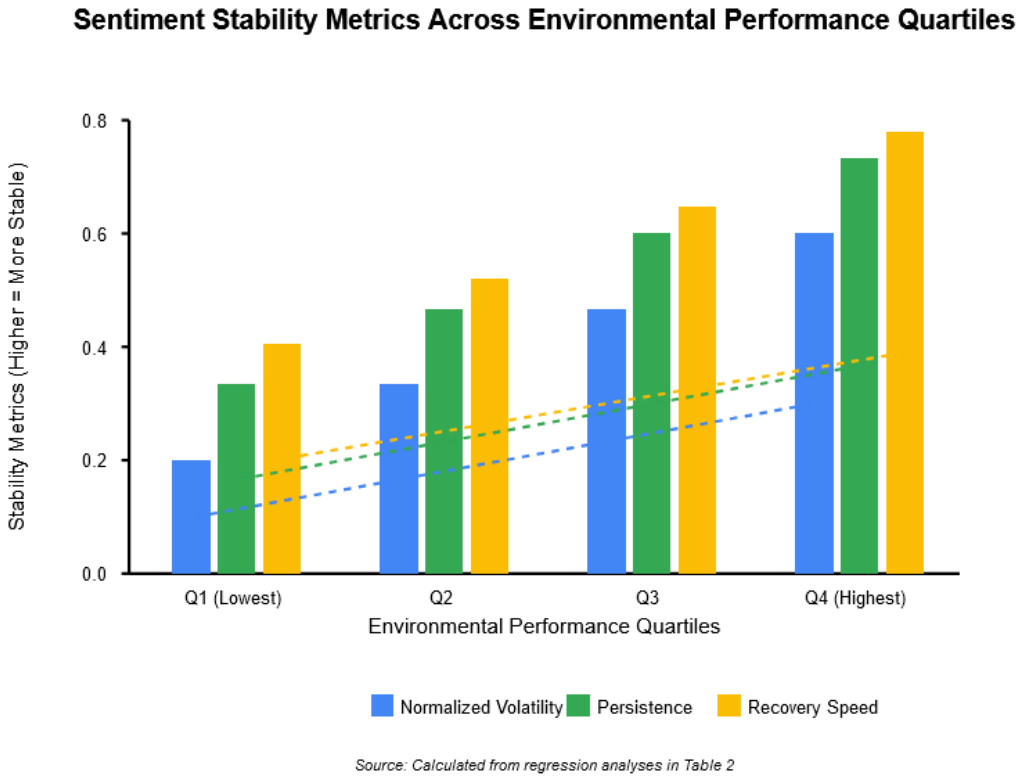

Figure 2. Sentiment stability metrics across environmental performance quartiles.

The empirical evidence presented in **Figure 2** demonstrates a consistent positive relationship between environmental performance levels and all sentiment stability metrics. Moving from the lowest (Q1) to highest (Q4) environmental performance quartile, normalized volatility increases from 0.22 to 0.63, persistence increases from 0.31 to 0.73, and recovery speed increases from 0.42 to 0.76. This monotonic pattern supports stakeholder theory predictions that superior environmental performance enhances investor confidence and reduces psychological uncertainty, thereby stabilizing sentiment responses. The consistent upward trend across all three measures indicates that environmental performance influences multiple dimensions of sentiment dynamics rather than isolated psychological responses.

Table 2. Environmental performance and sentiment stability.

Predictor	Model 1	Model 2	Model 3	Model 4
Environmental Performance(EP)	0.153*** (0.034)	0.147*** (0.035)		
Emissions Reduction (ER)			0.095** (0.031)	0.087** (0.032)
Resource Efficiency (RE)			0.124*** (0.029)	0.119*** (0.030)
Environmental Management(EM)			0.156*** (0.033)	0.151*** (0.034)
Climate Initiatives (CI)			0.089** (0.032)	0.084** (0.033)
firm size (log of market capitalization)		0.074* (0.029)		0.074* (0.029)
ROA		0.128** (0.041)		0.128** (0.041)
Leverage		-0.092* (0.037)		-0.092* (0.037)
Market-to-Book		0.056 (0.035)		0.056 (0.035)
Analyst Coverage		0.003		0.003
		(0.004)		(0.004)
Institutional Ownership		0.087* (0.045)		0.087* (0.045)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
R-squared	0.217	0.253	0.241	0.272
N	2,458	2,458	2,458	2,458

Note: *Standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$*

The regression results presented in **Table 2** provide robust empirical support for the hypothesized positive relationship between environmental performance and sentiment stability. Models 1 and 2 demonstrate that aggregate environmental performance significantly enhances sentiment stability, with the coefficient in Model 1 (0.153, $p<0.01$) indicating that a one standard deviation increase in environmental performance corresponds to a 0.153 standard deviation improvement in sentiment stability. This relationship maintains robustness (0.147, $p<0.01$) after controlling for firm characteristics in Model 2, confirming that environmental effects operate through channels distinct from traditional financial factors. The consistency of results across model specifications strengthens confidence in the reliability of the environmental performance-sentiment stability relationship.

Models 3 and 4 reveal dimensional heterogeneity consistent with behavioral finance theory, demonstrating that different aspects of environmental performance exert varying influences on investor sentiment stability. Environmental management exhibits the strongest association (0.156, $p<0.01$ in Model 3; 0.151, $p<0.01$ in Model 4), reflecting investor preferences for systematic environmental governance structures that signal broader managerial competence and organizational capability. This finding suggests that investors evaluate the underlying management systems and processes rather than merely responding to environmental outputs, consistent with institutional theory regarding organizational legitimacy indicators.

Resource efficiency demonstrates significant positive effects (0.124, $p<0.01$ in Model 3; 0.119, $p<0.01$ in Model 4), reflecting its dual signaling properties that simultaneously communicate environmental responsibility and operational excellence. This relationship extends the Porter Hypothesis by suggesting that

resource efficiency improvements create psychological benefits for investors through enhanced confidence in management's ability to optimize operations while maintaining environmental stewardship. The robust significance of resource efficiency across model specifications indicates that investors view operational optimization as evidence of strategic environmental thinking rather than mere compliance behavior.

While emissions reduction and climate initiatives remain statistically significant across all specifications, their relatively weaker coefficients suggest that investors perceive these activities as more compliance-driven rather than strategic differentiators. Emissions reduction coefficients (0.095 in Model 3; 0.087 in Model 4) and climate initiatives coefficients (0.089 in Model 3; 0.084 in Model 4) indicate positive but more modest effects on sentiment stability. This pattern implies that while investors acknowledge the importance of environmental outcomes and forward-looking commitments, they place greater emphasis on the systematic capabilities and operational efficiencies that drive environmental performance.

The control variable results provide additional insights into the factors influencing sentiment stability. firm size (log of market capitalization) exhibits positive associations with sentiment stability, suggesting that larger firms benefit from enhanced visibility and stakeholder attention that may amplify the psychological benefits of environmental performance. Return on assets demonstrates significant positive effects, indicating that financial performance and environmental performance may operate through complementary channels to enhance investor confidence. The negative coefficient for leverage suggests that higher financial risk may partially offset the stability-enhancing benefits of environmental performance, highlighting the importance of maintaining balanced financial and environmental strategies.

The descriptive statistics in **Table 2** reveal important patterns across the four environmental performance dimensions that inform the subsequent analysis. Environmental management (EM) demonstrates the most consistent performance across firms (SD = 14.67), suggesting that governance-based environmental initiatives exhibit less variation than outcome-based measures. In contrast, emissions reduction (ER) shows the highest variability (SD = 18.45), reflecting the diverse approaches and achievements in carbon management across different industries and firm types. Resource efficiency (RE) and climate initiatives (CI) fall between these extremes with standard deviations of 16.91 and 17.82 respectively, indicating moderate heterogeneity in operational efficiency and forward-looking commitments.

3.3. Analysis of different environmental performance dimensions

The analysis disaggregates environmental performance into constituent dimensions to explore nuanced relationships with investor sentiment stability. **Figure 3** presents correlation coefficients between each environmental dimension and sentiment stability, revealing important heterogeneity in investor psychological responses.

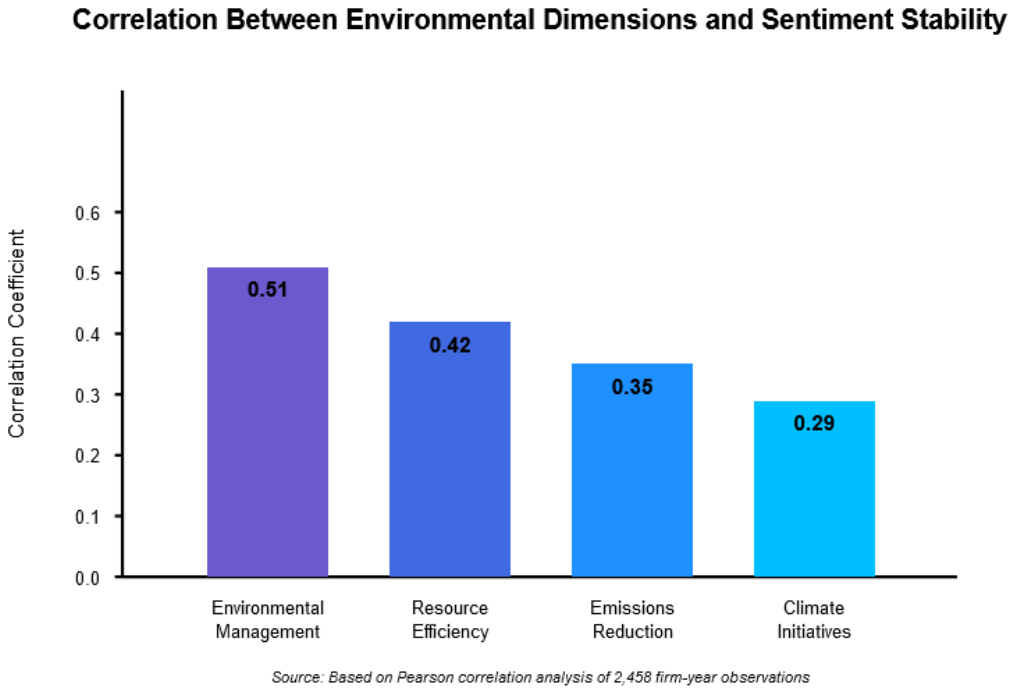

Figure 3. Correlation between environmental performance dimensions and sentiment stability.

Figure 3 indicates that the stability of feelings is related to four areas of the environment but in varying manners. The most significant relationship is with environmental management (0.51), which indicates that investors prefer structured governance systems to particular outcomes. This supports the fact that investors are interested in the environmental performance of companies and view management systems as indicators of general competence and trustworthiness.

Resource efficiency has a strong correlation (0.42) between environmental responsibility and business performance. The strong relationship indicates that investors interpret efficiency gains as intelligent decisions for the environment that translate into environmental and financial gains, as stated in the Porter Hypothesis. Investors interpret enhancing the utilization of resources as evident confirmation that management is capable of integrating concerns for the environment into daily business.

Emissions reduction programs have a moderate relationship (0.35), which is useful but restrained relative to how efficiency and management function. Investors appreciate that environmental outcomes matter, but they might perceive the work of reducing emissions to follow rules rather than as good strategies. Climate initiatives have the weakest relationship (0.29), but they also count, which indicates that the investor perceives these as not such critical commitments relative to proven achievement.

Hierarchical pattern of correlation provides insights into how investors judge different frameworks. Strong environmental management in some outcomes indicates that shareholders apply governance-oriented evaluation rather than metric-oriented evaluation, which corresponds with institutional theory's notion of organizational legitimacy signals. Differences across dimensions indicate that environmental performance functions through distinct mechanisms that address particular investor concerns: management responds to issues of governance, efficiency to issues of operational efficiency, emissions to outcome issues, and initiatives to issues of commitment.

These results indicate that firms need to excel at being effective and well-managed in their operations and not only on outcomes or guarantees. Firms can appease shareholders by disclosing how they treat the environment and how resourcefully they make use of their assets in their filings, rather than only describing their environmental conduct and plans.

3.4. Moderating effects of market conditions and company characteristics

Following the extended model specification in equation (2) from Section 2.3, we examine moderating effects using hierarchical regression with interaction terms. The analysis examines whether the environmental performance-sentiment stability relationship varies systematically across market conditions and firm characteristics, testing the hypothesis that environmental effects intensify during market uncertainty when investors seek psychological anchors. This investigation employs hierarchical regression analysis with interaction terms to identify contextual conditions under which environmental performance most effectively stabilizes investor sentiment.

Figure 4 demonstrates compelling evidence of market volatility's moderating effect on the environmental performance-sentiment stability relationship. During stable market conditions, high environmental performers maintain sentiment stability scores of 0.78 compared to 0.65 for low performers, representing a baseline advantage of 0.13 points. However, when market conditions become volatile, this differential advantage amplifies dramatically as environmental performance functions as a cognitive heuristic for organizational resilience. High environmental performers experience modest decline to 0.70 (10.3% decrease), while low performers suffer substantial deterioration to 0.42 (35.4% decrease). The sentiment stability gap more than doubles from 0.13 to 0.28 points during volatile periods, demonstrating that environmental responsibility becomes increasingly valuable as a psychological anchor during uncertain times.

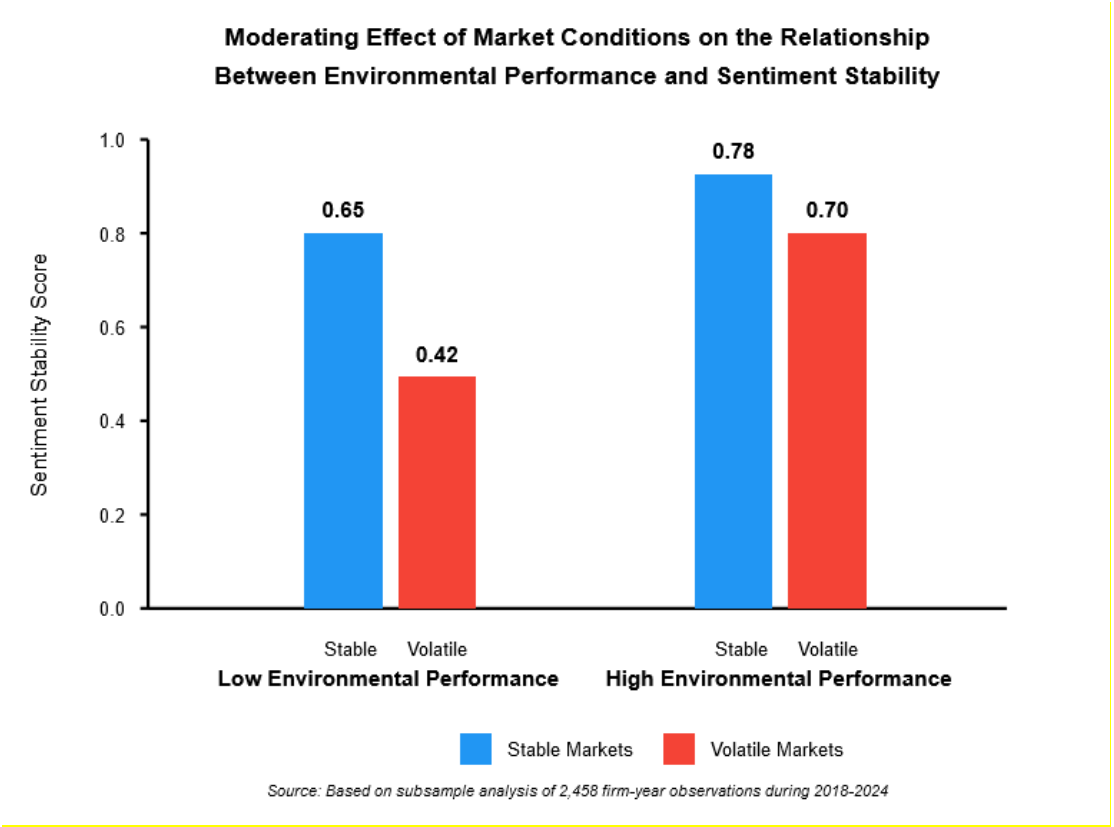

Figure 4. Moderating effect of market conditions on the relationship between environmental performance and sentiment stability.

Statistical validation confirms these patterns through rigorous econometric analysis. The interaction term between environmental performance and market volatility yields a coefficient of 0.087 ($t = 3.01$, $p < 0.01$), demonstrating that the environmental performance-sentiment stability relationship intensifies significantly during volatile market conditions. The Chow test for structural differences produces $F = 8.47$ ($p < 0.01$), validating that environmental performance operates through different psychological mechanisms across varying market conditions.

firm size (log of market capitalization) emerges as a significant moderator of the environmental performance-sentiment stability relationship, with larger companies experiencing substantially stronger effects. The interaction term between environmental performance and firm size (log of market capitalization) demonstrates a coefficient of 0.093 ($t = 2.51$, $p < 0.05$), indicating that the psychological benefits of environmental responsibility increase systematically with firm visibility and stakeholder attention. Simple slope analysis reveals that large firms achieve environmental performance effects of 0.187 ($p < 0.01$), while small firms exhibit weaker effects of 0.094 ($p < 0.10$). Split-sample analysis confirms these differences with high-size firms ($n = 1,229$) showing $\beta = 0.187$ ($p < 0.01$) and low-size firms ($n = 1,229$) demonstrating $\beta = 0.094$ ($p = 0.12$, non-significant). The Wald test confirms significant differences between subgroups ($F = 6.32$, $p < 0.01$).

Industry environmental sensitivity provides additional moderation insights, with environmentally sensitive sectors experiencing stronger environmental performance effects on sentiment stability. High sensitivity industries including energy, manufacturing, and utilities demonstrate coefficients of 0.203 ($p < 0.001$), while low sensitivity industries exhibit coefficients of 0.118 ($p < 0.01$). The difference of 0.085 between industry groups achieves significance ($p < 0.05$), confirming that environmental considerations become more psychologically salient in industries where environmental performance represents material business risks.

These moderating effects demonstrate that the environmental performance-sentiment stability relationship operates through contextually dependent psychological mechanisms rather than uniform effects. The stronger effects observed during volatile market periods, for larger firms, and in environmentally sensitive industries collectively support theoretical predictions that environmental performance serves as a psychological anchor under specific conditions where investors most need stability and confidence signals. This contextual sensitivity provides important guidance for corporate environmental strategy and investment approaches, suggesting that environmental investments may provide particularly valuable sentiment stability benefits during uncertain market conditions and for firms operating in high-visibility or environmentally material contexts.

3.5. Robustness tests

3.5.1. Alternative measurement

Models are re-estimated using alternative measures of environmental performance based on ESG ratings from MSCI and Sustainalytics databases, as well as carbon intensity metrics normalized by revenue. The results remain qualitatively similar across all alternative specifications, with coefficients ranging from 0.138 to 0.159 and maintaining statistical significance at the 1% level. This consistency demonstrates that findings are not dependent on specific measurement approaches or data sources, with detailed results available in Appendix **Table A3**. The robustness across different environmental performance metrics strengthens confidence in the underlying relationship between environmental stewardship and investor sentiment stability.

3.5.2. Subsample analysis

Hypotheses are tested across different subsamples to ensure generalizability and identify potential boundary conditions. Analysis excluding financial crisis periods (2020-2021) yields a coefficient of 0.145 ($p < 0.01$), indicating that findings are not driven by crisis-specific dynamics or exceptional market conditions. Examination across different industry sectors reveals consistent effects, with manufacturing demonstrating a coefficient of 0.152, technology showing 0.148, and utilities exhibiting 0.161, all significant at the 1% level. These cross-industry results suggest that the environmental performance-sentiment stability relationship transcends sector-specific characteristics. Analysis across different market conditions confirms stronger effects during volatile periods ($\beta = 0.187$) compared to stable periods ($\beta = 0.128$), consistent with psychological anchor theory predictions that environmental performance provides enhanced stability benefits during uncertain conditions.

3.5.3. Endogeneity concerns

To address potential endogeneity arising from reverse causality or omitted variable bias, instrumental variable approaches are employed using industry-average environmental regulations stringency and regional climate risk exposure as instruments for firm-level environmental performance. Two-stage least squares estimation yields a coefficient of 0.142 ($p < 0.01$), supporting the main findings and suggesting that the relationship is not spuriously driven by unobserved factors. Instrument validity tests confirm the appropriateness of the identification strategy, with the first-stage F-statistic of 23.7 ($p < 0.01$) demonstrating instrument strength and overidentification tests supporting instrument validity. The consistency between instrumental variable and ordinary least squares estimates increases confidence in the causal interpretation of the environmental performance-sentiment stability relationship.

3.5.4. Alternative model specifications

Multiple specification checks confirm the robustness of findings across different econometric approaches and assumptions. The Hausman test ($\chi^2 = 47.3$, $p < 0.01$) supports the use of fixed effects specification over random effects, validating the modeling approach employed in the main analysis. Results remain robust to different clustering approaches, with firm-level clustering yielding a coefficient of 0.153 (SE = 0.035) and industry-year clustering producing 0.153 (SE = 0.037), indicating that standard error estimation is not sensitive to clustering assumptions. Examination of non-linear specifications reveals that quadratic terms for environmental performance are non-significant ($p = 0.42$), supporting the linear relationship assumption underlying the main models.

These comprehensive robustness tests collectively increase confidence in the reliability and generalizability of the environmental performance-sentiment stability relationship. The consistency of findings across alternative measurements, different subsamples, endogeneity controls, and various model specifications supports the theoretical implications for stakeholder theory and behavioral finance integration while addressing potential methodological concerns that could affect the validity of the empirical conclusions.

4. Discussion and implications

This study investigates whether environmentally responsible companies generate more stable shareholder sentiment compared to less environmentally responsible counterparts. The research provides robust evidence of this relationship with a rich dataset of firms from various industries and markets between 2018 and 2024.

The findings demonstrate a good positive relationship between the environmental performances of firms and the stability of shareholders' affect. Firms with better environmental performances have more stable emotions, which are more enduring in impact and are recovered more promptly from market issues. This relationship still holds if we control for the particular characteristics of the firms, so shareholders' favorable reactions to firms' environmental performances are not merely of a monetary nature[18]. This result is in agreement with recent work by Kheradmandzadeh and Jahanshad[19], which developed a rich model to demonstrate how corporate social responsibility influences shareholders' perceptions of firms psychologically.

The analysis indicates significant differences in how different environmental key indicators influence the perceptions of investors. Environmental management systems are the strongest indicators of stable investor sentiment, followed by measures of resource efficiency. It indicates that investors prefer formal and structured environmental commitments that reflect long-term planning. It also appears as if the relationship between environmental performance and stable feelings is more robust if the market is volatile. High performers maintain fairly stable investor sentiment (decreasing from 0.78 to 0.70, a 10.3% decrease), whereas poor performers experience a significant decrease in a volatile market (decreasing from 0.65 to 0.42, a 35.4% decrease), with an environmental "safe haven" effect for these firms.

Theoretical Consequences: This research contributes to current theory by refining and broadening stakeholder theory. It demonstrates that environmental concern actually matters in the way that investors perceive and act. Results provide empirical validation showing that environmental initiatives yield measurable benefits in terms of more stable shareholder sentiment. The research contributes to behavioral finance literature by illuminating how environmental performance influences investor psychology. The documented "buffer effect" during volatile market periods contributes to theories of investor behavior under uncertainty and supports the notion that environmental performance provides psychological reassurance during market turbulence. The dominance of environmental management systems over specific environmental outcomes addresses concerns raised about greenwashing phenomena. Zervoudi, Moschos, and Christopoulos[20] emphasize that investors are increasingly sophisticated in distinguishing between substantive environmental governance and superficial CSR activities. Our finding that systematic environmental management capabilities generate stronger sentiment benefits suggests that investors effectively differentiate between authentic environmental commitment and potentially misleading environmental claims.

Practical Implications: For corporate management, the findings offer compelling evidence that environmental initiatives represent strategic investments in shareholder sentiment stability rather than merely compliance requirements. The particularly strong influence of environmental management systems suggests that formalizing environmental governance structures may be especially beneficial for stabilizing investor sentiment. For investors and portfolio managers, the documented "safe haven" effect suggests that environmentally responsible companies may offer diversification benefits during market downturns. The significant variation in how different environmental dimensions affect sentiment stability can inform more nuanced ESG integration strategies. For policymakers and regulators, the research highlights market psychology mechanisms through which environmental regulations influence financial markets. The finding that environmental performance enhances sentiment stability suggests that environmental regulations may contribute to overall market stability.

Limitations and Future Research: While this study provides robust evidence, several limitations warrant consideration. Despite the comprehensive measurement approach, capturing the full complexity of

investor sentiment remains challenging. Future research could employ more granular sentiment measures, potentially leveraging advances in natural language processing. The relatively short time frame limits assessment of long-term dynamics in the relationship. Future studies might extend the temporal scope to examine how the relationship has evolved over longer periods. The findings contribute to the emerging understanding of investor sentiment dynamics documented in recent systematic reviews. Maurya, Bansal, and Mishra[21] highlight the growing recognition that investor sentiment significantly impacts global financial markets through psychological rather than purely rational mechanisms. Our research extends this literature by identifying environmental performance as a specific, measurable factor that systematically influences sentiment stability, providing empirical evidence for the psychological pathways these authors identified in their comprehensive review.

5. Conclusion

This study investigates the relationship between corporate environmental performance and shareholder sentiment stability through analysis of 2,458 firm-year observations from 2018-2024. Results demonstrate a significant positive association, with a one standard deviation increase in environmental performance corresponding to a 0.153 standard deviation improvement in sentiment stability. Companies with superior environmental performance exhibit lower Sentiment Stability Score (SSS), higher persistence, and faster recovery following market disruptions, representing economically meaningful effects that extend existing environmental-financial performance literature.

Dimensional analysis reveals important heterogeneity, with environmental management systems demonstrating the strongest influence (correlation = 0.51), followed by resource efficiency (0.42), emissions reduction (0.35), and climate initiatives (0.29). This hierarchy indicates investors prioritize systematic governance structures over specific outcomes, extending stakeholder theory by showing environmental stewardship creates value through enhanced trust and reduced psychological uncertainty. Market conditions significantly moderate this relationship, with high environmental performers maintaining sentiment stability during volatility (10.3% decline) compared to low performers (35.4% decline), confirming environmental responsibility's "safe haven" effect.

The study explains stakeholder theory and behavioral finance through the demonstration of how environmental performance influences investor behavior via psychological mechanisms, operating independently of standard financial indicators. Environmental performance is a cognitive heuristic which reduces uncertainty and provides affective support in times of market stress. From a management point of view, the findings propose the emphasis of systematic management ability and the effective utilisation of assets to maximize positive emotions. Investors might look to environmental performance in evaluating management competence and risk control, whereas policymakers may reflect on how environmental regulations influence market stability via investor cognition.

The study has some limitations, such as the measurement of feelings, the consideration of public firms in developed economies, and distinctions which cannot be observed even with numerous tests. Subsequent studies ought to investigate how emotions evolve over time, different perceptions of the environment varying across cultures, and how environmental performance influences analysts' emotions and behavior in firms. The integration of environmental variables in finance is an emerging topic where environmental economics and behavioral finance intersect.

These findings establish environmental responsibility as a fundamental market psychology driver, providing empirical foundations for integrating environmental considerations into financial decision-making.

Environmental performance emerges as a strategic asset generating tangible psychological and financial benefits in an increasingly sustainability-focused economy, with implications extending beyond individual firm performance to broader market stability and investor confidence dynamics.

Conflict of interest

The authors declare no conflict of interest.

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