

# A Study on the Impact of ESG Disclosure Policies on Corporate Stock Returns Based on the Difference-in-Differences (DID) Method

Juanjuan Ma \*

SKEMA Business School, Paris, 92156, France

\* Corresponding Author Email: Juanjuan.ma@skema.edu

**Abstract.** Under the background of "dual carbon" goal and the deepening of ecological environment governance, implementation of "Measures for the Management of Enterprise Environmental Information Disclosure according to Law" (2022) requires key polluters to disclose environmental information and promotes the capital market to pay attention to the environmental behavior of enterprises. This study takes the A-share heavy polluters from 2019 to 2023 as the sample, sets 412 enterprises that had been included in the key polluters before the policy as the experimental group, and matches 824 non-key polluters as the control group. Results show that after the implementation of the policy, the abnormal return rate of the experimental group is significantly higher than that of the control group (coefficient is 0.003,  $p < 0.01$ ), and the effect is more prominent in the enterprises with high quality of environmental information disclosure. Event study further showed that the cumulative abnormal return of the experimental group within the policy announcement window was 1.2% ( $p < 0.05$ ). Conclusion shows that the environmental information disclosure policy reduces information asymmetry by enhancing corporate environmental transparency, effectively improves the market evaluation of heavy polluting enterprises, verifies the capital market incentive effect of the policy, and provides empirical evidence for the synergy between environmental regulation and corporate environmental responsibility.

**Keywords:** Stock Returns, Difference-in-Differences Method, Disclosure Policies, ecological environment governance, environmental transparency.

## 1. Introduction

The global ESG investment scale has exceeded 41 trillion US dollars, and the scale of ESG-themed funds in China has grown more than fivefold within three years [1, 2]. The "dual carbon" goals of policies and the opening up of the capital market have accelerated ESG practices. However, the ESG rating market in the A-share market has a low degree of localization, is dominated by individual investors, and the signal of ESG pricing efficiency is questionable [3].

Existing literature has drawn different conclusions on the relationship between ESG and stock returns: The positive effect group through meta-analysis shows that 62.6% of the studies support that ESG has a positive impact on financial performance, and the mechanisms include risk compensation and efficiency improvement [4, 5]. Skeptics emphasize data biases (such as "greenwashing" behavior) and endogenous problems (such as selection bias) that traditional models cannot solve [6]. Especially in China, there are significant differences between policy-driven ESG practices (such as mandatory disclosure) and the logic of mature markets, and existing research has insufficiently tested the causal relationship between the dynamic evolution of ESG scores and yields [7, 8]. The causal relationship between the dynamic evolution of ESG scores and returns was not examined.

China began to comprehensively promote the "dual carbon" strategy in 2021. In 2022, the Ministry of Ecology and Environment issued the "Administrative Measures for the Disclosure of Environmental Information by Enterprises in Accordance with the Law", clearly requiring key polluters (heavily polluting enterprises) to compulsorily disclose environmental information (such as pollutant emissions and carbon emission data) starting from 2022, and gradually expanding to ESG comprehensive disclosure (environment, society, and governance). The policy objective is to enhance the environmental transparency of enterprises through mandatory disclosure and guide capital

towards green transformation. Although previous studies have explored the economic consequences of environmental information disclosure from the perspectives of compliance costs and corporate reputation, they have not paid sufficient attention to the response of the capital market, especially lacking direct empirical tests on the mandatory environmental information disclosure policies and stock returns of heavily polluting enterprises under the "dual carbon" goals. This study analyzes the significant impact of the implementation of the "Measures for the Administration of the Disclosure of Environmental Information by Enterprises in Accordance with the Law" on the valuation of heavily polluting enterprises in the capital market by enhancing the environmental transparency of enterprises. The heterogeneity of policy responses from enterprises with different characteristics (such as the intensity of industrial pollution). The mechanisms behind policy effects such as alleviating information asymmetry and policy expectation guidance have played a role.

Based on this, this study takes heavily polluting and non-heavily polluting A-share enterprises from 2019 to 2023 as samples and uses the multi-period difference method (DID) to identify the causal relationship between policy shocks and the stock returns of enterprises. Combining the quality of enterprise environmental information disclosure, industry characteristics and policy synergy effects, a heterogeneity analysis framework is constructed. The mediating effect model was adopted to test the explanatory power of mechanisms such as enhanced information transparency and policy expectation guidance on market responses. The research objectives include three aspects: First, to verify the direction and extent of the net impact of environmental information disclosure policies on the stock earnings of heavily polluting enterprises; The second is to reveal the moderating role of enterprise characteristics (such as pollution intensity and scale) on policy effects; Third, clarify the specific mechanism by which policies influence stock prices through the path of "information disclosure - market perception - valuation correction"[9].

This research not only helps to improve the theoretical framework of the interaction between environmental policies and capital markets, but also provides empirical support for regulatory authorities to optimize the environmental information disclosure system (such as strengthening the quality constraints of disclosure and promoting the connection between disclosure and financing). Enterprises formulate ESG strategies (such as balancing disclosure costs and market value), and investors build green investment portfolios [10]. It has the dual nature of theoretical value and practical significance.

## 2. Design of experiment

In this study, under the framework of DID, firstly, the classification standard of the experimental group and the control group was clarified: the experimental group (Treat) was a heavy polluting enterprise that had been identified as a "key pollutant discharging unit" before the implementation of the policy, mainly distributed in chemical industry, iron and steel, thermal power, building materials and other high-pollution industries; The Control group (Control) refers to the non-heavy polluting enterprises that are similar to the experimental group in terms of industry, scale and geographical distribution, but not included in the list of key polluters, covering low-pollution industries such as electronics, medicine and textile. On this basis, the implementation time of the Measures for the Management of Enterprise Environmental Information Disclosure according to Law (such as January 1, 2022) is taken as the policy impact point, and the time dummy variable Post is defined: Post=1 after the implementation of the policy (2022 and after), Post=0 before the implementation of the policy (2021 and before). In order to ensure the research rigor, the sample selection follows the following rules: the time range covers 3 years before the policy (2019-2021) and 2 years after the policy (2022-2023), so as to meet the demand of the parallel trend test for multi-period observations; At the enterprise level, ST/\*ST financial abnormal enterprises and enterprises with missing ESG disclosure data (such as not releasing social responsibility report) were excluded, and enterprises with continuous observation for more than 2 years were retained to ensure the balance of panel data.

Through the above design, the data and method foundation are laid for the subsequent verification of the causal effect of policies on corporate environmental behavior or performance.

### 3. Definition of variables

The core variable definition and control design of this study are as follows: explained variable (Y) is the stock return rate, using monthly excess return rate (adjusted by the overall market volatility to eliminate the impact of systemic risk); The core explanatory variable is the policy interaction term (DID), which is constructed by the treatment group dummy variable (Treat) multiplied by the post-policy dummy variable (Post), where Treat is defined as "heavy polluting enterprise =1, non-heavy polluting enterprise =0", Post is defined as "after the implementation of the policy in 2022 =1, otherwise =0". DID captures the net effect of the policy through the dynamic difference between the two groups of enterprises before and after the policy. In order to avoid missing variable bias, the study further controls enterprise characteristics and macroeconomic factors: enterprise Size (Size, logarithm of total assets), leverage ratio (Lev, total liabilities/total assets), profitability (ROA, net profit/total assets), market value/book value (MB, market value/book value) are included in the enterprise characteristics. At the macro level, industry heterogeneity (such as natural differences in manufacturing/mining and service industries) is controlled through industry fixed effects, and the interference of macroeconomic fluctuations (such as GDP growth rate and interest rate changes) on the results is controlled through time fixed effects.

### 4. Data source and processing data

The experimental data cover A-share heavy polluters and non-heavy polluters from 2019 to 2023. The core sources include policy documents, financial databases and corporate public information. The policy data were based on the List of Key polluters published annually by the Ministry of Ecology and Environment. The data were obtained through the official website or third-party databases, and used to divide the experimental group and the control group. Among them, the experimental group was the heavy polluting enterprises that had been included in the list before the policy, and the control group was the non-heavy polluting enterprises that had not been included in the list. The stock return data come from the Wind financial terminal and CSMAR database, which is obtained by calculating the log return of each stock's monthly closing price, and adjusting the excess return based on the CSI 300 index return. Corporate financial and characteristic data (such as the logarithm of total assets, asset-liability ratio, ROA, etc.) were extracted from the financial statement module of CSMAR database, and some non-financial indicators (such as the quality of environmental information disclosure) were supplemented by manually downloaded environmental reports from Juchao Information website and corporate official website. The data of environmental information disclosure were obtained from the column of "Announcement of Listed Companies" and the special page of "Investor Relations" on the official website of the enterprise. In terms of data processing, ST/\*ST enterprises and samples with serious data missing were firstly excluded, and enterprises with continuous observation for more than 2 years were retained to ensure panel balance. Secondly, the industry distribution of the experimental group and the control group was matched according to the Industry Classification Management List of Environmental Protection Verification of Listed Companies. Finally, the cleaning was completed by data alignment, outlier processing (such as removing outliers) and missing value filling (such as filling the value of the previous period). In terms of data reliability, the official attributes of the policy directory, the authority of Wind/CSMAR and other databases, and the key indicators manually checked (such as ESG disclosure quality) jointly ensure the accuracy and reproducibility of the data.

#### 4.1. Model setting

A two-way fixed effect DID model was used to control firm (individual) and time fixed effects.

$$R_{it} = \alpha + \beta_1 Treat_i + \beta_2 Post_t + \beta_3 (Treat_i \times Post_t) + \gamma C_{it} + \mu_i + \lambda_t + \epsilon_{it} \quad (1)$$

#### 4.2. Parallel trend test

The core hypothesis of DID is that the returns of the experimental group and the control group are parallel before the policy. If the trends are not parallel, the model may not be able to separate the net effect of the policy. The test method used in this paper is the event study method.

$$R_{it} = \alpha + \sum_{k=-2}^2 \delta_k (Treat_i \times Year_{t-k}) + \beta X_{it} + \mu_i + \lambda_t + \epsilon_{it} \quad (2)$$

Dummy variables for each period before the policy (such as 2019, 2020 and 2021) are constructed to test whether the coefficient of the interaction term is significant 0: Where, represents the k period before the policy (k=-2 is the two years before the policy, k=0 is the year of the policy, and k=1 is the year after the policy).  $Year_{t-k}$  If the values before the policy (k and k=1 is the year after the policy). fore the polistructed to test whether t

### 5. Findings

#### 5.1. Descriptive statistics

**Table 1.** Variable differences between the experimental group and the control group

Variables	Experimental group (heavy pollution)	Control group (non-heavy pollution)	Difference (t test)
Stock return (R)	0.003 (0.025)	0.005 (0.022)	-0.82 (p>0.4)
Enterprise Size (Size)	22.1 (1.2)	21.5 (1.1)	5.2 (p<0.01)
Leverage ratio (Lev)	0.55 (0.12)	0.48 (0.15)	4.1 (p<0.01)
ESG score	58.2 (10.3)	65.1 (9.8)	-6.9 (p<0.01)

The standard deviation is shown in parentheses. As shown in table 1, the ESG score of the experimental group was significantly lower than that of the control group (due to the low score of the environmental dimension of the heavily polluting enterprises).

#### 5.2. Basic DID regression results

**Table 2.** Coefficients and significance of different variables

Variables	Coefficient (t-value)	Significance of significance
Treat	0.001 (1.23)	Not significant
Post	0.002 (1.87)	Marginal significant
Treatnal s	0.005 (2.68)	Significant (p<0.01)
Size	0.000 (0.56)	Not significant
Lev	-0.001 (-1.12)	Not significant
ROA	0.012 (2.15)	Significant (p<0.05)
MB	-0.000 (-0.34)	Not significant
Constant term	0.004 (1.98)	Marginal significant
Firm fixed effects	Controls	
Time fixed effects	Controls	
Ro	0.78	

As shown in table 2, after the policy, the stock return rate of heavy polluters is significantly higher than that of non-heavy polluters by about 0.5% (monthly), supporting the hypothesis that ESG disclosure policy improves the valuation of heavy polluters.

### 5.3. Results of parallel trend test

The event study shows that the coefficient of the interaction term in each period before the policy (2019-2021) is not significant ( $p > 0.1$ ), indicating that the two groups of return trends are parallel, and the DID hypothesis is valid.

### 5.4. Results of heterogeneity analysis

Industry heterogeneity: the DID coefficient of the chemical industry (high pollution intensity) was 0.007 ( $p < 0.01$ ), which was significantly higher than that of the iron and steel industry (0.003,  $p < 0.05$ ).

Scale heterogeneity: the DID coefficient of small and medium-sized enterprises (total assets <5 billion) was 0.006 ( $p < 0.01$ ), which was higher than that of large enterprises (0.004,  $p < 0.05$ ), possibly because the marginal effect of ESG improvement in small and medium-sized enterprises was larger.

Heterogeneity of ESG performance: the DID coefficient of the experimental group with low ESG score before the policy was 0.008 ( $p < 0.01$ ), which was higher than that of the enterprises with high score (0.003,  $p < 0.05$ ), indicating that the enterprises with large space of "greenwashing" benefited more from the disclosure policy.

## 6. Research and discussion

### 6.1. Economic significance

After the policy, the stock return rate of heavy polluting enterprises increased by about 0.5%/month (about 6% annualized), and this effect was economically significant. Improved information transparency: Mandatory disclosure of environmental information reduces the information asymmetry between enterprises and investors, and investors are more likely to recognize the long-term value of enterprises with high ESG potential; Policy expectation guidance: under the "dual carbon" target, investors expect that heavy polluting enterprises will obtain policy subsidies (such as carbon trading gains) or tax incentives through green transformation, and advance layout will push up stock prices.

### 6.2. Differences with previous studies

Previous studies mostly focus on the impact of voluntary ESG disclosure on profitability, while this study focuses on the impact of mandatory disclosure policy on heavy polluting enterprises, and finds that mandatory disclosure can also improve the valuation, and the marginal effect on small and medium-sized enterprises and high polluting industries is larger.

### 6.3. Policy implications

At the regulatory level: it is necessary to strengthen the supervision of ESG disclosure of heavy polluting enterprises (such as punishing "greenwashing" behavior), so as to avoid enterprises only formally disclosing without actually improving environmental performance; At the enterprise level: heavy polluting enterprises should combine ESG disclosure with green transformation (such as increasing investment in pollution control and developing low-carbon technology), so as to continuously attract long-term investors; At the investor level: ESG disclosure policy can be regarded as the "valuation repair signal" of heavy polluting enterprises, but the actual environmental performance of enterprises (such as carbon emission data) should be paid attention to rather than only the form of disclosure.

### 6.4. Limitations and future directions

The limitations of this study are mainly reflected in the following aspects: first, the sample scope is limited to the A-share market and does not cover other capital markets such as Hong Kong stocks and the US stocks, which may not fully reflect the transnational or cross-market effects of ESG disclosure policies; Second, the measurement of the quality of environmental information disclosure

mainly relies on the quantity of disclosure (such as whether to issue a report), and the substantiality (such as the clarity of environmental objectives, the details of governance measures) and authenticity (such as the risk of data fraud) of the disclosure content are not enough depicted. Third, the policy only examines the short-term impact of a single regulation (the Measures for the Management of Enterprise Environmental Information Disclosure according to Law), and does not include the interaction effect of other synergistic policies (such as the expansion of carbon trading market and green credit tilt) under the "dual carbon" goal; Fourth, the study does not fully control the dynamic changes of the actual environmental performance of enterprises (such as carbon emissions and pollutant emission intensity), which may miss their direct impact on stock returns.

Subsequent research can be further promoted from the following five aspects: the expansion of sample coverage can focus on multiple markets such as Hong Kong stocks and the US stock market, and further analyze the universality and heterogeneity characteristics of policy effects based on the institutional differences of different markets (such as the degree of information disclosure compulsion and ESG investment culture); The accuracy of variable measurement can be improved by text mining technology. Specifically, natural language processing and other methods can be used to quantify the quality of environmental information disclosure, such as extracting the frequency and depth of keywords such as "environmental risk" and "governance mechanism" in the report. Studying the expansion of time dimension and the introduction of multi-period policy shocks (such as carbon tax and green financial instruments) is helpful to analyze the synergistic effect mechanism of policy mix and the dynamic response law of enterprises' green transformation to policies. The combination of actual environmental data (such as carbon emissions and environmental protection investment amount measured by third-party institutions) can effectively separate the independent impact between information disclosure and actual environmental improvement. Exploring the indirect effect of policies on corporate ESG rating and financing costs (such as the interest rate of green bond issuance) is helpful to further reveal the transmission mechanism of ESG disclosure policies in the capital market.

## 7. Conclusion

Based on the difference-in-differences (DID) method, this study examines the impact of the Measures on the stock return of A-share heavy-polluting enterprises. Heterogeneity analysis shows that industries with high pollution intensity, small and medium-sized enterprises, and enterprises with significant improvement in ESG disclosure quality have more prominent return gains, indicating that the subject marginal effect of policies sensitive to environmental risks and high transformation potential is stronger. This study provides empirical evidence for the synergy between environmental regulation and capital market under the "dual carbon" goal. On the one hand, it clarifies the policy value of ESG disclosure for enterprises -- reducing information asymmetry by enhancing environmental transparency can effectively improve market valuation; On the other hand, it provides a "policy-enterprise-market" transmission logic reference for investors, suggesting that ESG disclosure compliance enterprises have more long-term investment potential. There are still three limitations in the research. First, the sample is limited to the A-share market and does not cover multiple markets such as Hong Kong stocks and the US stock market, which may ignore the impact of transnational institutional differences on policy effects; Secondly, the measurement of the quality of environmental information disclosure relies on the quantitative index of "whether to disclose", which does not adequately describe the substance and authenticity of the disclosed content. Third, it only examines the short-term impact of a single policy, and does not include the interaction effect of other synergistic policies under the "dual carbon" target. Further research can be carried out from the following four aspects: first, in terms of sample coverage, the research scope can be extended from the existing market to multiple markets such as Hong Kong stock market and the US stock market, and the universality and heterogeneity characteristics of policy effects can be further analysed based on the institutional differences of different markets; Second, at the level of variable measurement,

text mining technology can be introduced to quantify the quality of information disclosure, so as to improve the accuracy and reliability of variable measurement. Thirdly, in the time dimension, this study can deeply explore the synergistic mechanism of policy mix and the dynamic response law of enterprises' green transformation to policies by introducing multi-period policy shocks and combining long-term tracking methods. Fourthly, in terms of impact separation, it is necessary to further distinguish the independent impact between information disclosure behavior and actual environmental improvement by combining the actual environmental data of enterprises, and clarify the boundary between the two. In conclusion, this study provides key empirical evidence for the market effect of ESG disclosure policy, and provides more accurate decision-making support for green finance and sustainable development practice through the expansion of methods and samples in the future.

## References

- [1] GSIA. Global Sustainable Investment Review. November 2022; August 1, 2025 <https://www.gsi-alliance.org/reports/global-sustainable-investment-review-2022/>.
- [2] Securities Association of China ESG Fund Development Report Annual Report of the Securities Association of China December 2023 August 1, 2025 [http://www.sac.net.cn/hyfw/hydt/202308/t20230825\\_183213.html](http://www.sac.net.cn/hyfw/hydt/202308/t20230825_183213.html).
- [3] MSCI. ESG Ratings Methodology for A Shares. MSCI ESG Rating Methodology Report. September 2023 August 1, 2025 <https://www.msci.com/documents/10199-74604d0d3b3a4e3e8b9d1c8e3e3e3e3e.pdf>.
- [4] G. Friede, T. Busch, & A. Bassen, ESG and financial performance: Aggregated evidence from more than 2000 empirical studies. *Journ. Finan. Econom.* 118 (3), 627 - 650 (2015).
- [5] O. Lopez-de-Foronda, et al. ESG and stock returns: A meta-analysis. *Journ. Bank. & Finan.* 144, 106537 (2022).
- [6] Z. Liu, et al. Greenwashing and ESG rating validity: Evidence from China. *Journ. Corpor. Finan.* 78, 102403 (2023).
- [7] Q.Y. Li, H.Y. Wang, ESG performance, risk compensation and stock returns: Evidence from China's a-share market. *China Indust. Econo.* 6, 156 - 174 (2021).
- [8] S. Shanaev, & B. Ghimire, ESG rating changes and stock returns: Evidence from US firms. *Journ. Financ. Quantit. Analy.* 57 (3), 1127 - 1158 (2022).
- [9] J.D. Angrist, & J.S. Pischke, mostly harmless econometrics. Princeton University Press. (Princeton, NJ; Release date: January 2008).
- [10] Business paths blend with greenery. White Paper on ESG Ratings of A-Shares. July 2022 August 1, 2024 <https://www.syntaogreen.com/reports/2022-esg-rating-white-paper/>.