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Has ESG Performance Reduced Stock Price Volatility

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Abstract: In the context of sustainable development, it is of practical importance to study whether ESG performance can influence stock price volatility. This paper empirically analyzes the impact of corporate ESG performance on stock price volatility using a sample of A-share listed companies in Shanghai and Shenzhen, China, from 2011-2021. It is found that corporate ESG performance can significantly reduce stock price volatility, and this finding remains robust after controlling for sample selection bias, changing the measurement of key variables, and transforming the empirical model. Mechanistic tests suggest that analyst attention and corporate reputation are potential mechanisms of influence between ESG performance and stock price volatility. Further study finds that investor sentiment contributes to ESG performance in reducing stock price volatility. This paper provides operational evidence for ESG performance to play a positive screening role, stabilize stock markets and promote high-quality development of listed companies.

Keywords: ESG; Stock Price Volatility; Investor Sentiment; Analyst Attention.

1. Introduction

In recent years, a series of "black swan" incidents have been in the public eye and triggered strong social reactions, such as the falsification of motor vehicle emissions, the tainted vaccine incident of a biological company, and the financial fraud of Raisin Coffee. ESG is a more comprehensive view of sustainable development, which is based on the traditional approach of measuring non-financial indicators of environmental, social and corporate governance, so as to It allows companies to pursue business interests while taking social responsibility into account, and enables investors to evaluate companies in a multidimensional and comprehensive manner. It has been shown that good ESG performance of enterprises is important for enterprises to improve the transparency of accounting surplus information (Xu Xiangbing et al., 2022) [1]; improve corporate valuation (Wang Haiyang et al., 2022) [2]; mitigate the risk of stock price collapse and stabilize the capital market (Xi Longsheng and Wang Yan, 2022; Shuai Zhenghua, 2022) [3] [4]; reduce the cost of corporate financing (Qiu Muyuan and Yin Hong 2019) [5]; promoting high-quality enterprise development (Xiaoxi Zhang and Zongming Ma, 2022) [6] and other positive impacts. However, with the development of technology and enterprise mobile Internet, the real information of enterprises becomes more accessible, and everyone is the supervisor of the social value and social influence of enterprises, and the information actively disclosed by enterprises can be explored, monitored and verified by more stakeholders, and enterprises themselves start to enhance the comprehensive management in social responsibility and disclose the relevant data and information publicly, and the ESG report of enterprises is ESG reports are one of them. On the one hand, consumers are pushing bottom-up scrutiny of corporate values, demanding the ultimate in authenticity and transparency, requiring companies to express their good business practices and initiatives with unique and innovative good practices and matching facts, down to each traceable logical chain and background information. On the other hand, the top-down influence of the whole environment is equally important. In recent years, the national level of double carbon and common wealth, the strict requirements for ESG information disclosure by enterprises in the capital market, even for an ordinary financing, enterprises begin to face the risk of investment by investors through the examination of ESG information, and the ESG performance of enterprises is an important basis for investors to make investment decisions (Broadstock et al, 2021; Pedersen et al, 2021) [7] [8]. In this process, the significance of corporate ESG performance is self-evident.

As investors become more sensitive to environmental and social information, the impact of corporate ESG performance on the stock market has become increasingly evident. The volatility of stock price is not conducive to the healthy development of the capital market, but also hurts the interests of investors, and even has a huge negative impact on listed companies, so how to reduce stock price volatility has been the focus of academic research. However, there are few studies on the impact of ESG performance on stock price volatility in domestic literature. Does corporate ESG performance really help reduce stock price volatility? What is the causal chain? Clarifying these questions can help companies to correctly understand the stock market reactions triggered by ESG performance and improve their risk management capabilities as well as stock market investors' confidence.

In view of this, this paper examines the objective performance and transmission path of ESG performance on stock price volatility with the help of ESG rating data published by Huazheng, using Shanghai and Shenzhen A-share listed companies from 2011-2021 as the research sample. The marginal contributions of this paper are: first, it provides empirical evidence on the economic consequences of ESG performance and empirically examines the impact of ESG performance on stock price volatility and the internal logical chain. Second, it enriches the research on the preventive factors of corporate share price volatility; most of the previous literature explores how to reduce share price volatility in terms of institutional investors (Hao-Yu Gao et al., 2017) [9] and corporate transparency (Qing-Quan Xin et al., 2014) [10], etc. This study verifies the reduction effect of ESG performance on share price volatility based on the social

responsibility perspective and enriches related research.

2. Theoretical Analysis and Research Hypothesis

Under the long-term vision of "double carbon" strategy, the national strategic layout has been deeply compatible with the ESG concept of enterprises. China's ESG disclosure requirements for listed companies have gradually changed from "voluntary disclosure" to "mandatory disclosure for some companies", indicating that ESG performance has become a new trend in the capital market to measure companies. ESG performance due to sustainable development reshapes the business philosophy of enterprises and brings value creation effect.

First, good ESG performance helps improve the information environment of companies, enabling analysts to obtain timely and accurate information and reducing stock price volatility. According to information asymmetry theory, the availability of information and the persistence of market frictions make firms and stakeholders have serious information asymmetry problems (Mei Yali et al., 2023) [11]. At this time, corporate ESG performance plays the role of information transfer bridge, ESG contains a large content of information with many levels and a wide range, which makes it more necessary for professionals to interpret and analyze, and under this demand, corporate ESG performance will attract analysts to pay attention and follow up to reduce information asymmetry, and thus reduce stock price volatility. As an information intermediary between investors and listed companies, analysts can provide support for investors to obtain more information about the company (Pan Yue et al., 2011) [12]. The existence of analysts can, to a certain extent, increase the content of idiosyncratic information contained in the stock price in the market, send signals to the outside world about the better business conditions and earnings quality of enterprises, and also supervise the information disclosure behavior of enterprises, improve the level and quality of enterprise information disclosure, and promote the better circulation of information among investors, all of which can reduce the information asymmetry of enterprises and thus reduce the degree of stock price volatility In addition, ESG performance improves the information environment. In addition, ESG performance improves the quality of the information environment, and such public information will make many investors pay attention to the performance of enterprises in social responsibility and other aspects, which will help alleviate abnormal stock price fluctuations and return the stock price to a reasonable level.

Second, ESG performance is an important factor that affects corporate reputation in the current social context that emphasizes environmental protection (Guan Kaolei et al., 2019) [29] The insurance role played by reputation helps to reduce stock price volatility. According to reputation theory, when ESG performance is good, it accumulates moral and reputational capital for the company and establishes a positive image to the outside world, which helps the company to cope with external shocks and plays a "safeguard role" of ESG rating (Gao Jieying et al., 2021) [13]. Specifically, ESG is a hybrid of a company's environmental, social, and governance activities (Refinitiv, 2020) [14]. Companies have equal importance to the three pillars of ESG and have social and environmental responsibilities to their stakeholders. The social and environmental responsibility of a company improves its reputation, while investors have a better impression, goodwill and trust in companies with a better reputation, thus companies with a good reputation gain long-term support from investors, build a certain loyalty and investment preference, and in certain critical situations for can also provide insurance for the company (Godfrey, 2005). Compared to companies with low ESG, companies with good ESG performance have stronger sustainability, lower volatility and lower risk (Benlemlih & Girerd-Potin, 2017; Chollet and Sandwidi, 2018) [14] [15]; stronger stakeholder trust (Benlemlih et al., 2018; Chollet and Sandwidi, 2018) [16][17]. By placing more emphasis on environmental protection, social and governance, firms can minimize the consequences of high stock price volatility risk.

Based on the above analysis, the research hypothesis is proposed that, other things being equal, good corporate ESG performance can reduce share price volatility.

3. Research Design

3.1. Sample Selection and Data Sources

This paper selects the data of A-share listed companies in Shanghai and Shenzhen from 2011 to 2021 as the research sample, and further screens the sample data: (1) excluding the sample data of financial industry considering the special characteristics of financial industry; (2) excluding the sample of enterprises in ST and *ST special trading status; (3) excluding the sample of uncompensable missing financial data; (4) excluding the outliers. Finally, 10,407 valid samples were retained. In addition, to eliminate the effect of extreme values, all continuous variables in the retained sample data are Winsorized at the upper and lower 1% percentile (Winsorize), and the research data are obtained from CSMAR database and WIND database. The statistical analysis of this paper was done based on Stata 16.0 software.

3.2. Definition of Variables

3.2.1. Explanatory Variable: Stock Price Volatility (VAR_ADJ)

In the existing literature, the variance or standard deviation of stock returns is a more accepted measure of stock price volatility in studies on firm-level stock price volatility. Therefore, drawing on the study by Qingquan Xin et al. (2014) [10], the stock return variance of company i in year t is used, and the monthly stock return variance is obtained by first calculating the market-adjusted daily individual stock return variance in that month and then multiplying it by the number of trading days in that month, and then calculating the average of each monthly stock return variance from May of year t to April of year t+1 and multiplying it by 100. a larger VAR_ADJ indicates higher stock volatility The larger the VAR_ADJ, the higher the stock volatility.

3.2.2. Explanatory variable: ESG performance

At this stage, there are two main approaches to measuring ESG performance: (1) establishing an indicator system around environment, social responsibility and corporate governance, but it is limited by the lack of uniform criteria for selecting indicators and is somewhat subjective. (2) Using rating data released by rating agencies. ESG rating agencies with high recognition by domestic scholars include Runling Global, Shangdao Rongreen, Hexun.com, etc., which have certain authority and influence.

In this paper, the ESG rating system of Huazheng is selected to construct the measurement indexes of ESG

performance of enterprises. Huazheng Index has developed a three-level ESG index evaluation system close to the Chinese market in accordance with the standards of international mainstream rating systems and combined with the development of Chinese enterprises, which has more depth and breadth. The ESG rating is divided into nine grades from low to high C to AAA, and the ESG rating is assigned a score of 1 to 9, and the quarterly average ESG rating is calculated to measure the annual ESG performance of enterprises.

3.2.3. Control Variables

Referring to previous studies (Xiaofang et al., 2021; Chengfei et al., 2018) [28] [26], control variables were set in four aspects: financial characteristics, corporate governance, secondary market performance, and risk indicators, respectively, and the variable definitions are detailed in Table 1. in addition, annual and industry effects were controlled for in this paper.

3.3. Model Setting

Drawing on the research methods and ideas of existing scholars, the following model is constructed for empirical testing based on the above theoretical analysis. To verify the effect of corporate ESG performance on stock price volatility, model (1) is constructed:

$$VAR_ADJ_{i,t} = \partial_0 + \partial_1 \mathrm{ESG}_{i,t} + \sum_{j=2}^{20} \partial_j \, control_{i,t} + \sum industry_i + \sum year_t + \delta_{i,t} \quad (1)$$

Table 1. Definition of variables

Variable Name	Variable Symbol	Variable Symbol
Stock price volatility	VAR_ADJ	See previous variable description
ESG Performance	ESG	Social and Governance Composite Score
Size	Size	Annual total assets as natural logarithm
Balance ratio	Lev	Total liabilities at year-end divided by total assets at year-end
Net profit margin on total assets	ROA	Net profit / average balance of total assets
Cashflow Ratio	Cashflow	Net Cash Flow from Operating Activities divided by Total Assets
Total asset turnover ratio	ATO	Operating income / average total assets
Operating income growth rate	Growth	Current year's operating income / Previous year's operating income
Shareholding ratio of the largest shareholder	Top1	Number of shares held by the largest shareholder/total number of shares
Indep	Indep	Independent directors divided by the number of directors
Number of directors	Board	Number of board of directors as natural logarithm
Dual	Dual	Chairman and General Manager are the same as 1, otherwise 0
FirmAge	FirmAge	ln (current year - year of establishment + 1)
Book-to-market ratio	BM	Book value/total market value
Nature of ownership	SOE	State-controlled enterprises take the value of 1, others are 0
Whether Big4	Big4	company is audited by Big4 (PwC, Deloitte, KPMG, Ernst & Young) is 1, otherwise is 0.
TobinQ	TobinQ	(Market value of outstanding shares + number of non-marketable shares x net assets per share + book value of liabilities)/total assets
P/E ratio	PE	Current closing price / (Net income for the current year / Paid-in capital for the current period end)
Net Price Ratio	PB	Current Closing Price Current Period Value / (Total Owners' Equity Ending Value / Paid-in Capital Current Period Ending Value)
Market capitalization size	CAP	Natural logarithm of market capitalization
Beta coefficient	Beta	regression equation is: Considering cash dividend reinvestment individual stock return = Considering cash dividend reinvestment market return, calculated using 48 months of data regression.

4. Empirical Results and Analysis

4.1. Descriptive Statistics

Table 2 reports the results of descriptive statistics of the main variables. Among them, the mean value of share price volatility is 1.129, the standard deviation is 0.76, the maximum value is 20.98, and the minimum value is 0.225, which indicates that there is a large gap in share price volatility among the companies. ESG performance of Chinese listed companies still has room for improvement. The results of the descriptive statistics of other control variables are consistent with existing studies.

Table 2. Descriptive statistics table

Variable	N	Mean	p50	SD	Min	Max
VAR_ADJ	10407	1.129	0.953	0.760	0.225	20.98
ESG	10407	4.231	4.250	1.000	1	6.250
Size	10407	22.71	22.58	1.183	19.96	25.67
Lev	10407	0.448	0.447	0.188	0.0515	0.848
ROA	10407	0.0570	0.0453	0.0463	0.00164	0.230
Cashflow	10407	0.0591	0.0561	0.0664	-0.138	0.248
ATO	10407	0.696	0.598	0.443	0.102	2.559
Growth	10407	0.206	0.128	0.384	-0.413	2.343
Top1	10407	0.340	0.321	0.147	0.0900	0.739
Indep	10407	0.372	0.333	0.0523	0.333	0.571
Board	10407	2.153	2.197	0.194	1.609	2.639
Dual	10407	0.240	0	0.427	0	1
FirmAge	10407	2.937	2.996	0.285	1.792	3.497
BM	10407	1.168	0.776	1.156	0.0954	6.100
SOE	10407	0.396	0	0.489	0	1
Big4	10407	0.0637	0	0.244	0	1
TobinQ	10407	2.047	1.609	1.289	0.871	8.144
PE	10407	68.54	31.25	128.0	5.798	966.1
PB	10407	3.162	2.456	2.462	0.630	15.76
CAP	10407	23.28	23.14	1.024	20.72	25.94
Beta	10407	0.563	0.859	0.471	0	1

4.2. Correlation Test

The correlation tests of the main variables show that the Pearson correlation coefficient and Spearman correlation coefficient of ESG performance and share price volatility are both -0.1, and both are significantly negatively correlated at the 10% level, which initially indicates that corporate ESG performance can influence corporate share price volatility. In addition, the correlation between the variables is overwhelmingly less than 0.5, and the preliminary judgment is that there is no multicollinearity in the model, and the correlation results are not presented due to the limitation of space.

4.3. Regression Analysis

Table 3. ESG performance and stock price volatility regression results

	(1)	(2)	(3)	(4)
	OLS	Fe	One period behind	Two period lags
ESG	-0.063***	-0.067***		
	(-6.79)	(-5.15)		
LESG			-0.045***	
			(-4.24)	
L2ESG				-0.048***
				(-4.19)
Size	-0.736***	-1.057***	-0.999***	-0.951***
	(-6.23)	(-11.66)	(-13.63)	(-12.43)
Lev	0.107***	0.128***	0.111***	0.144***
	(6.69)	(5.64)	(7.09)	(8.04)
ROA	-0.054***	0.000	-0.083***	-0.068***
	(-3.42)	(0.01)	(-4.82)	(-3.55)
Cashflow	0.022*	0.044***	0.015	0.026**
	(1.89)	(4.03)	(1.33)	(2.07)
ATO	-0.020**	-0.098***	-0.010	-0.002
	(-2.32)	(-4.62)	(-1.01)	(-0.17)
Growth	0.091***	0.057***	0.087***	0.078***
	(8.24)	(6.26)	(8.69)	(6.77)
Top1	-0.004	0.009	-0.006	-0.003
	(-0.39)	(0.42)	(-0.64)	(-0.32)
Indep	-0.006	0.000	-0.025**	-0.025**
	(-0.69)	(0.01)	(-2.52)	(-2.22)
Board	-0.015	-0.010	-0.039***	-0.036***
	(-1.14)	(-0.52)	(-3.60)	(-3.00)
Dual	-0.003	0.007	-0.010	-0.010
	(-0.32)	(0.54)	(-1.03)	(-0.98)
FirmAge	0.011	0.117**	0.019**	0.010
	(1.25)	(2.02)	(2.01)	(0.92)
BM	0.009	-0.077***	0.006	-0.002
	(0.56)	(-3.84)	(0.34)	(-0.10)
SOE	-0.008	-0.061*	-0.012	-0.015
	(-0.72)	(-1.89)	(-1.20)	(-1.28)
Big4	-0.014**	0.001	-0.026***	-0.027***
	(-2.16)	(0.04)	(-3.09)	(-2.85)
TobinQ	-0.191***	-0.194***	-0.273***	-0.251***
	(-4.14)	(-4.91)	(-6.56)	(-5.15)
PE	0.031***	0.026**	0.026**	0.046***
	(3.36)	(2.45)	(2.29)	(3.67)
PB	0.215***	0.231***	0.214***	0.187***
	(7.41)	(8.16)	(6.96)	(4.84)
CAP	0.572***	0.796***	0.836***	0.787***
	(5.54)	(10.31)	(12.63)	(11.27)
beta	0.089***	0.030***	0.087***	0.082***
	(8.26)	(2.62)	(7.89)	(6.76)
year	Yes	Yes	Yes	Yes
industry	Yes	Yes	Yes	Yes
N	10407	10407	7289	5938
adj. R^2	0.412	0.254	0.455	0.431

Table 3 shows the regressions using ordinary least squares (OLS), fixed effects based on panel data, lagged one period and lagged two periods, respectively. Among them, OLS based can be derived that the regression coefficient of ESG is -0.063, which is significantly negatively correlated at 1% level and the hypothesis is verified. Column (2) panel-based fixed effects results show a regression coefficient of -0.067 for ESG, which is significantly negatively correlated at the 1% level, and the conclusion remains unchanged. Considering the delayed nature of ESG performance, i.e., ESG performance in the previous period may have an impact on stock price volatility in the current or next period, the explanatory variables are lagged one and two periods for regression, and the results are presented in columns (3) and (4), and the ESG regression coefficient remains significantly negative at the 1% level, and the conclusion remains unchanged. The test results support the idea that corporate ESG performance has a dampening effect on stock price volatility.

4.4. Endogeneity Test

4.4.1. Propensity Score Matching Method (PSM)

Table 4. PSM average treatment effects

Variable	Sample	Treated	Controls	Difference	S. E	T-stat
VAR_ADJ	Unmatched	1.051	1.201	-0.150	0.015	-10.12
	ATT	1.051	1.130	-0.079	0.016	-4.81
	ATU	1.199	1.148	-0.051		
	ATE			-0.064		

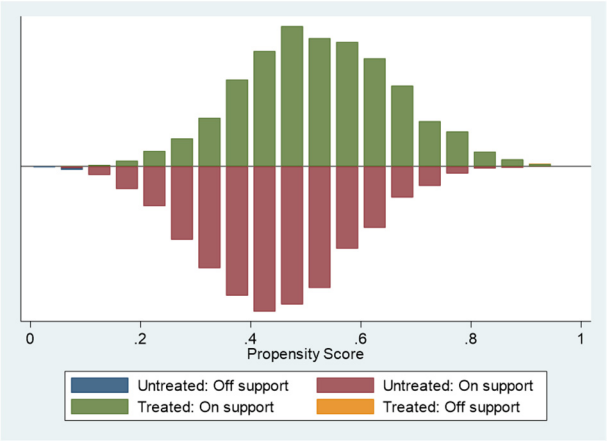

Figure 1. PSM common range of values

Drawing on Xiaofang et al. (2021), propensity score matching (PSM) was used to reduce the interference of sample firms' selection bias on the study findings by selecting the previous control variables as matching variables and constructing the experimental and control groups for nuclear matching by using the annual industry mean of ESG performance as the critical variable to obtain subsamples for regression according to the model. Table 4 shows that the matched mean treatment effect ATT corresponds to a t-value of -10.12, which is significantly negative at the 1% level. Column (1) of Table 5 shows the PSM subsample regression results, indicating that corporate ESG performance can dampen stock price volatility, strongly supporting the hypothesis of this paper. Figure 1 shows the common range of values for PSM matching, indicating that the matching results are relatively good. The regression results are presented in columns (3) and (4), and the ESG regression coefficients are still significantly negative at the 1% level, and the findings remain unchanged. The test results support the idea that corporate ESG performance has a dampening effect on stock price volatility.

4.4.2. Two-stage Least Squares (2SLS)

To mitigate the reverse causality and the bias caused by unobserved factors on the baseline regression results, drawing on He Feng et al (2022) [18], the intensity of Confucian culture at the municipal level in the company's location was selected, and the number of Confucian temples was used as a proxy variable for the intensity of Confucian culture, while the product of its product with the annual ESG mean (ESG_m_ conf) as an instrumental variable. Because institutional and cultural factors at the national level are determinants of corporate ESG performance, traditional culture and moral values developed historically affect ESG performance, while Confucianism, a highly influential school of thought, is a long-accepted moral standard, yet does not have a direct impact on corporate share price volatility. And the instrumental variables in this paper pass the weak instrumental variables test, the instrumental variables are selected more effectively.

Table 5. Results of PSM and 2SLS endogeneity tests

Variable	(1)	(2)	(3)
	VAR_ADJ	ESG	VAR_ADJ
ESG	-0.042***		-0.064**
	(-5.36)		(-2.11)
ESG_m_conf		0.241***	
		(30.44)	
controls	Yes	Yes	Yes
Year/ industry	Yes	Yes	Yes
N	10407	10406.000	10406.000
adj. R^2	0.410	0.211	0.412
F		152.488	168.916

4.5. Robustness Test

4.5.1. Replacing the Explanatory Variables

Drawing on the study of Qingquan Xin et al. (2014) [10], the annual variance of individual stock returns (VAR_ RAW) calculated according to the original returns of individual stocks is used as a robustness test by replacing the dependent variable and re-regressing the model, as shown in column (1) of Table 6, and the results are consistent with the previous paper.

4.5.2. Replacement of Regression Method

Since the data in the dependent variable stock price volatility indicators in this paper are all greater than 0, the model is regressed again using the truncated tail regression model (Tobit regression), and the regression results are shown in column (2) of Table 6, and the ESG performance coefficient is -0.063, which is significant at the 1% level, consistent with the previous results.

4.5.3. Adjusting the Sample Period

Table 6. Robustness tests

Variable	(1) Substitution of dependent variable	(2) Tobit	(3) Deleted 2020
ESG	-0.037***	-0.063***	-0.062***
	(-5.68)	(-7.68)	(-6.35)
controls	Yes	Yes	Yes
Year/ industry	Yes	Yes	Yes
N	10407	10407	9361
adj. R^2	0.696		0.417

In order to exclude the influence of such special events on the results, the paper excludes the 2020 sample during the sample window period and re-regresses the outbreak of the new crown epidemic in early 2020. The regression results are shown in column (3) of Table 6, and the results are consistent with the previous paper and more robust.

5. Further Analysis

5.1. Influence Mechanism

5.1.1. Analysts' Attention

To a certain extent, ESG performance conveys the concept that enterprises pursue the harmonious development of economic and social effects, and good ESG performance will attract attention and tracking to reduce information asymmetry and thus reduce stock price volatility. Therefore, this section introduces analyst tracking as a mediating variable to examine the path of the transmission mechanism of "ESG performance-analyst attention-share price volatility". The regression is conducted by using the mediating effect model of Zonglin Wen (2014) [19]. Drawing on Chin-Yuan Chen et al. (2017) [20], the number of analysts tracked plus one is taken as a logarithm as a measure of analyst attention. Model (1) is first used to test the effect of ESG performance on stock price volatility; then model (2) is used to test the (Analyst) effect of ESG performance on analyst tracking, and then the mediating effect of analyst tracking is combined with the previous theory and model (3). Column (2) of Table 7 shows that the coefficient of corporate ESG performance is significantly positive at the 1% level, indicating that good ESG performance can increase analyst attention and thus reduce stock price volatility.

$$Analyst_{i,t}/Fame_{i,t} = \lambda_0 + \lambda_1 ESG_{i,t} + \sum_{j=2}^{20} \lambda_j \, control_{i,t} + \sum industry_i + \sum year_t + v_{i,t} \quad (2)$$

$$VAR_ADJ_{i,t} = h_0 + h_1 \mathrm{ESG}_{i,t} + h_2 \mathrm{Analyst}_{i,t}/\mathrm{Fame}_{i,t} + \sum_{j=3}^{21} h_j \, control_{i,t} + \sum industry_i + \sum year_t + \tau_{i,t} \quad (3)$$

5.1.2. Corporate Reputation

Table 7. Results of impact mechanism test

	(1)	(2)	(3)	(4)	(5)
Variable	**VAR_ADJ**	**Analyst**	**Fame**	**VAR_ADJ**	**VAR_ADJ**
ESG	-0.063***	0.087***	0.032***	-0.057***	-0.060***
	(-6.79)	(11.02)	(5.65)	(-6.14)	(-6.60)
Analyst				-0.071***	
				(-6.07)	
Fame					-0.076***
					(-5.08)
controls	Yes	Yes	Yes	Yes	Yes
Year/industry	Yes	Yes	Yes	Yes	Yes
N	10407	10407	10407	10407	10407
adj. R2	0.412	0.467	0.729	0.414	0.413

To examine whether firms will use ESG performance to enhance corporate reputation and thus reduce stock price volatility. In this paper, referring to the study of Kaolei Guan and Rui Zhang (2019) [21], corporate reputation is measured by constructing a reputation evaluation system, and 12 corporate reputation evaluation indicators are selected after considering the evaluation of corporate reputation by various stakeholders, and the corporate reputation score is calculated by using the factor score method, and divided into ten groups according to the score, and each group is assigned a value from 1 to 10 in turn. column (3) of table 7 shows that corporate ESG performance will accumulate reputation capital and reduce evaluation risk, when the accumulated reputation will play an insurance role and reduce stock price volatility, and column (5) shows that corporate reputation has a partial mediating effect.

5.2. Heterogeneity Test

The previous section has verified the mediating path of corporate ESG performance affecting stock price volatility, but considering that the relationship between corporate ESG performance and stock price volatility may differ depending on external investor sentiment, the role of investor sentiment needs to be further investigated.

Investors are important observers and users of information (Brown et al., 2012) [22], and differences in their ability to receive and analyze information can affect corporate ESG performance, and since most investors retain a strong speculative mentality and do not have professional investment skills and abilities, they can show significant emotionality, and can have high or low emotional changes depending on the market environment, affecting their own rational judgment (Baker and Wurgler, 2006) [23]. Under the influence of investor sentiment, investors will be more sensitive to information about ESG performance in the stock market (Xu Ruiqian et al., 2020) [24], and many listed companies will allocate assets based on investor sentiment, and managers will revise their psychological expectations and subjective judgments according to investor sentiment and adjust their investment behavior accordingly, and investor sentiment has a positive impact on corporate investment behavior (Hua Guiru et al., 2011) [25]. (Hua Guiru et al., 2011) [25], which makes firms pay more attention to ESG management and investment philosophy and enhance ESG performance. Investor sentiment also forces firms to review their risk elements, which is one of the drivers of ESG performance enhancement. In addition, the "reassurance" effect of ESG performance becomes more evident when investor sentiment is high, building trust with the company and reducing share price volatility. Thus, investor sentiment reinforces the negative relationship between ESG performance and share price volatility of listed companies.

In order to study the moderating effect of investor sentiment, model (4) is constructed by adding an explanatory variable SentimentA to model (1) and introducing the cross-product term of ESG and investor sentiment (ESG_Sen):

$$VAR_ADJ_{i,t} = \beta_0 + \beta_1 ESG_{i,t} + \beta_2 SentimentA_{i,t} + \beta_3 ESG_{i,t} \times SentimentA_{i,t} + \sum_{j=4}^{22} \beta_j \, control_{i,t} + \sum industry_i + \sum year_t + \lambda_{i,t}$$

Table 8. Moderating effects of investor sentiment

	(1)	(2)	(3)
Variable	**Cross multiplier**	**High investor sentiment**	**Low investor sentiment**
ESG	-0.061***	-0.056***	-0.066***
	(-7.31)	(-3.83)	(-5.31)
SentimentA	0.141***		
	(4.18)		
ESG_Sen	-0.073**		
	(-2.33)		
controls	Yes	Yes	Yes
Year/ industry	Yes	Yes	Yes
N	10407	3996	6411
adj. R^2	0.413	0.444	0.383

6. Conclusion and Recommendations

This paper examines the relationship between corporate ESG performance and stock price volatility and the mechanism of effect using the data of A-share listed companies in Shanghai and Shenzhen from 2011 to 2021. The empirical results show that: (1) Corporate ESG performance can significantly reduce stock price volatility, and this finding remains robust after controlling for sample selection bias, changing the measurement of main variables, and changing the empirical model. (2) Mechanistic tests suggest that analyst attention and corporate reputation are potential mechanisms of influence between ESG performance and stock price volatility. (3) Investor sentiment contributes to the reduction of stock price volatility by ESG performance.

The above findings have important implications for how to reduce stock price volatility and promote the smooth operation of stock prices. First of all, in the context of actively promoting "carbon neutrality and carbon peaking", ESG performance has become an important indicator to measure the social responsibility, sustainable development and corporate governance of listed companies. Therefore, companies should take active measures to improve ESG management and enhance ESG performance, and disclose ESG information in a timely and accurate manner to strengthen their competitiveness. Secondly, from the perspective of investors, non-financial risks such as corporate ethics and environment have become important risks that cannot be ignored in investment, and stepping on mines can be effectively avoided by examining the negative elimination method of ESG performance and analyst concerns. In addition, investors should also strengthen their own learning, invest rationally, try to avoid bad emotions, refuse to blindly follow the trend of investment, and reasonably control investment returns and risks. For the relevant regulatory authorities, they should further improve the information disclosure system to minimize the investment risks brought by emotions and guide investors to invest rationally.

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