

ESG Performance and Stock Price Volatility

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Abstract: Environmental, social and governance (ESG) has emerged over the past two decades as a crucial ethical construct in modern economies. This paper selects ESG rating of A-share listed companies from 2020 to 2021 to explore the impact of ESG performance on stock price fluctuation, and further study the relationship between ESG rating disagreement and stock price fluctuation. It is found that the stock price volatility of companies with good ESG performance is lower than that of companies with poor performance, and this finding remains robust under the conditions of non-state-owned enterprises or industrial enterprises due to differences in the nature of corporate ownership and the industry in which the company is located. The study findings enrich the academic literature and can help investors in the investment decisions making.

Keywords: ESG, ESG rating disagreement, Stock Price Volatility, Multiple Regression

1. Introduction

ESG(Environmental, Social, and Governance)factors have gained significant attention in recent years as investors increasingly recognize the importance of sustainable and responsible investing^[1], and ESG's relationship with firms as well as financial markets has been extensively investigated^{[2][3]}. Understanding how ESG performance affects stock price volatility is crucial for both corporate managers and market investors. However, the existing studies mainly focus on developed countries, and there are few discussions on China.

Can ESG performance stabilize stock price fluctuations and mitigate volatility risks in China? What are the differences in ESG performance of different types of enterprises? These issues are outstanding but very important issues worthy of study. To explore the relationship between ESG performance and stock price volatility based on China's capital market, this study proposes some hypotheses to test and get some remarkable conclusions.

The marginal contributions of this paper are: (1) Most existing studies focus on the relationship between ESG performance, corporate performance and enterprise value in China, while this paper focuses on the effect of ESG performance on stock price volatility of enterprises. (2) We further investigate the relationship between ESG rating disagreement and stock price fluctuation and quantifies enterprise ESG rating into 10 numbers with much higher accuracy than the existing literature.

The following structure of this paper is as follows: The second part is the theoretical mechanism and research hypothesis. The third part is research design, including data source, variable selection and econometric model construction. The fourth part is the analysis of test results, including descriptive statistics, baseline regression and heterogeneity test. The fifth part is the conclusion and enlightenment.

2. Hypothesis Development

The reviewed literature consistently suggests a significant relationship between ESG performance and stock price volatility^{[4][5][6][7]}. Several studies have found that companies with higher ESG ratings tend to experience lower stock price volatility, indicating greater stability. This relationship holds across different industries and markets, although the magnitude of the effect may vary^{[8][9][10][11]}. Based on this, this paper proposes the following hypotheses:

H1: The higher the ESG rating, the lower the stock price volatility.

As previously shown, ESG ratings from different providers disagree substantially due to the lack of unified standards for ESG ratings^[12]. Therefore, the introduction of ESG rating disagreement is used to

measure the consistency of ESG ratings for companies. A lower ESG rating disagreement may indicate that the company's ESG performance is highly recognized by rating agencies, and the credibility of the company's ESG performance is higher. As a result, the company can gain more market trust, leading to more stable stock prices^{[13][14]}. Based on this, this paper proposes the following hypotheses:

H2: The lower the ESG rating disagreement, the lower the stock price volatility.

Furthermore, the impact of ESG performance on stock price volatility is influenced by various factors. Ownership structure plays a role, with non-state-owned or privately held companies exhibiting a stronger relationship between ESG performance and stock price stability. Compared to non-state-owned enterprises, state-owned enterprises often bear more social responsibilities and generally have better ESG performance. Additionally, state-owned enterprises are subject to stronger regulations due to the special nature of their ownership, which helps them gain more market trust and leads to generally more stable stock prices^{[15][16][17]}. Therefore, there is a difference in the impact of ESG performance on stock price volatility between state-owned and non-state-owned enterprises, with a more significant impact on non-state-owned enterprises. This hypothesis is consistent with the research conclusions of some research^{[18][19]} regarding ESG and stock price collapse risk, indicating that ESG has a more significant inhibitory effect on stock price volatility for state-owned enterprises. Based on this, this paper proposes the following hypotheses:

H3: The impact of ESG performance on stock price volatility differs between state-owned and non-state-owned enterprises, with a greater impact on non-state-owned enterprises.

Additionally, industry characteristics, such as the level of regulation and exposure to environmental risks, can moderate the relationship between ESG performance and stock price volatility. ESG performance includes the value contribution of companies in the environmental aspect, and industrial enterprises are often more involved in environmental issues. Additionally, the current market has increased its focus on the environment. Therefore, there is increased attention to the ESG performance of industrial enterprises. It can be inferred that there is a difference in the impact of ESG performance on stock price volatility between industrial and non-industrial enterprises, with a more significant impact on industrial enterprises. Based on this, this paper proposes the following hypotheses:

H4: The impact of ESG performance on stock price volatility differs between industrial and non-industrial enterprises, with a greater impact on industrial enterprises.

3. Research Design

3.1. Sample Selection and Data Sources

In China, there are different ESG scoring matrices given by rating systems such as China Securities Index, ShangDao RongGreen and Social Investment Alliance. The data used in this article mainly comes from two databases. The basic information and financial indicators of A-share companies are sourced from CSMAR database, while the ESG rating data is sourced from WIND database. The ESG rating data includes statistics from three rating agencies: WIND, Run Ling Global, and ShangDao RongGreen, covering the period from 2020 to 2021. The sample excludes companies with continuous losses (indicated by ST, PT, *ST) and those with missing data.

3.2. Variables Selection

3.2.1. Explained Variable: Volatility

The dependent variable in this study is stock price volatility (VOL), primarily measured by the standard deviation of individual stock returns over one year for listed companies, derived from the CSMAR database. The specific calculation formula (1) is as follows:

$$STD_{R_{ij}} = \sqrt{\frac{1}{n-1} \sum_{t=1}^n [R_{it} - E(R_{it})]^2} \quad (1)$$

where R represents the return of individual stocks for listed companies. Based on the panel data in this study, i represents the company, j represents the year, and t represents all trading days within each year.

3.2.2. Explanatory Variable

This article has two explanatory variables: WIND ESG rating (WIND_ESG) and ESG rating disagreement (STD_ESG). Due to the lack of unified standards and quantitative research on ESG ratings, this article quantifies ESG ratings using a simple scoring method, assigning the highest score of 10 and decreasing subsequently, as shown in Table 1:

Table 1: ESG rating assignment table

	10	9	8	7	6	5	4	3	2	1
WIND	AAA	AA	A	BBB	BB	B	CCC	-	-	-
ShangDao	AAA	AA	A	BBB	BB	B	CCC	-	-	-
Run Ling	A+	A	A-	B+	B	B-	C+	C	C-	D

Since different rating agencies have different rating methodologies, relying on a single agency may not be comprehensive enough. To further reflect the rating disagreement among agencies, this article introduces the indicator of ESG rating disagreement (STD_ESG), which measures the rating differences that each listed company can obtain. Therefore, this article selects the standard deviation of ESG ratings from three rating agencies: WIND, Run Ling Global, and ShangDao RongGreen, for the same listed company. A smaller ESG rating disagreement (STD_ESG) indicates a higher consensus among different rating agencies regarding the ESG performance of the listed company. Considering the relatively late start of ESG research in China and the limited number of rated listed companies in earlier years, the available rating data is concentrated in the past five years. Therefore, this article mainly selects ESG sample data from 2020 to 2021.

3.2.3. Control Variables

Referring to previous studies^{[20][21]}, the control variables we have selected are listed in Table 2, along with their detailed definitions document.

Table 2: Definition of variables

Type of variable	Variable name	Variable symbol	Definition
Explained variable	Stock Price Volatility	VOL	See previous variable description
Explanatory variable	Wind ESG Rating	WIND_ESG	ESG rating from WIND
	ESG Rating Dispersion	STD_ESG	Standard deviation of ESG ratings assigned by three rating agencies
Controlled variable	Debt-to-Asset Ratio	LEV	Debt-to-Asset Ratio
	Return on Equity	ROE	Net profit/Equity
	Book-to-Market Ratio	BM	Book value/total market value
	Shareholding Concentration	TOP	Number of shares held by the largest shareholder/total number of shares
	Beta	BETA	Measuring systematic risk of a stock
	Turnover	TUR	Trading volume /total shares
	Institutional Investor Shareholding Ratio	INST	Number of shares held by all financial institutions/total number of shares
Group variable	Corporate Ownership Nature	SOE	State-controlled enterprises take the value of 1, others are 0
	Industry in Which the Firm Operates	MFG	Manufacturing enterprises take the value of 1, others are 0

3.3. Model Specification

In order to explore the impact of ESG ratings and ESG rating disagreement on stock price volatility, this article constructs Model 1 and Model 2. Furthermore, the article investigates whether this impact is consistent for state-owned enterprises and non-state-owned enterprises, as well as industrial and non-industrial enterprises. Model 1 serves as the basic model of this article, testing hypotheses H1, H3, and H4. Model 2 is a derivative model based on Model 1, testing hypothesis 2.

Model 1 is represented by equation (2):

$$VOL = \beta_0 + \beta_1 \times WIND_ESG + \sum_{i=2}^{n=7} \beta_i \times Con_i + \varepsilon \quad (2)$$

where VOL represents the dependent variable, stock price volatility, Con_i represents a series of control variables, n represents the number of control variables, and i represents the order of control variables, starting from 2.

Model 1 is represented by equation (2):

$$VOL = \beta_0 + \beta_1 \times STD_ESG + \sum_{i=2}^{n=7} \beta_i \times Con_i + \varepsilon \quad (3)$$

where VOL represents the dependent variable, stock price volatility, Con_i represents a series of control variables, n represents the number of control variables, and i represents the order of control variables, starting from 2.

4. Empirical Results and Analysis

4.1. Sample Descriptive Statistics

Table 3 reports the results of descriptive statistics of the main variables.

Table 3: Descriptive statistics

Variable	N	Mean	SD	Min	Med	Max
WIND_ESG	7697	6.620	0.830	4	7	10
STD_ESG	997	1.145	0.430	0	1.155	3.055
VOL	7697	0.034	0.0390	0.005	0.030	1.134
LEV	7697	0.430	0.209	0.013	0.422	0.996
ROE	7697	-0.003	0.943	-45.740	0.070	2.324
BM	7697	0.620	0.272	0.034	0.606	1.559
TOP	7697	32.35	14.810	2.430	29.900	89.990
BETA	7697	0.920	0.587	-13.760	0.906	15.520
TUR	7697	454.400	332.500	9.886	365.300	2832
INST	7697	41.960	25.050	0	42.390	211.500

4.2. Regression analysis

4.2.1. The Impact of ESG Ratings on Stock Price Volatility

Regression results for Model 1 are presented in Table 4.

As can be seen from the table, the VIF for all variables in Model 1 is less than 5, indicating that there is no multicollinearity in Model 1. Through the analysis of the results of the F-test, the F-value for Model 1 is 98.795, and the significance P-value is 0.000, presenting significance at the 1% level; thus, the model as a whole is significant. The adjusted R² is only 0.092, indicating that Model 1 has a low degree of fit, mainly because there are too many factors affecting stock prices in reality. Although the model has a low degree of fit, it does not affect the significance of the model. Specifically, the partial regression coefficient for ESG rating (WIND_ESG) is -0.193, and is significant at the 1% level, indicating that the ESG rating has a significant impact on the company's stock price volatility. The negative sign of the regression coefficient indicates that companies with higher ESG ratings have more stable stock prices, which is consistent with hypothesis H1. Among the control variables, the P-values for Net Asset Return on Equity (ROE), Equity Concentration (TOP), and Stock Turnover Rate (TUR) are all much greater than 0.05, indicating that these control variables do not have a significant impact on stock price volatility.

Table 4: ESG rating and stock price volatility regression results

Variable	Coefficient	t-statistic	Prob.	VIF
C	0.092	23.405	0.000***	-
WIND_ESG	-0.193	-17.411	0.000***	1.044
LEV	-0.083	-6.658	0.000***	1.315
ROE	-0.009	-0.771	0.441	1.041
TOP	-0.016	-1.283	0.200	1.36
BM	-0.04	-3.214	0.001***	1.345
BETA	0.19	16.859	0.000***	1.076
TUR	0.009	0.685	0.493	1.331
INST	0.045	3.337	0.001***	1.517
R ²		0.093		
adj. R ²		0.092		
F		F=98.795 P=0.000***		

Note: *, ** and *** represent significant at the level of 10%, 5% and 1% respectively

4.2.2. The Impact of ESG Ratings Disagreement on Stock Price Volatility

Regression results for Model 2 are presented in Table 5.

Table 5: ESG rating disagreement and stock price volatility regression results

Variable	Coefficient	t-statistic	Prob.	VIF
C	0.013	13.983	0.000***	-
STD_ESG	0.049	2.78	0.006***	1.028
LEV	-0.01	-0.458	0.647	1.527
ROE	-0.067	-3.707	0.000***	1.084
TOP	0.106	4.721	0.000***	1.658
BM	-0.244	-10.599	0.000***	1.753
BETA	0.403	18.375	0.000***	1.592
TUR	0.484	21.207	0.000***	1.721
INST	0.105	4.359	0.000***	1.93
R ²	0.701			
adj. R ²	0.699			
F	F=289.693 P=0.000***			

Note: *, ** and *** represent significant at the level of 10%, 5% and 1% respectively

From the table, it can be seen that the VIF for all variables in Model 2 is less than 5, thus there is no multicollinearity in Model 2. Through F-test result analysis, Model 2's F-value is 289.693, and the significance P-value is 0.000, showing significance at the 1% level, therefore, the overall model is significant. Specifically, the partial regression coefficient for ESG rating disagreement (STD_ESG) is 0.094, and it is significant at the 1% level, indicating that ESG rating disagreement has a significant impact on company stock price volatility. The positive sign of the regression coefficient implies that companies with smaller ESG rating disagreement have more stable stock prices, which aligns with hypothesis H2. Among the control variables, the P-value for Debt to Asset Ratio (LEV) is much greater than 0.05, indicating that the Debt to Asset Ratio does not have a significant impact on stock price volatility, i.e., the company's financial liability capability indicator does not significantly impact stock price volatility.

4.3. Heterogeneity Test

This study conducts a grouped regression on variables based on different corporate ownership types and industries in which the enterprises operate. The specific results of the heterogeneity test are shown in Table 6.

Table 6: Heterogeneity test results

	Enterprise property		Industry	
	SOE=0 (1)	SOE=1 (2)	MFG=0 (3)	MFG=1 (4)
WIND_ESG	-0.012 0.001***	-0.004 0.001***	-0.005 0.001***	-0.011 0.001***
LEV	-0.019 0.003***	-0.007 0.003***	-0.020 0.003***	-0.013 0.003***
ROE	-0.000 0.001***	-0.003 0.002***	-0.001 0.001***	-0.000 0.001***
BM	-0.006 0.003***	-0.003 0.002***	-0.011 0.003***	-0.003 0.002***
TOP	-0.000 0.000***	-0.000 0.000***	-0.000 0.000***	0.000 0.000***
BETA	0.010 0.001***	0.019 0.001***	-0.002 0.001***	0.018 0.001***
TUR	0.000 0.000***	0.000 0.000***	0.000 0.000***	-0.000 0.000***
INST	0.000 0.000***	0.000 0.000***	0.000 0.000***	0.000 0.000***
cons	0.111 0.005***	0.035 0.005***	0.081 0.005***	0.095 0.005***
N	5333	2364	2217	5480
adj. R ²	0.0771	0.1897	0.0846	0.1123
Permutation Prob.	0.000***		0.000***	

The grouped regression is specifically divided into two categories, totaling four groups: (1)

non-state-owned enterprise group and (2) state-owned enterprise group, (3) non-industrial group and (4) industrial group. Regressions are performed separately on the aforementioned four groups, and preliminary results from the grouped regressions show that the regression models for all four groups are significant. However, in order to further explore the differences between the groups, this study employs the Permutation Test to examine coefficient differences. The Permutation P-value is the significance P-value for the coefficient difference of WIND_ESG, obtained through 1000 permutations.

4.3.1. Impact of ESG Ratings on Stock Price Volatility in State-Owned and Non-State-Owned Enterprises

Group testing based on the nature of corporate ownership is conducted to compare the impact of ESG on stock price volatility between non-state-owned enterprises and state-owned enterprises, with results shown in columns (1) (2). The effect of ESG in reducing stock price volatility is more pronounced in non-state-owned enterprises than in state-owned enterprises. Additionally, the p-value for the significance of the difference in WIND_ESG core variable coefficients between groups is 0.000, significant at the 1% level, indicating that there is a significant difference in the ESG coefficients between group (1) non-state-owned enterprises and group (2) state-owned enterprises, which is consistent with hypothesis H3. Generally speaking, state-owned enterprises often undertake more social responsibilities and have higher ESG performance (mean for non-state enterprises is 6.537, and for state enterprises is 6.807), and they also have relatively smaller stock price fluctuations. Therefore, the ESG coefficient for state-owned enterprises is smaller, indicating that the effect of ESG in stabilizing stock price fluctuations is weaker for state-owned enterprises than for non-state enterprises.

In conclusion, good ESG performance will play a role in stabilizing stock prices to some extent, only that this effect is more pronounced for non-state-owned enterprises.

4.3.2. Impact of ESG Ratings on Stock Price Volatility in Industrial and Non-Industrial Sectors

Group testing based on the industry in which the enterprises operate is conducted to compare the impact of ESG on stock price volatility between non-industrial enterprises and industrial enterprises, with results shown in columns (3) (4). The effect of ESG in reducing stock price volatility is more pronounced in industrial enterprises than in non-industrial enterprises. Additionally, the p-value for the significance of the difference in WIND_ESG core variable coefficients between groups is 0.000, significant at the 1% level, indicating that there is a significant difference in the ESG coefficients between group (3) non-industrial enterprises and group (4) industrial enterprises, which is consistent with hypothesis H4. Generally speaking, market investors pay more attention to the ESG performance of industrial enterprises in terms of environmental responsibility. Coupled with the current policy direction towards carbon neutrality, the ESG performance of industrial enterprises is more likely to attract attention. Therefore, the ESG coefficient for industrial enterprises is larger, indicating that, compared to non-industrial enterprises, the ESG performance of industrial enterprises has a greater effect in stabilizing stock prices.

In conclusion, good ESG performance will play a role in stabilizing stock prices to some extent, only that this effect is more pronounced for industrial enterprises.

5. Conclusions

This paper examines the relationship between corporate ESG performance and stock price volatility and using the data of A-share listed companies in China from 2020 to 2021. The empirical results show that: (1) There is a significant negative correlation between ESG ratings and stock price volatility, indicating that good ESG performance of a company has a stabilizing effect on its stock price. (2) There is a positive relationship between the disagreement of ESG ratings and stock price volatility, meaning that companies with smaller disparities in ESG ratings have more stable stock prices. (3) The impact of ESG ratings on the volatility of a company's stock price can vary due to the nature of corporate ownership: this effect is more pronounced for non-state-owned enterprises. (4) The impact of ESG ratings on the volatility of a company's stock price can vary according to the industry in which it operates: this effect is more pronounced for industrial enterprises.

The above findings have important implications for how to reduce stock price volatility and promote the smooth operation of stock prices. This paper provides new empirical evidence for the study of ESG performance and corporate stock price volatility, and puts forward relevant policy recommendations for enterprises and government departments.

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References

- [1] Gillan, S. L., Koch, A., & Starks, L. T. (2021) *Firms and social responsibility: A review of ESG and CSR research in corporate finance*. *Journal of Corporate Finance*, 66(January), 101889
- [2] Pedersen, L, S Fitzgibbons and L Pomorski. (2021) *Responsible investing: the ESG-efficient frontier*. *Journal of Financial Economics*, 142, 2, 572-97.
- [3] Li, Z., Feng, L., Pan, Z. et al. (2022) *ESG performance and stock prices: evidence from the COVID-19 outbreak in China*. *Humanities and Social Sciences Communications*. Commun 9, 242.
- [4] Lins KV, Servaes H, Tamayo. (2017) *A. Social capital, trust, and firm performance: The value of corporate social responsibility during the financial crisis*. *The Journal of Finance*. 72(4): 1785-1824.
- [5] Bouslah Kais, Kryzanowski Lawrence, M'Zali Bouchra. (2018) *Social Performance and Firm Risk: Impact of the Financial Crisis*. *Journal of Business Ethics*. 149(3): 643-669.
- [6] Albuquerque R, Koskinen Y, Zhang C. (2019). *Corporate social responsibility and firm risk: Theory and empirical evidence*. *Management Science*. 65(10): 4451-4469.
- [7] Shakil Mohammad Hassan. (2020) *Environmental, social and governance performance and stock price volatility: A moderating role of firm size*. *Journal of Public Affairs*. e2574.
- [8] Ferrell A, Liang H, and Renneboog L. (2016) *Socially responsible firms*, *Journal of financial economics*, 122(3), 585-606.
- [9] John Nofsinger, and Abhishek Varma. (2014) *Socially responsible funds and market crises*, *Journal of Banking and Finance*, 48, 180-193
- [10] Benlemlih M, Shaukat A, Qiu Y, et al, (2018) *Environmental and social disclosures and firm risk*, *Journal of Business Ethics*, 152(3), 613-626
- [11] Chollet P, and Sandwidi B W. (2018) *CSR engagement and financial risk: A virtuous circle? International evidence*, *Global Finance Journal*, 38, 65-81.
- [12] Kim, R. and Koo, B. (2023) *The impact of ESG rating disagreement on corporate value*, *Journal of Derivatives and Quantitative Studies*. 31 3, 219-241.
- [13] Gibson Brandon, R., Krueger, P., and Schmidt, P. S. (2021) *ESG rating disagreement and stock returns*, *Financial Analysts Journal* 77:4, 104-127
- [14] Chatterji, A. K., Durand, R., Levine, D. I., and Touboul, S. (2016) *Do ratings of firms converge? Implications for managers, investors and strategy researchers*, *Strategic Management Journal* 37, 1597-1614.
- [15] Hart, O., Zingales, L. (2017) *Companies should maximize shareholder welfare not market value*. *J. Law, Financial. Account.* 2, 247-274.
- [16] Boubakri, N., Guedhami, O., Kwok, C.C., Wang, H.H. (2019) *Is privatization a socially responsible reform?* *Journal of Corporate Finance*. 56, 129-151.
- [17] McGuinness, P.B., Vieito, J.P., Wang, M. (2017) *The role of board gender and foreign ownership in the CSR performance of chinese listed firms*. *Journal of Corporate Finance*. 42, 75-99.
- [18] Sheng Mingquan, Yu Lu, Wang Wenbing. (2023) *ESG Disclosure and Stock Price Crash Risk*. *Journal of Guizhou University of Finance and Economics*, No.223(02):32-41.
- [19] Luo Xiyang, Zhang Peilong. (2023) *The Impact of Corporate ESG Performance on Stock Price Crash Risk — From the Perspective of Internal Control*. *Business Research*, 30(01):78-94.
- [20] Zhang Yanliang, Zhang Qingyu, Zhang Jianbin. (2022) *Can Corporate Social Responsibility Information Disclosure Reduce Stock Price Volatility*. *Journal of Shandong University of Technology (Social Sciences Edition)*, 38(01):17-29.
- [21] Zhao Lingdi, Wang Xiaofei, Xu Le. (2022) *Has Corporate Green Investment Reduced Stock Price Volatility*. *China Population, Resources, and Environment*, 32(02):85-95.