How Does Corporate ESG Performance Affect Stock Return Volatility? -- An Empirical Study Based on A-share Listed Companies

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Abstract: Under the backdrop of the "dual-carbon" policy, an increasing number of investors consider ESG performance as an essential basis for evaluating a company's value and risk. While ESG performance has been correlated with stock volatility, the causal relationship between the two remains unclear. This paper analyzes the causal relationship and mechanisms between ESG ratings and stock return volatility using annual panel data from A-share listed companies (2013–2023) and explores the mediating effect of information asymmetry. The results indicate that comprehensive ESG evaluations reduce stock return volatility and stabilize prices by mitigating information asymmetry. Additionally, strong equity check-and-balance mechanisms further suppress volatility, demonstrating that higher equity checks and balances enhance ESG's inhibitory effect on stock volatility.

Keywords: ESG, stock return volatility, information asymmetry, equity checks and balances

1.   Introduction

The ESG concept was first introduced in the United Nations Global Compact program in 2004. In the context of the implementation of the "dual carbon" policy, to promote the construction of the domestic ESG system, the Ministry of Ecology and Environment has issued the "Format Guidelines for Disclosure of Corporate Environmental Information by the Law" in 2022, which requires domestic corporations to fulfill the ESG disclosure system by the law. Although the establishment of China's ESG system started late, it received great attention from all sectors of society once it was released, and more and more investors have begun to take ESG performance as an important basis for evaluating the value and risk of a company. Against this backdrop, ESG performance may have a profound impact on a company's market performance, especially stock volatility.

Stock volatility is the phenomenon of stock prices moving up and down over a certain period, usually characterized by the magnitude and frequency of price increases and decreases. It is an important indicator of the speed and magnitude of stock price changes, reflecting changes in market participants' expectations of stock value. Specifically, as companies improve their performance in environmental protection, social responsibility, and corporate governance, they can effectively reduce their risk response in the face of market uncertainty. Especially in China's A-share market, where investor sentiment is easily affected by short-term events, a company's ESG may become an important signal for investors to assess the stability of the company.

The central question this paper seeks to answer is: is there a causal relationship between ESG and stock return volatility, given the known correlation between ESG and stock volatility? Meanwhile, this paper reveals how ESG affects stock return volatility through multiple paths by introducing information symmetry and equity checks and balances as mediating and moderating variables. This is also the first major contribution of this paper, which deepens the understanding of the mechanism of ESG impact on stock volatility in the capital market, and also reveals the boundary conditions of ESG impact on stock volatility, which enriches the theoretical framework of ESG research and the domestic research literature on stock return volatility. The second major contribution of this paper lies in the practical dimension: this paper provides good practical insights for investors and regulators. The study can help investors better understand how ESG performance affects stock volatility through information symmetry and equity checks and balances, and thus optimize investment decisions. The results of the study also provide policy rationale for regulators, such as reducing overall market volatility by strengthening ESG disclosure requirements and optimizing corporate governance structure. It can be seen that the research framework of this paper has important marginal contributions at both theoretical and empirical levels, and can promote the development of ESG research in the direction of more refinement and multidimensionality.

2. Theoretical analysis and research hypothesis

2.1. Literature review

Stock volatility return is the rate of return corresponding to the degree of volatility of stock prices over time. In the process of exploring the factors affecting stock volatility returns, many scholars start from within the firm, and the currently existing literature focuses on information transparency, corporate overinvestment, and the proportion of shares held by large shareholders. For example, Li Zengquan et al. suggest that the more opaque the information, the higher the risk of stock price volatility [1]. Jiang Xuanyu and Xu Nianxing suggest that corporate overinvestment is significantly positively related to the risk of stock price collapse [2]. Wang et al. suggest that the negative relationship between large shareholders' ownership and the risk of stock price collapse is more significant when the agency conflict between shareholders and management is more serious and when the monitoring ability of minority shareholders is weaker [3]. Some scholars also look at the external environment and find that both interest rate marketization reform and government chain-of-control management can dampen stock price volatility to some extent [4,5].

ESG is a series of corporate evaluation standards that measure the environmental, social, and governance capabilities of enterprises. At present, under the background of the implementation of the "dual-carbon" policy, the capital market pays more and more attention to the concept of ESG. Most scholars agree that the disclosure of ESG information by enterprises can bring positive impacts to enterprises. For example, ESG advantages can improve the level of corporate foreign investment and reduce the cost of corporate financing, and the enterprises that disclose ESG information are more likely to create higher corporate value [6-8].

From the literature sorted out above, it can be seen that although more and more investors begin to take ESG performance as an important basis for assessing company value and risk, scholars begin to study the impact of ESG performance on company value, risk and investment, etc., the exploration of the economic effect and mechanism of ESG performance on stock price volatility risk has not attracted much attention so far, and thus domestic literature on the impact of ESG evaluation on stock volatility return is very scarce.

2.2. Formulation of research hypotheses

With the penetration of ESG into the business philosophy of enterprises and the investment philosophy of investors, it is bound to reshape the pricing rules of the stock market and affect the efficiency of stock pricing. In China, information plays a key role in stock pricing. With the lagging development of China's financial market, insufficient investor protection, and the prevalence of stock manipulation and insider trading, there is a more serious information asymmetry in the capital market, which leads to abnormal fluctuations in China's stock market easily. Then, how to reduce the information asymmetry becomes the key content to stabilize China's stock market. In his study, Song Xianzhong found that the CSR report of an enterprise can play an information effect, and external investors can understand the financial status of an enterprise through the non-financial information disclosed by the enterprise [9]. ESG disclosure is an effective way for external investors to indirectly understand the real operating conditions of enterprises, which is very helpful for investors to make reasonable and wise investment decisions. Moreover, an ESG disclosure system can also encourage enterprises to fulfill their ESG responsibilities to enhance the transparency of accounting surplus information, thus providing investors with more transparent and reliable financial information [10].

As a result, based on the above research findings, this paper proposes two research hypotheses:

H1: ESG comprehensive evaluation of companies can suppress stock return volatility;

H2: ESG comprehensive evaluation suppresses stock return volatility by reducing information asymmetry.

3. Research design

3.1. Research model

In order to test the effect of ESG on stock volatility returns, this paper constructs the following model (1):

$$Stock1_{i,t}=\beta_0+\beta_1 ESG_{i,t}+\beta_2 ROE_{i,t}+\beta_3 Cash_{i,t}+\beta_4 Debt_{i,t}+\beta_5 Tax_{i,t}+\epsilon_{i,t}$$

The dependent variable Stock is the stock volatility return, and Stock1 and Stock2 are chosen as their proxies to represent the company-adjusted and industry-adjusted stock volatility returns, respectively. The independent variable ESG is the ESG composite rating, and ESG and Wind_ESG are chosen as their proxies to denote the CSI ratings and the WIND database, respectively. ROE, Cash, Debt, and Tax are the relevant control variables, and ε is the random error term. In addition, with reference to the theoretical analysis in this paper, we expect the regression coefficient of ESG in the model (1) to be significantly negative.

3.2. Variable definitions

Table 1: List of variable definitions

Variable Classification	Variant	Marking	Definition
Explanatory Variable	Equity Return Volatility	Stock	Annual daily stock returns. Where Stock1 is company-adjusted stock return volatility and Stock2 is industry-adjusted stock return volatility.
Explanatory Variable	ESG Composite Rating	ESG	The nine ratings C, CC, CCC, B, BB, BBB, A, AA, and AAA are assigned 1-9 in ascending order, where ESG is rated using the CSI ratings and Wind ESG is rated using the Wind database.
Control Variable	Cash Flow Ratio	Cash	Cash Assets/Total Assets
	Gearing	Debt	Natural logarithm of annual gearing ratio
	Return on Net Assets	ROE	Net Profit/Shareholders' Equity

Table 1: (continued)

	Total Profit for Tax Purposes	Tax	Taxes/Total Profit
Intermediary Variable	Information Asymmetry	Asy	where Asy1 is based on an abnormal rate of return measurement and Asy2 is based on the annual stock turnover rate
Moderator Variable	Shareholding Ratio of the Largest Shareholder	Balance	Number of Shares Held by the Largest Shareholder/Total Number of Shares of the Company

3.3. Research sample

This paper takes the annual panel data of A-share listed companies from 2013 to 2023 as the research sample. The data used in the paper are from the CSMAR database and Wind database, and the raw data are processed as follows: (1) excluding the samples with missing key variables; (2) excluding the companies that are ST and delisted during the study period. Finally, 34,728 valid samples were obtained.

4. Empirical analysis

4.1. Descriptive statistical analysis

As can be seen from Table 2, the mean value of company-adjusted stock return volatility is 2.8%, with a standard deviation of 0.038, indicating that most of the stocks in the A-share market have less short-term volatility, relatively lower risk, and have a positive long-term average rate of return. The industry-adjusted stock return volatility has a mean of 6.9% and a standard deviation of 0.092, indicating that after removing the disturbances of industry performance, the relative performance of most stocks within their industries is high in return but also relatively high in risk. The mean values of ESG and Wind_ESG are 4.181 and 4.183, respectively, with a standard deviation of 0.934 and 0.971, indicating that ratings of The mean values of ESG and Wind_ESG are 4.188 and 4.183 respectively, with standard deviations of 0.934 and 0.971, indicating that most of the firms in the ratings are in the B series, and the proportion of A series is low.

Table 2: Results of descriptive statistics

VarName	Obs	Mean	SD	Min	Median	Max
Stock1	34728	0.040	0.038	0.001	0.028	0.396
Stock2	34728	0.098	0.092	0.002	0.069	0.892
ESG	34728	4.181	0.934	1.000	4.000	8.000
Wind_ESG	34728	4.183	0.971	1.000	4.000	8.000
Asy1	34728	-0.274	0.495	-7.019	-0.180	5.512
Asy2	34728	-0.268	0.618	-9.428	-0.125	3.404
Balance	34728	0.310	0.149	0.019	0.288	0.900
ROE	34704	0.056	0.290	-31.062	0.071	2.385
Cash	24189	4.898	1.113	-4.161	4.845	13.920
Debt	34728	0.412	0.208	0.008	0.401	8.557
Tax	30490	2.615	0.966	-11.906	2.701	11.981

4.2. Benchmark regressions

Columns (1) and (3) of Table 3 show the results of the benchmark regression of ESG composite ratings on stock return volatility with the gradual addition of control variables, where the estimated coefficients of ESG are both significantly negative at the 1% level, and their impact coefficients

become progressively larger with the increase of control variables. This indicates that there is a significant negative causal relationship between firms' ESG performance and stock return volatility, which supports research hypothesis H1.

Columns (2) and (4) are high-dimensional fixed-effects regressions of ESG composite ratings on stock return volatility, in which the model in column (2) contains only ESG variables and does not incorporate other control variables, whereas the model in column (4) incorporates more control variables on top of ESG variables. The coefficient of ESG in the model (2) is -0.005 and it is significant at a 1% level of significance, which shows that the ESG composite evaluation has a significant negative impact on stock return volatility. After adding other control variables, that is, in the results of model (4), it is found that the coefficient of ESG has increased, increasing to -0.003, which shows that the addition of control variables makes the negative effect of ESG composite evaluation on stock volatility of returns weakened, but it is still significant at the 1% level.

Table 3: Regression results of ESG composite ratings on stock return volatility

VARIABLES	(1) Stock1	(2) Stock1	(3) Stock1	(4) Stock1
ESG	-0.005***	-0.005***	-0.003***	-0.003***
	(-10.98)	(-16.93)	(-6.81)	(-9.38)
ROE			0.049***	0.049***
			(8.08)	(9.80)
Cash			0.001***	0.001***
			(2.39)	(2.70)
Debt			-0.023***	-0.022***
			(-5.79)	(-7.72)
Tax			-0.001*	-0.001*
			(-1.91)	(-1.87)
Constant	0.062***	0.060***	0.058***	0.049***
	(32.93)	(51.56)	(18.77)	(20.68)
Observations	34,728	34,681	22,868	22,461
R-squared	0.043	0.574	0.049	0.602
Control		NO		NO
Fe	YES	YES	YES	YES
Industry、City、Pro	NO	YES	NO	YES
Year	YES	YES	YES	YES
R-squared		0.574		0.602
Adjusted R-squared		0.509		0.518
F-statistics	39.16***	286.6***	20.27***	45.63***

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4.3. Analysis of intermediation effects

As seen in Table 4, the regression coefficient of ESG in column (1) is -0.003, which is significant at the 1% level, indicating that ESG comprehensive evaluation has a significant negative impact on stock return volatility. The regression coefficient of ESG in column (2) is -0.016, which is significant at the 1% level, indicating that ESG comprehensive evaluation has a significant negative effect on information asymmetry. In column (3), after adding information asymmetry, the negative effect of ESG comprehensive evaluation on stock return volatility is still significant, but the

coefficient remains at -0.003, which indicates that ESG suppresses stock return volatility mainly by reducing information asymmetry.

Table 4: Mediated effects test

VARIABLES	(1) Stock1	(2) Asy1	(3) Stock1
Asy1			-0.001**
			(-2.74)
ESG	-0.003***	-0.016***	-0.003***
	(-6.81)	(-2.82)	(-6.78)
ROE	0.049***	-0.935***	0.049***
	(8.08)	(-10.91)	(8.03)
Cash	0.001**	0.007***	0.001**
	(2.39)	(2.61)	(2.37)
Debt	-0.023***	0.001	-0.023***
	(-5.79)	(0.02)	(-5.78)
Tax	-0.001*	0.005	-0.001*
	(-1.91)	(1.21)	(-1.92)
Constant	0.058***	0.212***	0.058***
	(18.77)	(4.98)	(18.68)
Observations	22,868	22,868	22,868
R-squared	0.049	0.246	0.049
Number of Stk	4,233	4,233	4,233
Stk	YES	YES	YES
Year	YES	YES	YES
F-statistics	20.27***	312.9***	18.99***

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4.4. Moderating effects analysis and robustness tests

Columns (1) and (2) of Table 5 analyze the moderating effects, from which the direct effect of equity checks and balances on stock return volatility is significantly negative, suggesting that a good structure of equity checks and balances can directly reduce stock price volatility. Meanwhile, Balance × ESG is significantly positive, revealing the positive moderating effect of equity checks and balances in the relationship between ESG and stock return volatility. The theoretical logic can be systematically deduced as follows: first, equity checks and balances form a power monitoring network through decentralized control, inhibit short-term opportunistic behaviors of management or major shareholders, and force ESG practices to pay more attention to substantive risk mitigation, thus enhancing the effectiveness of ESG in reducing operational uncertainty; second, equity checks and balances have a positive moderating effect in the relationship between ESG and stock return volatility. Secondly, equity checks and balances promote multiple shareholders to demand stricter ESG information disclosure, enhance information transparency, and reduce investors' expectation divergence due to ESG value miscalculation, thus weakening the overreaction of stock prices; in addition, equity checks and balances reduce the probability of sudden risk events by balancing internal conflicts of interest, forming a "two-pillar" function with the long-term risk protection function of ESG. "In addition, equity checks and balances reduce the probability of sudden risk events by balancing internal conflicts of interest and form a synergy with the long-term risk protection function of ESG to produce a multiplier buffer effect. The interaction term coefficient in

the empirical evidence shows that for every 1 unit increase in equity checks and balances, the inhibition effect of ESG on volatility is increased by 8%, which confirms that equity checks and balances promote the transformation of ESG from "formal compliance" to "substantive value creation" through the triple mechanism of governance enhancement, information optimization, and risk synergy and ultimately enhance the value creation of ESG. This confirms that through the triple mechanism of governance enhancement, information optimization, and risk synergy, ESG is transformed from "formal compliance" to "substantive value creation", and ultimately suppresses stock return volatility more significantly.

To verify the robustness of the findings, column (3) of Table 5 uses industry-adjusted stock return volatility instead of company-adjusted stock return volatility, column (4) of Table 5 uses Wind database ESG ratings instead of CSI ESG ratings, and the regression coefficients are consistent and significant, which verifies the reliability of the findings and ensures that the results do not depend on the measurement method of the explanatory variables.

Table 5: Moderating effect and robustness test of equity checks and balances on ESG on stock return volatility

VARIABLES	(1) Stock1	(2) Stock1	(3) Stock2	(4) Stock1
ESG	-0.003***	-0.003***	-0.007***	-0.002***
	(-6.81)	(-6.78)	(-6.96)	(-6.40)
ESG×Balance		0.008**		
		(2.56)		
Balance		-0.433***		
		(-12.95)		
ROE	0.049***	0.049***	0.120***	0.049***
	(8.08)	(8.08)	(8.17)	(8.07)
Cash	0.001**	0.001**	0.001***	0.001***
	(2.39)	(2.38)	(2.62)	(2.45)
Debt	-0.023***	-0.023***	-0.054***	-0.023***
	(-5.79)	(-5.79)	(-5.68)	(-5.69)
Tax	-0.001*	-0.001*	-0.003*	-0.001*
	(-1.91)	(-1.90)	(-1.90)	(-1.92)
Constant	0.058***	-13.911***	0.138***	0.055***
	(18.77)	(-12.90)	(18.46)	(18.88)
Observations	22,868	22,868	22,868	22,868
R-squared	0.049	0.050	0.049	0.047
Number of Stk	4,233	4,233	4,233	4,233
Stk	YES	YES	YES	YES
Year	YES	YES	YES	YES
F-statistics	20.27***	115.15***	19.90***	20.16***

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5. Conclusions and recommendations

5.1. Conclusions of the study

This paper uses the annual panel data of A-share listed companies from 2013 to 2023 as the research sample to analyze the causal relationship and the mechanism of action between ESG and stock return

volatility and also explores the mediating effect of information asymmetry. The final conclusion is:ESG can reduce stock return volatility and stabilize stock prices by reducing information asymmetry. It is also found that excellent equity checks and balances can also help to reduce the volatility of stock returns, which is manifested in the fact that the higher the equity checks and balances are, the stronger the suppression effect of ESG on stock return volatility is.

5.2. Related recommendations

Enterprises should actively participate in ESG information disclosure and comprehensively improve the quality of information disclosure. At the same time, enterprises should deeply understand and actively accept the key position of ESG in realizing high-quality development, and deeply integrate ESG concepts into their core strategies and operating philosophies.

Investors need to pay close attention to the ESG of enterprises and make rational investment decisions based on in-depth exploration and analysis of non-financial information that goes beyond traditional financial statements to identify potential risks and avoid blindly following the trend.

In formulating the ESG evaluation system, rating agencies must closely integrate the actual situation of the Chinese market and international standards to create evaluation benchmarks that are both in line with national conditions and in line with global standards. In addition, it is crucial to gradually include non-listed companies in the scope of evaluation.

Regulators should ensure the credibility and transparency of ESG information through third-party validation, thereby enhancing market efficiency and stability. At the same time, financial subsidies, tax incentives, and other incentives can be used to motivate companies to take the initiative to improve their ESG performance and the quality of information disclosure.

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