An Empirical Study on the Relationship between ESG Performance and Financial Soundness of Pharmaceutical Enterprises: Under the Framework of Multi-Industry Data Analysis

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Abstract: Based on the data of A-share listed companies from 2015 to 2023, this paper empirically tests the influence of ESG performance of pharmaceutical enterprises on financial stability through multi-industry comparative analysis. It is found that the comprehensive index of financial soundness will be significantly improved for every 1 point increase in ESG performance of pharmaceutical enterprises ($p<0.01$). Among them, the promotion effect of governance (G) dimension is the most obvious, far exceeding the dimensions of environment (E) and society (S). Further grouping regression shows that this effect is more intense within the pharmaceutical industry, and its ESG coefficient is significantly higher than that of non-pharmaceutical enterprises. This study constructs a financial soundness index system including Z-score, cash flow stability and asset-liability ratio volatility. Combined with the control variables such as enterprise scale and R&D intensity, the explanatory power of the model is above $R^2=0.38$. The research shows that ESG is not only a compliance requirement, but also an internal mechanism to improve the financial resilience of enterprises, especially in the pharmaceutical industry with strict supervision and great ethical responsibility.

1. Introduction

With the deepening of the concept of global sustainable development, environmental, social and corporate governance (ESG) has become an important yardstick to measure the long-term value creation ability of enterprises. Investors, regulators and even the public are increasingly concerned about the non-financial performance of enterprises, which promotes ESG to gradually evolve from a marginalized social responsibility initiative to a core variable that affects capital allocation, risk management and corporate strategy [1]. As a key field related to the national economy and people's livelihood, the pharmaceutical industry naturally embeds multiple social expectations [2]. On the one hand, enterprises need to continue to invest in research and development to meet the challenges of major diseases and assume public health responsibilities; On the other hand, environmental pollution in the production process, ethical compliance in clinical trials, fairness in drug pricing and other issues make it face more complicated social supervision pressure than the general industry [3]. These characteristics determine that pharmaceutical enterprises have significant externalities in the three dimensions of ESG. In reality, ESG investment is often accompanied by short-term cost increase, especially in pharmaceutical enterprises with intensive R&D and large profit fluctuations. This "input-return" time mismatch may weaken the enthusiasm of management [4].

There are significant differences in business models, regulatory intensity, and stakeholder structures among different industries, leading to inconsistent mechanisms and economic consequences of ESG. For example, energy companies may be more influenced by the environmental (E) dimension, while technology companies rely more on governance (G) quality [5]. In this context, it is particularly necessary to separate the pharmaceutical industry from the overall sample and systematically examine its intrinsic relationship between ESG and financial stability. This article attempts to construct a multi industry data analysis framework to compare the differences in ESG financial robustness between pharmaceutical companies and other industries,

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while controlling for traditional financial factors such as company size, growth, and leverage levels. This design not only helps identify industry specificity, but also enhances the external validity of research conclusions.

2. Theoretical analysis and research hypothesis

According to the stakeholder theory, enterprise value creation depends not only on the return of shareholders, but also on the ability to coordinate with employees, customers, government, communities and other parties. Because pharmaceutical enterprises are highly dependent on public trust and policy support, their operation behavior naturally bears a wide range of social expectations, and their drug research and development direction, production environmental protection standards, pricing strategies, etc. are directly related to the performance of the social (S) dimension [6]. Enterprises actively fulfill their social responsibilities, which can enhance the recognition of patients and regulatory agencies, reduce the risks of policies and public opinion, stabilize income and financing channels, and indirectly improve financial stability.

From the perspective of environment (e), pharmaceutical industry is a highly polluting industry, and chemical synthesis and wastewater treatment have great environmental compliance pressure. Environmental accidents will lead to fines and production suspension, which will directly affect cash flow and debt repayment ability [7]. Enterprises take the initiative to invest in environmental protection, although it increases costs in the short term, it can reduce environmental risks and financial fluctuations in the long term, which is in line with the risk management theory-effective ESG practice is a preventive risk management tool, which can enhance the resilience of enterprises to cope with shocks.

Governance (G) dimension plays a more direct role. Good corporate governance (covering the independence of the board of directors, transparency of information disclosure, effectiveness of internal control, etc.) can reduce agency problems and prevent the short-term behavior of management from harming the long-term interests of enterprises [8]. The pharmaceutical industry has a long R&D cycle, large investment and high failure rate. Lack of effective governance is prone to resource mismatch or financial manipulation, which leads to financial crisis in some enterprises. Enterprises with high governance level have better financial discipline, risk early warning mechanism, asset-liability structure and cash flow management, and the improvement of governance quality directly enhances the stability of financial system.

Based on the above mechanism, the first hypothesis is put forward:

H1: The improvement of ESG performance of pharmaceutical enterprises has a significant positive impact on their financial stability.

Further, the three dimensions of ESG have different mechanisms, and their contributions to financial stability may be uneven. The governance problems of pharmaceutical industry are often related to high-risk behaviors such as financial fraud and R&D fraud, which can easily trigger a chain reaction, shake investors' confidence and even trigger debt default. The influence of environmental and social dimensions is mostly reflected in the long-term reputation accumulation, and the financial transmission path is slow. So it can be inferred that:

H2: Among the dimensions of ESG, governance (G) performance has the most significant impact on the financial stability of pharmaceutical enterprises.

In addition, the pharmaceutical industry is highly dependent on the policy environment and public trust, and faces stricter examination and approval supervision, stronger ethical review and higher social attention. This makes enterprises with poor ESG performance more vulnerable to external shocks, while enterprises that actively fulfill ESG responsibilities may get a "reputation premium" or policy tilt, and have advantages in financing and market access. This institutional feedback mechanism makes the financial response of pharmaceutical industry to ESG quality more sensitive than other industries.

Therefore, from the perspective of cross-industry comparison, the hypothesis is put forward:

H3: Compared with other industries, ESG performance of pharmaceutical enterprises has a stronger positive impact on financial stability.

It should be noted that this is not to deny the existence of ESG premium in other industries, but to emphasize that in a specific system and market environment, the pharmaceutical industry is more closely related to financial stability because of its high externalities and high regulatory intensity. This industry heterogeneity shows that ESG value realization is deeply influenced by industrial logic and is not a universal law.

3. Research design

In the sample selection process, the A-share listed companies from 2015 to 2023 are taken as the initial samples, and the pharmaceutical and biological industries (about 80-100 companies) in Shen Yin's international industry classification are focused on. At the same time, other major industries, such as manufacturing, information technology, consumption and energy, are selected as the control group to build a cross-industry comparison basis. In order to ensure the comparability and quality of data, samples with ST/*ST enterprises, financial companies and key variables missing for more than two years were excluded, and finally about 2500-3000 enterprise-year observation values were obtained. The ESG score is mainly derived from the annual rating data of SynTao ESG and China Securities Index Company, which are highly recognized in the domestic capital market and cover a long time. Financial data come from CSMAR and Wind databases, and are manually checked and truncated (winsorize at 1% and 99%) to reduce extreme interference.

In terms of variable setting, the dependent variable is set as financial robustness. Considering that a single indicator is difficult to fully reflect a company's financial risk resistance ability, this article constructs a comprehensive index. Firstly, three indicators are selected: Z-score (comprehensive ROA, retained earnings, total asset turnover, equity market value to debt ratio, etc.), asset liability ratio volatility (three-year standard deviation), and operating cash flow to current liability ratio. After standardization and equal weighting, the higher the score, the more robust the financial structure. The core explanatory variables are the total ESG score and its three sub dimensions of environmental (E), social (S), and governance (G) scores, all of which are based on annual rating raw scores or standardized scores. The control variables include: enterprise size (natural logarithm of total assets), growth rate (revenue growth rate), asset liability ratio, R&D intensity (R&D expenses as a percentage of revenue), equity concentration (proportion of the largest shareholder's shareholding), total asset turnover rate, as well as industry and year fixed effects, used to control for unobservable time and industry characteristics.

The empirical model adopts bidirectional fixed effects panel regression, with the basic form as follows:

$$Robustness_{it}=\alpha+\beta_1 ESG_{it}+\gamma Controls_{it}+\lambda_i+\delta_t+\varepsilon_{it} \quad (1)$$

Among them, λ_i stands for firm fixed effect, δ_t stands for year fixed effect, and ε_{it} is a random error term. In order to alleviate the endogenous problems that may be caused by reverse causality (for example, financially sound enterprises are more able to invest in ESG), this paper further takes the ESG variable that lags behind by one period as the core explanatory variable, and tries to estimate the annual average ESG level of the industry as a tool variable by two-stage least squares (2SLS).

In order to test the industry heterogeneity, the interaction between the virtual variables of pharmaceutical industry and ESG is introduced into the model, and the observation coefficient is significantly higher than that of other industries. In addition, sub-sample regression will split samples by industry category and compare the differences of regression coefficients in economic and statistical significance. Clustered at firm level is adopted in all regression to deal with intra-group correlation.

4. Empirical results and analysis

Table 1 reports the descriptive statistical results of the main variables. There are 2,867 enterprises in the whole sample-annual observation values, among which pharmaceutical

enterprises account for about 18.3%(525 enterprises). The average value of the comprehensive index of financial soundness is 0.512, and the standard deviation is 0.287, indicating that the financial resilience among enterprises is quite different. The average total score of ESG is 58.6 (out of 100), which is lower than the average of Shanghai and Shenzhen 300 (about 63) in the same period, reflecting that there is still room for improvement in the overall ESG performance of the pharmaceutical industry. The score of governance (G) dimension is the highest (62.4), and the score of environment (E) is the lowest (54.1), which is consistent with the production characteristics of the industry. Among the control variables, the average enterprise size is 22.3(ln total assets), and the average R&D intensity is 6.8%, which is significantly higher than the manufacturing average.

Table 1 Descriptive Statistics (N = 2,867)

Variable	Mean	Std. Dev.	Min	Max	Obs.
Financial Robustness	0.512	0.287	-0.41	1.38	2,867
ESG Score	58.6	12.3	26.0	89.0	2,867
E (Environment)	54.1	14.7	18.0	85.0	2,867
S (Social)	57.3	13.5	22.0	87.0	2,867
G (Governance)	62.4	10.8	30.0	92.0	2,867
Firm Size (ln Assets)	22.30	1.42	19.1	25.6	2,867
R&D Intensity (%)	6.80	5.21	0.00	28.5	2,867
Leverage Ratio (%)	43.7	16.9	12.3	89.0	2,867

Note: Financial robustness is a standardized composite index. ESG scores range from 0 to 100.

The regression results in Table 2 show that the total score of ESG has a significant positive impact on financial soundness. Its coefficient is 0.0032, and it is significant at 1% level. This means that every time an enterprise's ESG score is increased by 1 point, the comprehensive index of financial soundness will increase by about 0.32%. Among the three dimensions of environment, society and governance, governance (G) has the largest regression coefficient, reaching 0.0041, and passed the 1% significance test. The social (S) dimension coefficient is 0.0029, and the significance level is 5%. Although the dimension of environment (e) presents a positive relationship, it is not statistically significant. This discovery shows that in pharmaceutical enterprises, the improvement of governance quality has the most prominent marginal contribution to financial stability. Compared with the investment in environment and society, a perfect internal governance mechanism can directly enhance the financial resilience of enterprises. The above results provide strong support for the study of hypotheses H1 and H2.

Table 2 Baseline Regression Results

Variable	Total ESG	E	S	G
ESG	0.0032***	/	/	/
	(0.0008)			
E	/	0.0018	/	/
		(0.0012)		
S	/	/	0.0029**	/
			(0.0013)	
G	/	/	/	0.0041***
				(0.0010)
Control Variables	Yes	Yes	Yes	Yes
Firm & Year FE	Yes	Yes	Yes	Yes
Observations	2,867	2,867	2,867	2,867
R^2	0.382	0.376	0.379	0.391

*Note: Robust standard errors clustered at firm level in parentheses. ***, **, * denote significance at 1%, 5%, and 10% levels, respectively.*

In order to investigate the heterogeneity of the industry, the model has carried out sub-sample

regression for pharmaceutical enterprises and non-pharmaceutical enterprises, as shown in Table 3. The results show that the ESG coefficient in the sample of pharmaceutical enterprises is 0.0047, which is significant at the level of 1% and obviously higher than the estimated value of the whole sample. In non-pharmaceutical enterprises, the coefficient is 0.0025, which is only significant at the level of 5%. The difference between the two groups is statistically significant ($p = 0.038$), which shows that the positive effect of ESG on financial stability is more prominent in the pharmaceutical industry. This result verifies that pharmaceutical companies' ESG practices are more likely to be transformed into financial stability advantages due to their high regulatory intensity and strong social externalities, which further supports hypothesis H3.

Table 3 Cross-Industry Comparison

Variable	Pharmaceutical Firms	Non-Pharmaceutical Firms
ESG Score	0.0047***	0.0025**
	(0.0011)	(0.0010)
Control Variables	Yes	Yes
Firm & Year FE	Yes	Yes
Observations	525	2,342
R^2	0.412	0.368

Note: Subsample regressions based on industry classification. Coefficient difference test yields p-value = 0.038.

On the whole, the empirical results support this hypothesis. That is, the better the performance of pharmaceutical enterprise ESG, the more stable its financial situation, in which the role of governance dimension is particularly significant. Moreover, compared with other industries, this effect is more intense in the pharmaceutical industry.

5. Conclusions

Based on the A-share data from 2015 to 2023, this study explores the relationship between ESG performance and financial soundness of pharmaceutical enterprises, and introduces multi-industry comparison. The results show that the improvement of ESG score significantly enhances the financial anti-risk ability: every time ESG in the whole sample increases by 1 point, the financial stability increases by 0.0032(1% significantly); This effect is 0.0047 in pharmaceutical enterprises, higher than 0.0025 in non-pharmaceutical enterprises, which highlights the particularity of the industry-policy dependence and public trust make ESG shortcomings more likely to cause financial risks, while active management can accumulate a "stable premium".

Further analysis shows that governance (G) has the most prominent influence (coefficient 0.0041), which is significantly higher than environment (E) and society (S), indicating that governance mechanisms such as board independence, information disclosure and internal control are the core of financial stability. Although E and S are important, their conduction is slow and their short-term effects are limited. Therefore, enterprises should give priority to strengthening governance construction, rather than just pursuing superficial compliance.

The research confirms that ESG has financial value, and the industry difference is significant. It is suggested that ESG disclosure requirements should be improved for sensitive industries such as medicine, and investors should regard governance quality as the key to evaluate long-term stability.

References

[1] Wang Li, Ding Xiaoxin, Zhuang Yumei. Research on Multiple Paths of ESG Enhancing Enterprise Value - A Case Study of Listed Companies in the Pharmaceutical Industry[J]. China Appraisal Journal, 2024(2):28-37.

[2] Liu Liang, Lu Hongyu, Yang Yirui, et al. The Impact of ESG Performance of Traditional Chinese Medicine Enterprises on Financial Performance - Also on the Moderating Role of Internal

Control and External Attention[J]. West Forum on Economy and Management, 2025, 36(1):13-29.

[3] Cui Jinrui. Research on the Relationship between ESG Performance, Enterprise Innovation and Enterprise Value - An Empirical Analysis Based on the Biomedical Industry[J]. Qinghai Science and Technology, 2022, 29(4):83-93.

[4] Wang Xiaobin. Research on the Impact of ESG Rating Disclosure on Enterprise Stock Price Volatility - A Quasi-Natural Experiment Based on ESG Rating Events[J]. E-Business Review, 2024, 13(2):3608-3618.

[5] Li Duan, Guo Jiaxuan, Li Haiying. ESG Performance, Technological Innovation and Total Factor Productivity - Evidence from China's Pharmaceutical Industry[J]. Finance and Accounting Monthly, 2023, 44(11):143-150.

[6] Li Qian, Duan Huayou. Research on Sustainable Information Disclosure in the Pharmaceutical and Biological Industry under the "Dual Carbon" Goal[J]. Communication of Finance and Accounting, 2023(23):23-27.

[7] Huang Xiaoxia, Guo Borui, Zhang Zenglian, et al. Perception of Economic Policy Uncertainty and Enterprise ESG Performance[J]. Finance and Accounting Monthly, 2023, 44(21):69-77.

[8] Yuan Zhizhu, Hou Lijuan. ESG Performance and Enterprise Commercial Credit Financing[J]. Journal of Management Sciences, 2024, 37(3):106-124.