**Original Research Article**

# The Impact of ESG Performance on the Change of Z-score Before and After the COVID-19 - Taking Chinese A-share Manufacturing Industry as A Sample


## Abstract

Since the outbreak of the COVID-19, many companies around the world have fallen into financial difficulties to varying degrees due to various factors. But there are also a lot of companies that have taken on more corporate social responsibilities than usual during the epidemic. This study uses the A-share manufacturing industry of Chinese listed companies from 2019, 2020, and the third quarter of 2021 as the research samples, and empirically probes the impact of ESG performance on changes in the Z-score of companies before and after the COVID-19. The results of the study found that during the epidemic, the better the ESG performance, the more unfavorable the overall financial situation of the company. However, if the company that ESG performance remained the same or even improved compared with last year would significantly improve the overall financial situation of the company. The improvement was even more pronounced for companies at the high level of financial physique. In addition, after the recovery of the epidemic, the performance of ESG has no significant impact on the overall financial situation of the company, but companies with better financial situation recovery can significantly improve the Z-score of the company if the ESG performance can be on par with the previous period or even improve. According to the empirical research results, this study also puts forward corresponding suggestions.



Keys： ESG； Z-score model； COVID-19




## 1 Introduction

**Comment [n1]:** The abstract focuses more on the research findings. This article presented the research findings, but it was not accompanied by a brief explanation of the significance of these findings or the reasons that support these findings.
As an example, the better the ESG performance, the more unfavorable the company's overall financial situation. This statement was not accompanied by a brief explanation.

**Comment [n2]:** The introduction describes why this research is needed, and how previous studies' findings indicate that more research on ESG performance is needed. It also discusses the research objectives related to the variables used, the relationship between variables, and the methods used. This article only discusses aspects of ESG performance in the introduction but does not mention the variables used, the reasons for using these variables, or the methods used.

Due to the COVID-19 and the various epidemic prevention measures in various countries, the economic exchanges between the two countries have been restricted to varying degrees. This has led many enterprises around the world to fall into varying degrees of financial difficulties. At the same time, people are increasingly aware of the impact of natural disasters and public health events on enterprises. Thanks to this global economic environment, the green investment concept of environment, social, and governance (ESG) has been paid more and more attention. During the COVID-19, many enterprises took the initiative to undertake corporate social responsibility (CSR) to lend a helping hand to the broad masses of the people, donating funds and materials, maintaining their due rights and interests to enterprise employees, providing people with home-based convenience services during the epidemic period, etc. It has made great contributions to the national anti-epidemic and the country. However, the increased costs of enterprises due to social responsibility will inadvertently increase the non-operating costs of enterprises. In theory, this damages the interests of shareholders. Therefore, some scholars believe that CSR will hurt the financial and operating conditions of enterprises. However, in modern times, more and more scholars have found that the effect of social responsibility may take a long time to play a role (Chen, 2021), and some scholars believe that the implementation of social responsibility needs to be effective only under the premise of information disclosure (Fang, 2020). At present, the epidemic control effect is good in China, and the overall economy has begun to recover steadily, but the recovery status and progress among enterprises are different. Based on this, this paper hopes to explore whether CSR will have an important impact on the improvement of the financial physique after the COVID-19 through empirical research. The influence of COVID-19 is enormous and wide. It is a good opportunity to verify whether the implementation of social responsibility can create a "win-win" situation between enterprises and stakeholders. At present, there are only a few pieces of literature on this topic in China. This paper will use empirical methods to explore the impact of the implementation of corporate social responsibility on the improvement of the financial situation after the epidemic. Considering the large differences in operating conditions among enterprises, quantile regression and the

ordinary least square (OLS) method are used for comparative analysis. It is expected to improve the practical reference value of this paper.

## 2 Literature Review

Referring to the relevant academic literature, most studies believe that ESG is positively correlated with the financial performance of enterprises. The following is a summary of the research on the relationship between E, s and G and the financial situation of the enterprise as a whole:

In terms of environmental performance, most of the research conclusions show that environmental performance has a positive correlation to improving corporate financial distress. Liu (2021) believes that improving environmental performance can largely avoid resource waste, save environmental protection investment and obtain potential benefits of a good environment. The research of Charles et al（2021） shows that enterprises actively consider the performance of environmental responsibilities in business decisions, which can have a crucial impact on the company's reputation, to obtain better competitive advantage and financial performance. Xu and Zhang (2020) pointed out that the adoption of rules and systems in line with environmental protection in the process of production and operation can affect the operation effect of enterprises, and effectively improve the income level of enterprises while expanding environmental protection investment. Jia and Wang (2018) study from the perspective of long-term development of enterprises, in the early stage of implementing environmental protection system, due to the lack of experience and equipment, business activities will face greater risks and cost pressure. At this time, there is a negative correlation between the two. When the enterprise has accumulated certain experience and ability and breaks through certain boundaries, Enterprises can get benefits from the environmental investment. At this time, there is a positive correlation between financial performance and environmental performance. In terms of social responsibility, Wu and Liu (2021) took the listed companies in Shanghai and Shenzhen from 2009 to 2019 as samples to test the impact of corporate social responsibility. They believe that there is a significant negative correlation between CSR. The better the quality of social responsibility in the

current period, the safer the enterprise is, the less likely it is to fall into financial difficulties. The research of Zhong et. al. (2021) shows that the higher the quality of corporate social report information disclosure, the less the lack of social responsibility. Accordingly, it has a positive regulatory effect on financial performance and promotes the sustainable development of enterprises. According to the research of Zhu and Li (2021), enterprises need to invest certain funds in the practice of social responsibility, but the vast majority of managers do not use this fund effectively, which will erode financial performance and have a certain negative impact, and the improvement of social responsibility on the financial situation of enterprises also needs a certain business cycle. The research results of foreign scholars Jahmanea and Gaies (2020) show that CSR has a positive and significant impact on the return on total assets and shareholders' equity. In terms of corporate governance, Zhang and Li (2017) found that the level of corporate governance is negatively correlated with financial distress, A high level of corporate governance can obtain more resource support and reduce financial risks. Ma and Wei (2015) believe that the introduction of corporate governance factors has greatly improved the emergence of financial distress of listed companies, in which the education level of the chairman of the board of directors is positively correlated with the recovery of corporate financial distress, and the degree of equity concentration and the correlation of the top ten shareholders are negatively correlated with the recovery of financial distress, There is no significant correlation between the shareholding ratio of senior executives and the emergence of financial distress. Zhang (2014) believes that the more concentrated the equity, the larger the size of the board of directors, the more independent directors, and the more meetings of the board of supervisors, the better the corporate governance and the less likely the enterprise is to fall into financial difficulties. As for the overall performance of ESG, Qureshi et al. (2021) found that companies with good ESG indicators are more favored by investors and will improve enterprise operation and market performance. Díaz et al. (2021) studied the impact of ESG on the financial situation of enterprises during the epidemic and believed that different industries were affected by ESG to varying degrees, but it is undeniable that ESG played a strong role in helping enterprises get out

of financial difficulties. Madison and Schiehll (2021) believe that ESG has become an important reference for stakeholders' investments. Enterprises that get high scores on ESG are less likely to fall into financial difficulties, but the investment cost of ESG will affect financial performance in a short time, so enterprises need to further optimize the relationship between ESG and financial indicators. Zhang and Zhao (2019) found that ESG performance has a significant positive impact on the financial status of non-state-owned enterprises, small-scale enterprises, and non-polluting enterprises. Jun et al. (2018) believe that there is a positive correlation between ESG's moderate disclosure and financial performance, but high-level and low-level disclosure will reduce the company's economic benefits, and governance factors are the key to improving corporate finance.

In addition, some scholars hold different opinions. For example, Xiong and Chen (2016) believe that improving the social performance of enterprises will damage the financial situation, and the investment effect on the environment is lagging, which will affect the financial performance of enterprises to a certain extent, which is easy to make enterprises fall into financial difficulties. Chen and Li (2014) believe that there is no significant correlation between environmental performance and improving the financial performance of enterprises because the income and reward brought by environmental performance are not greater than the expenditure borne by enterprises in fulfilling their environmental responsibilities, so the effect of environmental performance on improving the financial distress of enterprises is not obvious. Some scholars also believe that the relationship between financial performance and environmental performance is not a simple linear relationship, but a U-shaped curve. Chen (2021) believes that social responsibility has a lagging positive correlation with financial performance, mainly because small and medium-sized companies have a small scale and high operating costs, and the funds invested in fulfilling social responsibility will affect the performance of short-term financial performance. Li (2018) believed that there was no significant correlation between the size of the board of directors and the number of meetings and financial distress, the nature of the controller in the ownership structure in the governance structure and the degree of ownership

concentration were negatively correlated with financial distress, and the degree of equity balance was positively correlated with financial distress.

Based on the research of the above scholars, it is inferred that the research hypothesis of this paper is:

H1: there is a positive correlation between ESG performance and overall financial performance.

## 3 Methodology

Z-score is a financial evaluation model suitable for the manufacturing industry. Considering that the impact of the COVID-19 has rebounded in the fourth quarter of 2020, this paper selects the manufacturing industry rated by ESG among Chinese A-share listed companies from 2019, 2020, and the third quarter of 2021 as the sample. The manufacturing industry is followed by the definition of the China Securities Regulatory Commission (CSRC) as railway, ship, aerospace, and other transportation equipment manufacturing industry, computer, communication, and other electronic equipment manufacturing industry, electrical machinery and equipment manufacturing industry, pharmaceutical manufacturing industry, culture and education, industrial beauty, sports, and entertainment products manufacturing industry, chemical fiber manufacturing industry, leather, fur, feather, and their products and footwear industry, automobile manufacturing, instrument manufacturing, chemical raw materials, and chemical products manufacturing, special equipment manufacturing, furniture manufacturing, wine, beverage, and refined tea manufacturing, food manufacturing, and other manufacturing. All sample data are obtained from WIND and CSMAR databases. After downloading the data, delete the incomplete samples first, and then delete the extreme values. 501 samples are obtained from 2019 to 2020 and the third quarter of 2020 to the third quarter of 2021. Considering the different operating conditions of the sample companies, to improve the practical reference value of the research results of this paper, a more in-depth discussion will be carried out. In terms of research methods, in addition to the least square method, the explained variables will be analyzed by quantile regression from low to high scores of 25%, 50%, and 75%. In terms of variable setting, considering the sustainability of the ESG effect, add an ESG

**Comment [n3]:** There is no justification for using the z score to evaluate a company's financial performance in methodology

rating variable without regression to increase the integrity of the model. The following is the ordinary least squares and quantile regression model:

The change from 2019 to 2020:

$$\Delta ZSCORE_{it} = \alpha_0 + \alpha_1 ESG_{it} + \alpha_2 NOREG_{it} + \alpha_3 GRI_{it} + \alpha_4 SCALE_{it} + \alpha_5 AGE_{it} + \alpha_6 STATE_{it} + \alpha_7 IND_{it} + \alpha_8 ROA_{it} + \alpha_9 GPROFIT_{it-1} + \alpha_{10} ATO_{it-1} + \alpha_{11} DEBT_{it-1} + \alpha_{12} RGROWTH_{it-1} + \alpha_{13} AUDIT_{it-1} + \varepsilon_{it} \ldots\ldots (1)$$

The change from the third quarter of 2020 to the third quarter of 2021:

$$\Delta ZSCORE_{it} = \alpha_0 + \alpha_1 ESG_{it} + \alpha_2 NOREG_{it} + \alpha_3 GRI_{it} + \alpha_4 SCALE_{it} + \alpha_5 AGE_{it} + \alpha_6 STATE_{it} + \alpha_7 IND_{it} + \alpha_8 ROA_{it} + \alpha_9 GPROFIT_{it-1} + \alpha_{10} ATO_{it-1} + \alpha_{11} DEBT_{it-1} + \alpha_{12} RGROWTH_{it-1} + \alpha_{13} AUDIT_{it-1} + \varepsilon_{it} \ldots\ldots (2)$$

Variable description:

1. Dependent variable: This paper uses the change of Z score (Δ ZSCORE) as the dependent variable, that is, the increase or decrease of Z score in the current period and the previous period. Altman (1968) initially reflected the overall financial situation and risk of the enterprise through five aspects: asset scale, liquidity, profitability, total asset turnover, and financial structure. Subsequently, Liao and Ying (2011) developed a Z-score model suitable for China based on Altman (1968), as follows:

   Z=0.295-0.715X1+7.083X2-0.42X3+0.308X4-1.395X5+2.203X6-0.265X7-1.327X8-0.835X9+1.576X10+1.092X11-0.034X12-0.716X13+0.018X14-0.626X15-0.17X16。

   Where X1 = return on equity; X2 = return on total assets; X3 = earnings per share; X4 = retained earnings per share; X5 = gross profit; X6 = operating profit; X7 = asset turnover rate; X8 = debt ratio; X9 = current ratio; X10 = acid ratio; X11 = growth rate of revenue; X12 = the growth ratio of net profit; X13 = the growth rate of total assets; X14 = the growth rate of earnings per share; X15 cash flow divided by liability; X16 the type of audit opinion. If the Z-value> 2.675 means a good financial condition; if $1.81 \leq Z \leq 2.675$, the financial status is in a gray area; if the Z-value< 1.81 means the possibility of financial failure is very high. This paper

uses the Z-score Model developed by Liao and Ying (2011) as the variable calculation basis of empirical research.

2. Independent variable:

2.1 ESG score (ESG): at present, there are many ESG rating agencies for listed companies in China, such as the Sino-Securities Index Information Service (Shanghai) Co. Ltd, the China Alliance of Social Value Investment (CASVI), and Rankins CSR Ratings (RKS). This paper adopts the rating results of the CASVI index. The CASVI was established in September 2017 and it is an independent third-party professional service organization for various asset management institutions, mainly providing comprehensive services of index and index investment. Moreover, the company has obtained the authorization of the Shanghai Stock Exchange and Shenzhen Stock Exchange, focusing on the research and development of index and index investment, and provides whole industry chain services including research and consultation, product design, marketing promotion, valuation, and data information. Its rating method has the characteristics of being close to the Chinese market, wide coverage, and high timeliness, the rating results are published in time every quarter, so this paper selects the rating results of CASVI as the ESG variable and converts the rating into corresponding scores. The CASVI rating is divided into nine levels, from low to high, which are C, CC, CCC, B, BB, BBB, a, AA, and AAA respectively. This paper converts them into scores of 1-9 respectively.

2.2 Compared with the previous period, there is no regression (NOREG): referring to the research of Zhang and Zhao (2019), ESG is a behavior with long-term impact. Therefore, whether the ESG rating remains at the level of the previous period is set as one of the variables in the research design, to understand the relationship between the deferred effect of ESG and the implementation performance of the two years at the same time. This variable is a dummy variable. If it is not backward from the previous period, it is set to "1", otherwise it is set to "0"

2.3 Disclosure of social responsibility report (GRI) by GRI reporting guidelines: learning from the research of Zhong et. al. (2021), the active disclosure of social responsibility reports is conducive to the implementation effect of ESG. Therefore, whether the social responsibility report is disclosed by GRI reporting guidelines is set as one of the variables, which is a virtual variable. If the sample companies disclose the implementation of ESG by GRI reporting guidelines, it is set as "1", otherwise set to "0"

3. Control variables:

3.1 Firm's scale (Scale): Based on the research of Gu and Wang (2010), it is found that the size of the company has a significant impact on the financial structure. Therefore, this paper uses the company size as one of the control variables. This paper takes the total assets of the sample company as the alternative variable of the company size, and narrows the absolute value gap between this variable and other variables, but does not affect the relative relationship, So take its natural logarithm.

3.2 Age of the company(AGE): referring to the research results of Xia (2019), the age of the company has a significant impact on the financial structure. Therefore, this paper uses the age of the company as one of the control variables, and the calculation basis is the number of years from the year of establishment to June 30, 2021

3.3 Property right nature (STATE): according to the research Gao (2018), state-owned enterprises are one of the characteristics of Chinese governance and have a significant impact on the financial situation of enterprises. Therefore, this paper selects the property right nature as one of the control variables, which is a virtual variable. If it is a state-owned enterprise, set it to '1', otherwise set it to '0'

3.4 Industry: (IND): according to the notice of the General Tax Bureau of the Ministry of Finance of February 7, 2020, Announcement No. 8, concerning the tax policies for preventing and controlling the COVID-19, points out that the enterprises in difficult industries include four major categories: transportation,

catering, accommodation, and tourism. So industries related to above four are set as virtual variables. If those related to these four industries are set as "1", otherwise set as "0".

3.5 Since the change of Z-score compared with the previous year is related to the values of various indicators of the previous year, this paper summarizes the 16 indicators of the Z-score Model according to their nature, deletes the indicators with the same nature, and selects five indicators: return on net assets (ROE), the growth rate of the gross profit (GPROFIT), total asset turnover rate (ATO), debt ratio (DEBT) and audit opinion type (AUDIT) as the control variables.

## 4 Results

Table 1 descriptive statistics of variables in 2019 and 2020 (N = 501)

| | Min. | Max. | Ave. | SDV. |
|---|---|---|---|---|
| ΔZSCORE | -2.374 | 4.879 | 0.141 | 0.945 |
| ESG | 4.000 | 9.000 | 7.497 | 0.907 |
| NOREG | 0.000 | 1.000 | 0.894 | 0.308 |
| GRI | 0.000 | 1.000 | 0.271 | 0.445 |
| SCALE | 11.295 | 17.267 | 13.924 | 1.344 |
| AGE | 9.049 | 35.986 | 21.756 | 5.221 |
| STATE | 0.000 | 1.000 | 0.533 | 0.499 |
| IND | 0.000 | 1.000 | 0.168 | 0.374 |
| ROE | -0.700 | 0.352 | 0.083 | 0.137 |
| GPROFIT | 0.037 | 0.835 | 0.294 | 0.180 |
| ATO | 0.166 | 2.368 | 0.736 | 0.401 |
| DEBT | 0.064 | 0.884 | 0.439 | 0.183 |
| RGROWTH | -0.448 | 1.025 | 0.083 | 0.215 |
| AUDIT | 0.000 | 2.000 | 0.046 | 0.261 |

Note: for the description of each variable, please refer to 3 Methodology.

From the data in Table 1, it can be seen that the minimum value of the change proportion of Z-score is -2.374 and the maximum value is 4.879. The financial status of the sample enterprises is in good condition, and there are also enterprises with less ideal

**Comment [n4]:** In addition to reading the results of data processing, a discussion of research findings in relation to theory, previous research, and research data that support the discussion should be carried out. This article's discussion of the results is simply reading statistical results without any discussion that is supported by supporting theories and previous research. The discussion should be interesting because the characteristics of companies in each country differ sufficiently for readers to understand the characteristics of Chinese companies. Unfortunately, the discussion is not available in this article.

operation status. However, from the average value of 0.141, the overall financial situation of the sample enterprises is in a downward trend. The value range of ESG is 4-9, and the overall average value is 7.497. After corresponding to the rating of the China Securities Index, the ESG rating of the sample enterprises is basically above B, and the average rating level is a, which is relatively good. The average value of the GRI index is 0.271. It can be inferred that the proportion of sample enterprises actively disclosing social responsibility according to GRI standards is low. The average value of NOREG is 0.894, which is relatively high. It can be seen that most enterprises can stably assume certain social responsibilities, and there are few setbacks.

Table 2 Descriptive statistics of variables in the third quarter of 2020 and the third quarter of 2021 (N = 501)

| | Min. | Max. | Ave. | SDV. |
|---|---|---|---|---|
| ΔZSCORE | -1.520 | 4.816 | 0.873 | 0.916 |
| ESG | 4.000 | 9.000 | 7.497 | 0.907 |
| NOREG | 0.000 | 1.000 | 0.924 | 0.265 |
| GRI | 0.000 | 1.000 | 0.271 | 0.445 |
| SCALE | 11.412 | 17.261 | 14.029 | 1.347 |
| AGE | 10.049 | 36.986 | 22.756 | 5.221 |
| STATE | 0.000 | 1.000 | 0.533 | 0.499 |
| IND | 0.000 | 1.000 | 0.168 | 0.374 |
| ROE | -0.249 | 0.349 | 0.094 | 0.094 |
| GPROFIT | 0.036 | 0.853 | 0.287 | 0.180 |
| ATO | 0.148 | 2.601 | 0.707 | 0.404 |
| DEBT | 0.076 | 0.866 | 0.441 | 0.177 |
| RGROWTH | -0.468 | 1.035 | 0.084 | 0.236 |
| AUDIT | 0.000 | 1.000 | 0.028 | 0.165 |

Note: for the description of each variable, please refer to 3 Methodology.

Table 2 shows that compared with 2019-2020. The maximum value of the increase and decrease of Z score is basically the same as that of the previous year, but the overall average increases greatly. It can be inferred that the financial recovery of the

sample enterprises is better from the third quarter of 2020 to the third quarter of 2021. At the same time, it can be seen from the ESG rating results and whether the data are regressive or not that the overall ESG performance is consistent with that of the previous period, and a higher proportion of sample companies maintain at least the same performance as that of the previous period. As for the average value of GRI index, it is still the same as that of the previous year, and there is no significant increase compared with the two periods. The distribution of the data of other control variables is different, which shows that the operating conditions of the sample companies are very different. Comprehensively, the research method of quantile regression in this paper will improve the practical reference of the research results.

Table 3 the OLS results of model (1) (N = 501)

| | Coefficient | t | p | VIF |
|---|---|---|---|---|
| Con_ | 0.689 | 1.135 | 0.257 | |
| ESG | -0.164 | -2.947 | 0.003*** | 1.552 |
| NOREG | 0.530 | 3.420 | 0.001*** | 1.384 |
| GRI | -0.016 | -0.167 | 0.868 | 1.163 |
| SCALE | -0.006 | -0.151 | 0.880 | 1.776 |
| AGE | -0.006 | -0.734 | 0.464 | 1.079 |
| STATE | 0.146 | 1.700 | 0.090* | 1.119 |
| IND | 0.117 | 1.066 | 0.287 | 1.023 |
| ROE | -0.512 | -1.262 | 0.207 | 1.872 |
| GPROFIT | 0.516 | 1.733 | 0.084 | 1.741 |
| ATO | -0.154 | -1.249 | 0.212 | 1.483 |
| DEBT | 0.803 | 2.626 | 0.009*** | 1.898 |
| RGROWTH | -0.410 | -1.929 | 0.054* | 1.273 |
| AUDIT | 0.298 | 1.667 | 0.096* | 1.319 |
| F value | 4.353 | Significance | *** | |

Note 1: for the description of each variable, please refer to 3 Methodology.

Note 2: when p < = 0.01, the significance is * * *, when 0.01 < p < = 0.05, the significance was * *, 0.05 < p < = 0.1, the significance is *.

Table 4 the OLS results of model (2) (N = 501)

| | Coefficient | t | p | VIF |
|---|---|---|---|---|
| Con_ | -0.423 | -0.668 | 0.504 | |
| ESG | 0.009 | 0.147 | 0.883 | 1.392 |
| NOREG | 0.176 | 1.076 | 0.282 | 1.310 |
| GRI | -0.020 | -0.217 | 0.829 | 1.150 |
| SCALE | 0.078 | 2.168 | 0.031** | 1.645 |
| AGE | -0.020 | -2.633 | 0.009*** | 1.098 |
| STATE | -0.072 | -0.904 | 0.367 | 1.092 |
| IND | -0.077 | -0.754 | 0.451 | 1.030 |
| ROE | -1.157 | -2.307 | 0.021** | 1.553 |
| GPROFIT | 1.962 | 7.225 | 0.000** | 1.671 |
| ATO | 0.014 | 0.125 | 0.900 | 1.387 |
| DEBT | 0.127 | 0.441 | 0.660 | 1.819 |
| RGROWTH | -0.663 | -3.615 | 0.000*** | 1.311 |
| AUDIT | 0.483 | 1.907 | 0.057* | 1.221 |
| F value | 7.593 | Significance | *** | |

Note 1: for the description of each variable, please refer to 3 Methodology.

Note 2: when $p <= 0.01$, the significance is * * *, when $0.01 < p <= 0.05$, the significance was * *, $0.05 < p <= 0.1$, the significance is *.

Before analyzing the empirical results, first, examine the rationality of the research model. It can be seen from table 3 and table 4 that the F values of the two-stage regression models are significant, indicating that the design of the linear regression model in this paper is predictive. In the selection of regression model variables, it is observed that the VIF values of all variables in the two tables are between 1.023-1.898 and no more than 10, indicating that the variables of the regression model have no obvious homogeneity. Therefore, it can be judged that the research model design and variable selection of this paper should be appropriate, and then the empirical analysis is carried out.

Table 5 the quantile regression results of model (1) (N = 501)

| Variable | 25% | 50% | 75% | OLS |
|---|---|---|---|---|
| Con_ | -1.220** | 0.445 | 1.524*** | 0.689 |
| ESG | -0.017 | -0.037 | -0.153*** | -0.164*** |
| NOREG | 0.250* | 0.065 | 0.329** | 0.530*** |
| GRI | -0.014 | 0.035 | 0.067 | -0.016 |
| SCALE | 0.022 | -0.030 | -0.041 | -0.006 |
| AGE | 0.003 | 0.004 | -0.002 | -0.006 |
| STATE | 0.011 | -0.012 | -0.048 | 0.146* |
| IND | 0.048 | 0.019 | -0.007 | 0.117 |
| ROE | 0.645* | 0.152 | -1.017*** | -0.512 |
| GPROFIT | 0.369 | 0.272 | 0.773*** | 0.516* |
| ATO | -0.151 | -0.188** | -0.028 | -0.154 |
| DEBT | 1.198*** | 0.649*** | 0.657** | 0.803*** |
| RGROWTH | -0.720*** | -0.468*** | -0.479** | -0.410* |
| AUDIT | 0.216 | 0.313*** | 0.513*** | 0.298* |

Note 1: for the description of each variable, please refer to 3 Methodology.

Note 2: when $p <= 0.01$, the significance is * * *, when $0.01 < p <= 0.05$, the significance was * *, $0.05 < p <= 0.1$, the significance is *.

Quantile regression can comprehensively evaluate the parameter estimation of various factors at different quantiles, while the least square method only considers the average level. Therefore, we use the least square method and quantile regression to conduct regression analysis at the same time. Based on solving the problem of sample selection error, we investigate the impact of various factors on the financial situation after the epidemic at different quantiles. The empirical results of the least square method in Table 5 show that the changes of ESG and the overall financial performance of the enterprise show a negative significant impact, which means that during the outbreak of the epidemic, the better the performance of ESG in the current period, the worse the overall financial performance of the enterprise; However if the performance of ESG is not lower or even better than that of the previous period, it will improve the overall financial performance of the enterprise. However, we further explore the

empirical results of quantile regression and find that among the levels with the most (or the least) increase in Z-score, ESG performs better, which has a particularly adverse impact on the overall financial performance. However, if this type of enterprise can maintain the same value or even make progress in ESG performance, On the contrary, it can promote the overall financial performance. As for the companies whose Z-score growth is at the middle and low levels, the performance of ESG has no significant impact on the overall financial situation. Only for the companies whose progress is at the low level, if the ESG remains unchanged or even makes progress compared with the previous period, it is conducive to the overall financial performance.

During the outbreak of the epidemic, the economy will be affected in a wide range, and enterprises engaged in social responsibility will receive more attention and praise than before, so they will have greater support for the operation of enterprises; However, the cost of CSR is also very high. Therefore, if only social responsibility is invested in the current period, it will inevitably harm the financial situation of the enterprise. However, if the enterprise continues to invest in social responsibility, the return will be more obvious in such an extraordinary period. It is worth noting that the initiative to disclose the implementation of social responsibility by the GRI reporting guidelines has no effect during this period. This may be because the implementation of CSR during the epidemic will be more widely concerned and emphasized than usual, so whether there is a written report is less important.

Table 6 the quantile regression results of model (2) (N = 501)

| Variable | 25% | 50% | 75% | OLS |
|---|---|---|---|---|
| Con_ | -0.744 | -0.455 | 0.095 | -0.423 |
| ESG | 0.013 | -0.023 | -0.017 | 0.009 |
| NOREG | 0.014 | 0.074 | 0.365* | 0.176 |
| GRI | 0.074 | 0.015 | 0.019 | -0.020 |
| SCALE | 0.055** | 0.075*** | 0.104** | 0.078** |
| AGE | -0.003 | -0.013** | -0.030*** | -0.020*** |
| STATE | 0.001 | 0.002 | -0.037 | -0.072 |
| IND | -0.223*** | -0.066 | -0.165 | -0.077 |

| | | | | |
|---|---|---|---|---|
| ROE | -0.511 | -0.675* | -1.173* | -1.157** |
| GPROFIT | 1.344*** | 2.071*** | 1.984*** | 1.962*** |
| ATO | -0.070 | 0.015 | -0.104 | 0.014 |
| DEBT | 0.389* | 0.246 | -0.416 | 0.127 |
| RGROWTH | -0.547*** | -0.420*** | -0.328 | -0.663*** |
| AUDIT | -0.081 | 0.094 | 0.358 | 0.483* |

Note 1: for the description of each variable, please refer to 3 Methodology.

Note 2: when p < = 0.01, the significance is * * *, when 0.01 < p < = 0.05, the significance was * *, 0.05 < p < = 0.1, the significance is *.

Table 6 shows that on the whole, from the third quarter of 2020 to the third quarter of 2021, the implementation performance of ESG and whether to step back has no significant impact on the improvement of enterprise Z-score. This means that after the epidemic was controlled, the company's operation gradually recovered, and many companies focused on repairing the losses suffered in operation last year. After the outbreak of the epidemic, the high-intensity CSR behavior gradually decreased. Therefore, among the factors affecting the improvement of the financial situation, it has been transformed into the actual performance results of operation behavior. However, social responsibility is still an investment with deferred effect, because from the empirical results of quantile regression, the factor that ESG performance does not decline in the level with the greatest progress in overall financial performance still has a positive and significant impact on improving overall financial performance.

## 5 Conclusion

This paper uses the A-share manufacturing industry of Chinese listed companies from 2019 to the third quarter of 2021 as the sample to empirically study the impact of ESG performance on the overall financial situation of enterprises before and after the epidemic. The results show that:

1. During the COVID-19, the better the ESG performance, the worse the overall financial situation of the enterprise. However, if the ESG performance of the enterprise is flat or even improved compared with last year, it will significantly improve the

**Comment [n5]:** The conclusion includes the research question's answer as well as a brief discussion of the research findings and their managerial implications for investors and the government. It also reveals the research's shortcomings.
In this article, the discussion of research problems has not been accompanied by reasons to support the research findings, and they have not used these findings to provide advice to companies, further research, the government, and investors.

overall financial situation of the enterprise; This situation is more significant for companies whose financial situation has improved at the senior level.

2. After the recovery of the epidemic, the performance of ESG has no significant impact on the overall financial status of the enterprise, but the better the recovery of financial status, if the performance of ESG can be the same as or even improve the previous period, it will significantly improve the overall financial status of the enterprise.

According to the empirical research results, this paper puts forward the following corresponding suggestions:

1. For enterprises: CSR is not only the payment to stakeholders, but also brings many intangible benefits to the enterprise itself. As the empirical results of this paper show, whether it is the resistance to lose during the outbreak of the epidemic or the recovery after the end of the epidemic, the performance of ESG does not retreat has a significant positive effect. There is no specific level of requirements for the commitment of social responsibility. How much ability and responsibility do you have, but do not carry out it intermittently to cope with some purposes, but continue to carry out and even make more and more progress, so that the effect will gradually appear.

2. For national and CSR rating agencies: due to the different operating conditions of each enterprise, CSR cannot be enforced or set specific goals, otherwise it will damage the normal profits of enterprises and harm the national economy. The concept of CSR is becoming more and more advanced in China. At present, almost all rating agencies in China refer to rating a small number of listed companies. To encourage enterprises to try their best to bear social responsibility, it is suggested that rating agencies can improve the rating method and apply it to small and medium-sized enterprises, Moreover, if the state can increase the holding of competitions related to CSR and give appropriate rewards and praise to those with excellent performance, it should have a better publicity function.



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