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The Impact Of ESG Performance On Corporate Share Price Volatility

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Abstract:
Background*: The Communist Party of China's 20th National Congress report emphasized the need to forge a Chinese pathway toward modernization that fosters harmonious coexistence between humanity and nature. To achieve this, expediting the green transformation of our development model and advancing carbon peaking and neutrality with vigor and prudence is imperative. ESG, an emerging paradigm of development, resonates with China's green, low-carbon principles and sustainable development directives. Investors increasingly utilize corporate ESG performance as a pivotal criterion in their investment strategies. The relationship between ESG advancement and the capital market, and how to leverage ESG principles to bolster China's market development, has emerged as a focal point for the development of ESG in China.*
Materials and Methods*: The paper undertakes research hypotheses and examines A-share listed companies spanning from 2013 to 2022. It undertakes a range of analyses, including two-way fixed effects models, endogeneity checks, robustness assessments, and heterogeneity explorations.*
Results*: The empirical findings reveal that: (1) Strong ESG performance markedly decreases a company's stock price volatility. (2) State-owned enterprises, as opposed to non-state-owned ones, exhibit a more pronounced impact on reducing stock price volatility through superior ESG performance. (3) Large-scale enterprises, compared to small-scale ones, demonstrate a more significant effect on mitigating stock price volatility through commendable ESG performance.*
Conclusion: *In conclusion, this paper offers the following recommendations from the viewpoints of government, enterprises, and investors: firstly, the government should enhance information disclosure and refine the ESG rating system. Secondly, enterprises must bolster their ESG principles, augment investments, and refine internal governance mechanisms. Thirdly, investors should prioritize a company's social benefits, cherish sustainable development, incorporate ESG principles, and diminish the volatility and systemic risks associated with their investment portfolios.*
Key Word: *ESG performance; Stock price volatility; Social responsibility; Two-way fixation.*

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I. Introduction

As the world continues to deepen the concept of sustainability and global warming intensifies, investors and corporate stakeholders are increasingly focusing on a number of areas, including environmental, social and governmental governance, and are using ESG as a standard for measuring corporate sustainability as a means of realizing the goal of sustainable development. The three dimensions of environment, social responsibility and corporate governance together constitute the ESG system, which is a standard system for evaluating corporate sustainable development. Meanwhile, as a non-financial performance indicator, ESG disclosure can effectively alleviate the information asymmetry between internal and external enterprises, thus facilitating investors to make more accurate investment decisions. As China's economy transforms from high-speed development to high-quality development, increasingly severe environmental problems have threatened the stability of China's economy and society. Since 2003, China has made significant progress in the ESG field, demonstrating a commitment to environmental protection and social responsibility at the policy level, as well as achieving important results in reforming its corporate governance structure. For example, in September 2018, the China Securities Regulatory Commission (CSRC) issued the Code of Governance for Listed Companies, which incorporates the emerging development concept of ESG; and in April 2022, the CSRC explicitly included "corporate environmental, social and governance-related information" in the Guidelines for the Management of Investor Relations of Listed Companies" in the Guidelines on Investor Relations Management for Listed Companies [1].

In terms of the scale of development, in recent years, China's rapid development of the capital market, ESG investment still continues a relatively strong development trend, major financial institutions have joined the ESG market to seize the war, has launched the index products with ESG as the underlying, the stock market share price volatility is the inevitable result of market development. The main reason for stock price volatility is information asymmetry, which is easy to produce bias in investment decision-making, leading to sharp fluctuations in stock prices, and the disclosure of corporate ESG reports effectively reduces the information asymmetry between the two.

In terms of research significance, as a relatively mature concept, stock price volatility has been widely used by scholars as a key indicator of capital market stability. Most of the current domestic and international literature focuses on the study of the ratio of upward and downward stock price fluctuations as well as the study of ESG on corporate value, corporate performance and transparency of accounting information, etc., and there is little literature linking ESG performance with stock price volatility to study the issue of the degree of risk impact therein. Therefore, this paper explores the impact of ESG performance on stock price volatility in the stock market, conducts endogeneity tests and robustness tests, and further investigates the impact of ESG performance on stock price volatility of firms with different property rights and different sizes through heterogeneity analysis, which enriches the relevant literature.

The practical significance is also an aspect that cannot be ignored. First of all, due to the impact of the international environmental turbulence and the defects of domestic regulatory mechanism, the share price of China's A-share market will be subject to substantial fluctuation phenomenon, and a large number of investors may face huge property losses, which will have an adverse impact on the whole market. By studying the relationship between ESG performance and corporate stock price volatility, we can optimize investors' investment decisions and increase the stability of the financial market. Secondly, as ESG investment started late in China, various regulations are not perfect and there is no uniform standard, which helps the government to develop ESG disclosure standards and improve ESG disclosure system to maintain the stability of stock price. Finally, from the perspective of ESG performance, it verifies the reduction effect of ESG performance on the volatility of corporate stock prices, provides relevant references for the development of ESG in China's capital market, and provides some references and suggestions for corporate managers, investors and regulators.

In this article, we employed two research methods:

Literature analysis method: that is, by reading a lot of literature, relying on literature to find, research, summarize and analyze domestic and foreign literature related to ESG performance and corporate stock price volatility, and summarize the current status of research on both. Based on previous studies, this paper systematically combs the path of ESG performance on corporate stock price volatility, puts forward the three hypotheses that ESG performance reduces corporate stock price volatility, state-owned enterprises' stock price volatility is more significantly affected by ESG performance, and the stock price volatility of large corporations is significantly affected by ESG performance, and carries out further research.

Empirical analysis method: This paper selected a sample of A-share non-financial listed companies from 2013 to 2022, and examined the impact of ESG performance on the volatility of companies' stock prices by designing variables and building models. Through a two-way fixed-effects model, individual and time fixed effects are added to reduce the impact of omitted variable bias. Robustness tests are also conducted to avoid endogeneity problems as well as variable bias. Finally, a heterogeneity analysis is conducted in terms of the nature of ownership and firm size to test the different effects of ESG performance on stock price volatility under state-owned and non-state-owned firms as well as large-scale and small-scale firms.

This paper is innovative in three main ways:

(1) Innovation of research method. Through the reading of previous literature, it is found that few scholars have studied the volatility of corporate stock prices by measuring the impact mechanism through the CSI ESG composite scores, and most of them carry out the impact generated by innovation as well as efficiency.

(2) Innovation in research data. Most of the previous literature adopts data years that are forward in time, which cannot accurately analyze the impact effect in the current situation. This paper selects data from 2013-2022, which has a certain timeliness, and complements the literature on ESG performance and corporate stock price volatility accordingly.

(3) In this paper, on the basis of researching the effect of issuing ESG performance on corporate stock price volatility, it also further analyzes the differences in the impact between the two under different enterprise sizes and different property rights properties, which also complements and improves the related research on the impact of ESG performance on corporate stock price volatility.

II. Literature Review

Research on ESG performance

ESG measures the comprehensive performance of an enterprise in all aspects other than financial indicators. With the country's emphasis on environmental issues, various stakeholders have begun to pay attention to the ESG performance of enterprises, and related studies have gradually increased. In corporate value-related studies, Miralles-Quiros et al. (2018) take Brazilian listed companies as a research sample and find that companies actively practicing ESG concepts and improving the fulfillment of their ESG responsibilities do not harm the interests of shareholders, but rather increase the value of the company.Gillan et al. (2010) find that corporate ESG performance has a positive impact, and companies adopting stronger ESG policies also have higher operating efficiency and valuation than their peers[2].Dimson (2015) found that ESG performance of listed companies can significantly contribute to their progress, which may be attributed to the fact that ESG-performing companies can relatively gain advantages in financing and enhance their corporate value through lower financing costs[3].

Domestically, Wang Bo et al. (2022) examined the environment of enterprises with China's A-share listed companies from 2015-2019 as a research sample, and the results showed that ESG performance reduces the financial burden of enterprises by reducing the cost of financing and enhancing market attention, which in turn improves the market value of the enterprises[4]. Wang Shuangjin et al. (2022) used industrial enterprises as a research sample and found that there is an impact relationship between industrial enterprises' active ESG responsibility and financial performance, and this impact shows a U-shaped nonlinear relationship.

Studies on the factors of stock price volatility

Stock price volatility is an important measure of the magnitude and uncertainty of stock price movements, which reflects the market's expectations about the future profitability and risk of a particular firm.Andreas (2019) found that the formulation and dynamic adjustment of national monetary policy can have a significant impact on the volatility of stock prices[5]. Park & Shin (2013) study explored whether there is a correlation between different types of of companies and whether there is a correlation between their financial indicators and their stock prices and found through empirical analysis that among all the companies' financial indicators, profitability indicators have the most significant impact on stock prices[6]. Bernanke and Kuntner (2005) argued that monetary policy is closely related to stock price volatility but monetary policy is only partly responsible for the volatility of stock prices[7].

Based on the perspective of investors' heterogeneous expectations, domestic scholar Wen Xingchun (2017) found that sustained monetary policy can affect stock price volatility by significantly changing investor sentiment[8]. According to Jiang H. et al. (2010), there is a negative correlation between the effectiveness of firms' micro-regulatory mechanisms and stock price volatility. Specifically, firms with good micro-control mechanisms are able to reflect more idiosyncratic information in their stock prices, which in turn enhances investment value and helps to reduce stock price volatility.

Research on ESG performance on stock price volatility

According to Barney (1991), the reason why corporate resources have a lasting competitive advantage is that they are scarce and difficult to replicate.Social and environmental responsibility in ESG, as a scarce, unrepeatable, and incompletely imitated resource, the social and environmental responsibility performed by the company allows the company to gain a unique competitive advantage[9]. Surehsa (2015) found that stock price volatility is mainly due to the concealment or fabrication of some companies' own information published externally, which leads to information asymmetry between internal and external investors, thus causing stock price volatility[10].

Domestic scholars Liu Hui-Hong (2023) selected A-share listed companies from 2012-2021 as a sample to study the impact of corporate ESG performance on stock price volatility. The study found that corporate ESG performance has a significant inhibitory effect on corporate stock price volatility, and innovation efficiency mediates between corporate ESG performance and corporate stock price volatility[11]. Enterprises actively fulfilling ESG responsibilities can obtain investors' favor and more reputational advantages, which in turn can obtain more funds to enhance resource advantages to increase innovation investment (Wang Zhi and Peng Baichuan, 2022), promoting the improvement of corporate innovation ability, thus reducing the risk of stock price volatility[12]. Cheng Xin et al. (2018) showed that the participation of institutional investors plays a supervisory role for listed companies and can improve the company's information environment, thus greatly improving the transparency of the company's information and reducing the volatility of the stock price[13].

Literature review

Combining the existing relevant literature at home and abroad, it can be seen that compared with foreign countries, China's ESG evaluation system is in its infancy, but in recent years, China's ESG practice has been steadily moving forward, and both the number of ESG disclosures and the degree of diversification are becoming more and more mature. However, for the literature research, most of the studies on ESG by domestic scholars focus on the relationship between ESG disclosure, firm performance and enterprise value. This paper chooses to explore the impact of ESG ratings on stock prices from the perspective of volatility, combines the existing literature to explore the intrinsic connection between ESG ratings and stock price volatility, and further explores its role mechanism to improve the research on the impact between ESG ratings and stock price volatility, and to provide a theoretical basis for the institutional development of China's capital market.

III. Theoretical Analysis And Hypothesis Development

Stakeholder theory

Freeman states, "All those individuals and groups who can act in the process of achieving the organization's goals, or who are affected by the organization's pursuit of its goals, can be considered stakeholders."[14] This definition reveals the bi-directional nature of the relationship between business and stakeholders, i.e., there is mutual influence on each other. The gist of stakeholder theory is that the firm will be viewed as a multilateral contractual network jointly constructed by all stakeholders who are the main constituents of that contractual network. They are closely linked to the company's interests through their contributions and unique resources, and thus have the right to negotiate with the company on an equal footing to ensure that their interests are properly and effectively safeguarded. In addition, stakeholders bear the costs of the company's operations and take over the responsibility for the company's operations while fulfilling their supervisory role.

The disclosure of ESG information by enterprises can effectively serve all stakeholders, and it is also an important channel for the display of non-financial information of enterprises, which allows stakeholders to see other development values in addition to the profitability of enterprises. The disclosure of ESG information can show the efforts made by enterprises in environmental protection, and at the same time, it can also force these enterprises to make a green transformation, which is conducive to the long-term development of the enterprise and enhances the value of the enterprise. Similarly, the ESG information disclosed by enterprises in the social responsibility and corporate governance-related information, to optimize resource allocation, strengthen internal supervision and management has a certain role in promoting, so as to reduce the potential risks of enterprises, reduce the volatility of stock prices.

Information asymmetry theory

The theory of information asymmetry emphasizes that investors are at a disadvantage in terms of information acquisition, and that individuals with more information are in an advantageous position, such as listed companies. This information asymmetry may result in information occlusion, leading to a weak information flow, resulting in economic activities in which the information obtained by each subject of interest from various sources is not fully consistent. In the transaction process, the seller has more comprehensive information relative to the buyer and profits more. Investors, as buyers, can only analyze the business level and development potential of the enterprise through the financial information disclosed by the enterprise, and the valuation of the enterprise will often produce erroneous judgments, and it is easy to make irrational investment decisions, which in turn affects the volatility of the stock price.

The ESG performance of a company is comprehensively assessed through the integrated consideration of the three dimensions to provide investors with a deeper insight into the real situation of the company. Through in-depth analysis of corporate environmental responsibility, social contribution and corporate governance level, it can effectively reduce the information asymmetry between enterprises and investors, reduce irrational decisions made by investors due to insufficient information, and help investors make more accurate predictions on the company's future strategic planning, thus achieving the purpose of curbing the risk of stock price volatility.

Hypothesis development

With the growing concern for sustainable development in all sectors of society, actively fulfilling environmental, social and corporate governance responsibilities helps to build good relationships with stakeholders. Investors who adhere to the concept of value investing are more inclined to focus on companies that do better in ESG. These investors are more concerned about the sustainable development prospects of enterprises, and believe that companies with excellent ESG performance usually have a high potential for sustainable development. ESG information can reduce the volatility of stock prices caused by the impact of external information, mainly because it mitigates the asymmetry of internal and external information, and based on the ratings, investors can make horizontal and vertical comparisons, so that on the one hand, they can understand the changes in the performance of the enterprise's own ESG performance, and on the other hand, they can make a comparison with companies that do not have good ESG performance. On the one hand, investors can understand the change of the enterprise's own ESG performance, and on the other hand, they can compare the ESG performance of different enterprises, which can help investors make more rational investment decisions, so that the enterprise's stock price can better reflect its true intrinsic value and curb the volatility of the stock price. Enterprises actively undertake social responsibility, enhance environmental awareness, can

effectively enhance corporate reputation, establish a good image, and improve the competitiveness of enterprises in the market. Based on the above analysis, this paper proposes research hypothesis H1:
H1: Good ESG performance significantly reduces firms' stock price volatility.

Enterprises in China can be divided into two categories, State-owned enterprises and non-State-owned enterprises, depending on the nature of the actual controller. Non-state-owned enterprises, in view of their private property rights, tend to put the pursuit of maximizing economic benefits at the forefront of their business practices, thus paying less attention to the possible negative impact on society and the environment in their business activities. At the same time, in addition to the lack of uniform market standards and certification systems, non-state-owned enterprises may lack the necessary policy support and market incentives, and face more severe challenges due to the limitations of credit ratings, enterprise size and market acceptance, among other factors. In contrast, SOEs have strong political connections with the government and need to fulfill their social responsibilities at the national level, and their ESG compliance behavior is often policy-oriented and mandatory. This means that the ESG practices and performance of SOEs are more likely to be influenced and guided by government policies, and thus are more standardized and systematic in their implementation, which helps to reduce the market's uncertainty about the future cash flows and risks of SOEs, and thus reduces the volatility of their share prices. In addition, SOEs tend to have better internal management and governance structures, and good ESG performance reflects the improvement of their internal management and governance capabilities. This improvement helps enterprises to cope with external risks and uncertainties more effectively and reduce the volatility of their operations. Based on the above analysis, this paper proposes research hypothesis H2:
H2: Good ESG performance of SOEs is more effective in reducing share price volatility than that of non-SOEs.

There are significant differences in the size of enterprises in China, and investors often prefer to invest in large-scale enterprises that can more easily gain the trust and reputation of the market, while small-scale enterprises may have difficulty in attracting sufficient investor attention and capital injection. In addition, small-scale enterprises may encounter more difficulties in terms of risk control and environmental efficiency, making it difficult for them to meet the strict requirements of the market and regulation. Large-scale companies usually have better disclosure mechanisms and higher transparency. Good ESG performance requires detailed disclosure of environmental, social and governance information, and this increased transparency can help reduce information asymmetry and share price volatility. And large-scale companies typically have more resources and capabilities to cope with external changes and challenges, including environmental and social issues. This enables them to better implement ESG strategies and reduce the impact of these issues on share price volatility. Coupled with the fact that it is easier for them to obtain policy and regulatory support, which may include tax incentives, subsidies, etc., it helps to reduce the operating costs and risks of the firms. Based on the above analysis, this paper proposes research hypothesis H3:
H3: Good ESG performance of large-scale firms is more effective in reducing stock price volatility than that of small-scale firms.

IV. Data

Sample selection and data sources

In this paper, A-share listed companies during the period of 2013-2022 are selected as the initial sample of the study, and the sample excludes the trading data of ST and *ST stocks as well as the data of financial listed companies, and truncates the data according to the ratio of 1% to exclude those data samples that lack completeness and continuity, so as to avoid the impact of data extremes on the overall results of the study. After processing, this paper finally obtained a complete dataset with a total of 12,959 sample data. The data in this paper comes from CSMAR database and Wind database, which guarantees the authority and reliability of the data.

Selection of variables

The explanatory variable is stock price volatility (VAR_ADJ). var_adj_it represents the variance of firm i's stock price return in year t, which is calculated by taking the average of the variance of the monthly stock returns (and then multiplying it by 100) for the period from May of year t to April of year t+1. Here, the monthly stock return variance is based on the variance of daily individual stock returns (market-adjusted) during the month, multiplied by the actual number of trading days in the month. larger values of VAR_ADJ_it imply correspondingly higher stock price volatility. By excluding the effect of overall market returns, VAR_ADJ_it is able to more accurately portray the unique risk characteristics of individual stocks, i.e., the heterogeneous volatility in individual stock returns. In view of this, this paper decides to adopt VAR_ADJ as the core indicator of firms' stock price volatility.

The explanatory variable is ESG performance (ESG). Given the actual situation of rating coverage and data acquisition, this study decides to adopt the CSI ESG rating to quantify the ESG performance of enterprises. This rating system is closely aligned with the actual situation of ESG disclosure in the A-share market, excludes data indicators that are inconsistent with the current development in China and difficult to obtain, and implements ESG evaluation through the industry-weighted average method. The rating results are categorized into nine grades, in descending order, C, CC, CCC, B, BB, BBB, A, AA, AAA, and these grades are assigned a value from 1 to 9. Given that the CSI ESG ratings are updated on a quarterly basis, this study chooses the scores of the ESG composite ratings as the core indicators for evaluating the ESG performance of companies.

The control variables include firm size (size), return on total assets (ROA), firm age (age), and current ratio (Fratio).

Table no 1: Description of variables.

Variable type	variable name	variable symbol	Description of variables
explanatory variable	stock price fluctuation	VAR_ADJ	Stock price return variance
explanatory variable	ESG performance	ESG	Environmental, social and governance composite score
control variable	Enterprise size	size	Natural logarithm of total assets
	Age of business	age	(current year - year of listing) taken as a logarithmic number
	return on total assets	ROA	Net profit/total assets
	current ratio	Fratio	Current assets/current liabilities

Modeling

In order to explore the association between ESG performance and firms' stock price volatility, and to fully take into account the unique non-temporal individual characteristics of firms as well as the non-individual temporal characteristics specific to each year, this paper introduces a two-way fixed-effects model to circumvent the endogeneity problem that may be caused by omitted variables. The following is about the specific design of the model: $VAR\_ADJit=\alpha0+\alpha1ESGit+ \alpha2\sum Controlsit+ \lambda i+\mu t+ \varepsilon it$

This formula, subscripts i and t represent sample firms and time years, respectively. In particular, the explanatory variable VAR_ADJ is the firm's stock price return variance; the explanatory variable ESG is the firm's composite ESG score; Control is the relevant control variable, which is described in detail in Table no 1; λ denotes the individual fixed effect; μ denotes the year fixed effect; and ε is the random error term. This paper focuses on the coefficient of the core explanatory variable ESG, α1. If α1 is significantly negative, it indicates that ESG performance has a significant reduction effect on firms' stock price volatility.

V. Empirical Results

Descriptive statistics

Table no 2 demonstrates the descriptive statistics of the main variables. As can be seen from the table, firstly observing the explanatory variables, the maximum value of share price volatility (VAR_ADJ) is 80.43, the minimum value is 0.168, the mean is 1.360 and the standard deviation is 3.234, which indicates that the firms in the sample data have a high level of volatility in their share prices. The maximum value of the explanatory variable ESG performance (ESG) is 8, the minimum value is 1, the mean is 4.136, and the standard deviation is 1.123, which indicates that there is a significant difference between the ESG performance of different firms. The maximum value of firm size is 28.64, the minimum value is 17.63, the mean value is 22.80, and the standard deviation is 1.452, which indicates that the overall size of the firms in the sample data is on the large side. The maximum value of enterprise age (age) is 4.060, the minimum value is 0, the mean value is 3.318, the standard deviation is 0.210, indicating that the overall age of enterprises in the sample data. The maximum value of current ratio (Fratio) is 68.97, the minimum value is 0.0278, the mean value is 1.919, and the standard deviation is 2.128, indicating that the current ratio of enterprises in the sample data is poor.

Table no 2: Descriptive Statistics.

Variable	N	Mean	Min	Max.	SD
VAR ADJ	12959	1.360	0.168	80.43	3.234
ESG	12959	4.136	1	8	1.123
size	12959	22.80	17.64	28.64	1.452
Fratio	12959	1.919	0.0278	68.97	2.128
age	12959	3.318	0	4.060	0.210
ROA	12959	0.0276	-2.646	0.590	0.0710

Benchmark regression

Table no 3 presents the regression results of this paper, aiming to enhance the robustness of the findings, and for this purpose the control variables are controlled using a stepwise introduction of control variables. First, without adding any control variables, column (1) demonstrates that the coefficient of ESG is -0.0605 and this result is significant at the 10% level. Subsequently, control variables are gradually added to the model to do a more comprehensive and accurate analysis. After adding all the control variables selected in this paper, column (4) presents a coefficient of ESG of -0.0599, which remains significant at the 10% level. The results of this series of regressions indicate that ESG performance has a significant reducing effect on the volatility of firms' stock prices. Thus, the research hypothesis H1 is proved to be valid.

Table no 3: Benchmark regression results.

	(1)	(2)	(3)	(4)
	VAR_ADJ	VAR_ADJ	VAR_ADJ	VAR_ADJ
ESG	-0.0605*	-0.0532	-0.0533	-0.0599*
	(0.0358)	(0.0347)	(0.0347)	(0.0356)
size		-0.2183***	-0.2183***	-0.2269***
		(0.0722)	(0.0722)	(0.0729)
Fratio		0.0330	0.0331	0.0280
		(0.0257)	(0.0257)	(0.0257)
age11			0.1668***	0.1683***
			(0.0141)	(0.0143)
ROA				1.0127
				(0.6357)
_cons	1.6100***	6.4928***	5.9397***	6.1388***
	(0.1482)	(1.6993)	(1.6798)	(1.6975)
FE	year coid	year coid	year coid	year coid
r2	0.4074	0.4082	0.4082	0.4085
r2_a	0.3284	0.3292	0.3291	0.3294
F	2.8545	3.8143	44.1779	35.4251
N	12959	12959	12959	12959

Note: a. Values in parentheses are ε values, same as in the table below.
b. ***, **, * represent significant at the 1%, 5%, and 10% levels, respectively, and the same table below.

Endogeneity test

Referring to the instrumental variable approach constructed by Xuan Zhang et al. (2019), this study adopts the average of the ESG performance of other firms within the industry segment in which firm i is located (denoted as ESG_ind) as a proxy instrumental variable for the stock price volatility of this firm. On the one hand, due to belonging to the same industry, these firms are highly similar in terms of the external corporate environment they face, etc.; on the other hand, the ESG performance of other firms within the industry does not directly contribute to the share price volatility of this firm. The regression results are shown in column (1) of Table no 4: the results of the two-stage least squares estimation show that the coefficient of ESG is significantly negative, indicating that good ESG performance can significantly reduce the share price volatility of the firms, which is in line with the previous findings.

Considering that firms with lower stock price volatility are more inclined to assume and fulfill more responsibilities in terms of ESG, this study may have a problem of model endogeneity due to reverse causality. Given that the lagged term of firms' ESG ratings is less affected by the current period's stock price volatility, this study decides to use the latter period's data of firms' ESG performance as an explanatory variable for the regression analysis. The results, as shown in column (2) of Table no 4, show that the ESG coefficient of the lagged period is -0.0264 and is significant at the 1% level, which indicates that ESG performance significantly reduces firms' stock price volatility, and thus the conclusion remains valid.

Table no 4: Endogeneity test.

	(1)	(2)
	VAR_ADJ	VAR_ADJ
ESG	-0.0427*	
	(0.1487)	
size	-0.2296***	-0.0924***
	(0.0815)	(0.0200)
Fratio	0.0278	-0.0178***
	(0.0262)	(0.0053)
age11	0.1657***	0.0227***
	(0.0214)	(0.0051)
ROA	0.9943	-0.3414**
	(0.6191)	(0.1380)
L.ESG		-0.0264***
		(0.0091)
_cons		3.3907***
		(0.4551)

FE	year coid	year coid
r2	0.0022	0.4928
r2_a	0.0011	0.4189
F	44.7542	12.4785
N	12911	11183

Robustness tests

Since the 2020 epidemic in China is considered to have an abnormal impact on stock price volatility and bring bias to the regression results, this paper excludes the data from 2020 and after and retains the data from 2013-2019 to verify the relationship between ESG performance and stock price volatility of listed companies once again. As shown in column (1) of Table no 5, the ESG coefficient is -0.0281 and passes the 5% significance test, which is not much different from the original correlation coefficient, so the main effects regression can be considered robust.

The core of heteroskedasticity robust analysis is the use of robust standard errors to estimate the uncertainty in the model parameters. In this paper, we take a regression analysis in the form of transforming the clustering robustness into heteroskedasticity robustness, and the results, as shown in column (2) of Table no 5, show that the ESG coefficient is -0.0599 and is significant at the 5% level, thus further confirming the conclusions of this paper.

Table no 5: Further tests of robustness.

	(1)	(2)
	VAR_ADJ	VAR_ADJ
ESG	-0.0281**	-0.0599**
	(0.0111)	(0.0303)
size	-0.1536***	-0.2269***
	(0.0447)	(0.0676)
Fratio	0.0021	0.0280
	(0.0097)	(0.0197)
age11	0.0947***	0.1683
	(0.0097)	(0.1389)
ROA	0.2290	1.0127
	(0.4427)	(0.6330)
_cons	4.4490***	6.1318***
	(1.0235)	(1.6368)
FE	year coid	year coid
r2	0.3666	0.4015
r2_a	0.2480	0.3240
F	66.6046	3.3762
N	8761	12911

Heterogeneity test

This paper also considers the possible heterogeneity in the impact of ESG performance on stock price volatility of firms with different property rights, so it introduces the dummy variable of property rights nature to analyze the heterogeneity. The results are shown in columns (1) and (2) of Table no 6. Column (1) shows the regression results for non-state-owned enterprises, and the ESG coefficient is -0.1320 and insignificant, indicating that the ESG performance of non-state-owned enterprises does not have a significant effect of reducing the volatility of the share price of the enterprises; Column (2) shows the regression results for state-owned enterprises, and the ESG coefficient is -0.0447, and it is significant at 10% level, indicating that the ESG performance of state-owned enterprises has a significant effect of reducing the volatility of the share price of the enterprises. performance has a significant reducing effect on the share price volatility of enterprises. The reason for these results is that the good performance of state-owned enterprises in ESG can release positive signals to the outside world and effectively alleviate the problem of information asymmetry. As a key pillar of the national economy, the information disclosed by SOEs is subject to stricter regulation and standardization, which helps to weaken the market's overreaction to uncertainties and thus suppresses share price volatility. In addition, state-owned enterprises show strong potential for sustainable development, according to the theory of corporate reputation, investors have a more positive view of enterprises with a good reputation, forming a certain degree of trust and investment preference, which not only helps the enterprise to obtain more resources to support, but also maintains the stability of the stock price effectively. The above regression results verify the research hypothesis H2.

There are obvious differences in the size of enterprises in China. In this paper, the median total assets are used as the criterion to divide the sample of firms into large-scale and small-scale firms to test the impact of ESG performance on the volatility of firms' stock prices. The results are shown in column (3) and column (4) of Table no 6. Column (3) shows the regression results of large-scale enterprises, and the ESG coefficient is -0.0923 and is significant at 1% level, which indicates that the ESG performance of large-scale enterprises has a significant reduction effect on the share price volatility of enterprises; column (4) shows the regression results of small-scale enterprises, and the ESG coefficient is -0.0054 and is insignificant, which indicates that the ESG performance of small-scale enterprises does not have any significant effect on the share price volatility of enterprises. performance does not have a significant effect on firms' stock price volatility. In particular, large-scale firms tend to have more mature and perfect internal control and governance structures. Good ESG performance reflects the improvement of internal management and governance ability, which helps companies manage risks more effectively and reduce share price volatility. Moreover, large-scale companies are likely to have more institutional investors, who usually pay more attention to long-term investment returns and the sustainable development of the company. Therefore, the ESG performance of large-scale firms is particularly important to these investors, and good ESG performance can attract and retain these investors and reduce stock price volatility. The above regression results validate the research hypothesis H3.

Table no 6: Heterogeneity test.

	(1)	(2)	(3)	(4)
	VAR_ADJ	VAR_ADJ	VAR_ADJ	VAR_ADJ
ESG	-0.1320	-0.0447*	-0.0923***	-0.0054
	(-1.74)	(-1.09)	(-2.62)	(-0.08)
size	-0.0911	-0.2751**	-0.5476**	-0.2126*
	(-0.82)	(-2.50)	(-2.11)	(-1.76)
Fratio	0.0144	0.0441	-0.0419	0.0348
	(0.56)	(1.12)	(-1.52)	(1.21)
age	0.0000	0.1625***	0.1666 ***	0.0000
	(.)	(12.96)	(11.39)	(.)
ROA	1.5670	0.8295	0.8163	1.2298
	(1.40)	(1.13)	(0.70)	(1.58)
_cons	3.8936	7.1937 ***	14.0995**	6.1103**
	(1.50)	(2.81)	(2.26)	(2.27)
N	2.9e+03	1.0e+04	6.4e+03	6.4e+03
r2_a	0.1228	0.3511	0.3470	0.2989

VI. Conclusions

Conclusions of the study

This paper selected A-share listed companies from 2013-2022 as a sample, this paper used two-way fixed effect model to explore the impact of ESG performance on corporate stock price volatility, and carried out robustness test, endogeneity test, and through heterogeneity analysis to test the effect of issuance of ESG performance on the effect of stock price volatility of different property rights properties and different enterprise sizes, and came up with the following conclusions:

1. Good ESG performance can significantly reduce share price volatility. With the launch of the national strategies of "building an ecological civilized society" and "carbon peak and carbon neutral", China has begun to vigorously develop a green and low-carbon economy, and to achieve sustainable economic and social development by promoting the green transformation of enterprises. The high quality ESG performance of enterprises can demonstrate to the outside world that they are actively practicing environmental protection, social responsibility and corporate governance responsibility, thus alleviating the phenomenon of information asymmetry. The theory of information asymmetry states that there is often a lack of equal information between companies and investors, and investors' investment decisions are often directly affected by the lack of information. Good ESG performance can improve the information asymmetry in the stock market, so that the market can visualize the comprehensive performance of enterprises in the three aspects of environment, society and governance through ESG performance. Moreover, investors no longer rely solely on traditional financial indicators when evaluating corporate value, but also incorporate non-financial information ESG performance into their evaluation system, and ESG performance of listed companies has gradually become a tool for investors to make investment decisions.
2. Good ESG performance of SOEs has a more significant effect on reducing share price volatility than that of non-SOEs. SOEs tend to have closer ties with the government and their disclosure is subject to stricter regulations and requirements. Good ESG performance means that SOEs are more transparent about their environmental, social and governance performance, which helps to reduce information asymmetry, thereby

reducing the market's reaction to uncertainty and lowering share price volatility. Second, SOEs are more likely to receive media and public attention due to their special status. Good ESG performance attracts positive media exposure and enhances public trust in the firm, thereby reducing share price volatility. Again, SOEs are likely to have more institutional investors, who usually pay more attention to long-term investment returns and corporate sustainability. Therefore, the ESG performance of SOEs is particularly important to these investors, and good ESG performance can attract and retain these investors and reduce share price volatility.

3. Good ESG performance is more effective in reducing share price volatility for large-scale companies than for small-scale companies. Large-scale companies are likely to have more institutional investors, who usually pay more attention to long-term investment returns and corporate sustainability. Therefore, the ESG performance of large-scale companies is particularly important to these investors, and good ESG performance can attract and retain these investors and reduce share price volatility. Moreover, large-scale companies tend to have more mature and improved internal control and governance structures. Good ESG performance reflects an improvement in the internal management and governance of the company, which helps the company to manage risks more effectively and reduce share price volatility. Therefore, compared with other types of companies, ESG performance has a more significant effect on reducing share price volatility of large companies.

Recommendations For Countermeasures

First, to address the problems of China's current ESG evaluation system not being perfect enough and the evaluation standards not being unified, we should establish a clear ESG rating system as soon as possible and build an ESG system of Chinese characteristics. Relevant departments of China's government should actively play a coordinating and convening role to establish a five-directional evaluation system and strengthen the synergies and between all parties to take advantage of complementary strengths. Regulators urgently need to formulate and release ESG investment guidance policies to provide a clear action framework for institutions to participate in ESG investment. In addition, there is a need to continuously strengthen the completeness of relevant policy guidelines, widely promote ESG concepts, and implement reward and punishment mechanisms to incentivize companies to improve their ESG performance. Specifically, companies with low ESG ratings should be penalized, while companies with high ESG ratings should be given incentives such as tax breaks and loan preferences, so that these rewards and punishments can jointly promote the sound development of the ESG system. In order to promote the transparency and quality of corporate ESG information, there is an urgent need to accelerate the improvement of ESG disclosure mechanisms and promote the establishment and deepening of related policies. The government should formulate industry-specific disclosure guidelines, and supervisory organizations should be responsible for ensuring that companies follow these regulations to ensure compliance with disclosure content and quality. For the specific conditions of listed companies in different industries, detailed ESG disclosure guidelines should be issued to comprehensively supervise the presentation format, content and quality standards of ESG information.

Secondly, improve the ESG governance mechanism and organizational structure. In order to comprehensively promote the internal construction of the ESG system, it is necessary to build a sound ESG governance structure, which is responsible for strategic decision-making and supervision, responsible for reviewing and supervising ESG-related matters, and driving the development of the company's internal ESG system from the top down. Increasing investment in social responsibility and environmental protection in daily operations, and continuously optimizing the corporate governance structure and internal control mechanism, can effectively reduce the risks arising from share price volatility. By strengthening ESG concepts, companies can not only enhance the well-being of external stakeholders, but also inspire empathy among internal stakeholder groups, resulting in a win-win situation for all. Critically, this can help stabilize share price volatility and help companies strengthen their core competencies and promote sustainable development.ESG performance should be viewed as a long-term strategic consideration for corporate development, not just a short-term benefit. Recognizing the importance of ESG performance, companies should enhance their ESG management by practicing social responsibility, environmental protection and improving their corporate governance structure. This will attract more attention from social capital and enhance the stability of corporate operations, which will in turn improve ESG performance. In addition, continuously optimizing the corporate governance structure and internal control can effectively reduce the risk of share price volatility.

Third, when making investment decisions, investors will also pay close attention to the social benefits of the company in addition to the economic benefits. In order to enhance the scientific nature of investment decisions, they should continuously optimize their ESG investment strategies and flexibly apply ESG ratings and adopt differentiated ESG investment strategies for companies of different sizes and regions. Investors should attach great importance to the trend of sustainable development and green finance, actively practice ESG concepts, comprehensively examine the ESG performance of investment targets, and strive to achieve a win-win situation between investment returns and social responsibility. Investors should take ESG factors into account when constructing a risk management framework aimed at reducing portfolio volatility and systemic risk. This is done by, among other things, incorporating ESG factors into the risk assessment system in order to identify and quantify potential ESG risks, which includes both qualitative and quantitative analysis. In addition, by constructing a diversified portfolio containing companies with different ESG ratings, the ESG risk of a single company can be effectively diversified, thereby reducing the volatility of the overall portfolio.

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